

AFIDA

Advanced Fuel Ignition Delay Analyser IP 617

Correlates with ASTM D613; EN ISO 5165 & DIN 51773



- Suitable for use with Cetane improvers
- Integral 36 place carousel and auto sampler
- Calibrated with industry approved PRFs over the range 35 to 85 G-CN
- Fully automated measurement
- Small sample volumes
- Short analysis time

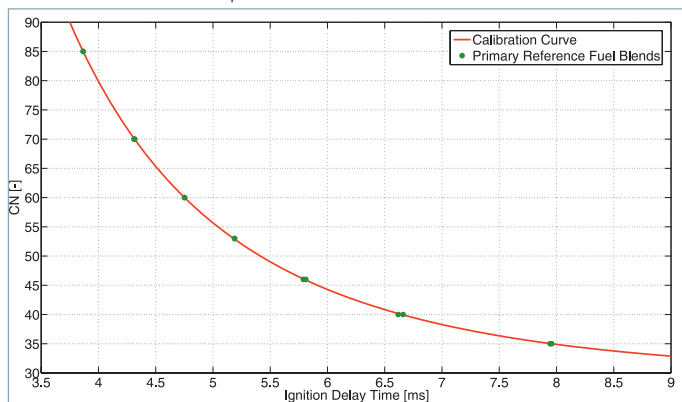


AFIDA is a revolutionary development providing fully automated determination of the Generic Cetane Number (G-CN) of diesel and diesel related fuels using test method IP 617.

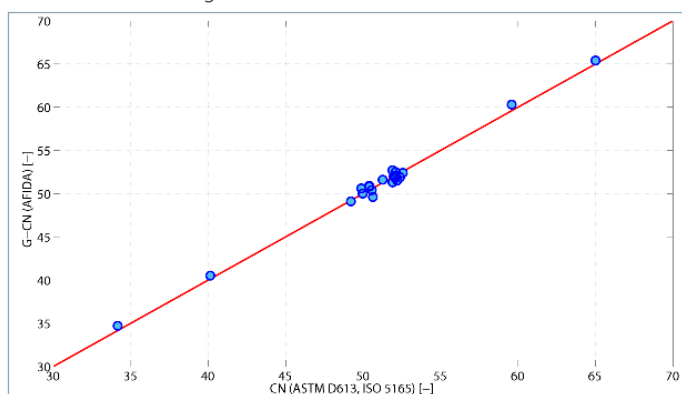
The analyser uses a constant volume combustion chamber (CVCC) and incorporates a unique and patented high pressure injection system that generates fine fuel droplets similar to modern common rail injectors in most diesel engines.

An ultra robust temperature controlled piezo electric injector provides rapid switching and highly repeatable fuel metering, offering improved performance and consistency when compared with solenoid controlled injectors and pintle type nozzles.

The analyser provides very fast, efficient and calibrated G-CN determinations, tests are fully automated via an integral 36 position carousel and auto sampler.



› Figure 1: Example of a calibration with 7 PRF blends covering measurement range CN 85 to CN 35



› Figure 2: G-CN correlation to CFR engine

Features

- Excellent correlation to ASTM D613, EN ISO 5165 & DIN 51773
- Proven for a wide range of sample types - middle distillates, blend components, biodiesel, FAME, XTL, HVO, heating oil and Jet A1
- Suitable for use with Cetane improvers
- Integral 36 place carousel and auto sampler
- Calibrated with industry approved PRFs over the range 35 to 85 G-CN
- Fully automated measurement
- Small sample volumes (approx 40 ml/analysis including flushing)
- Short analysis time of approximately 20 minutes per sample
- Precise and reproducible software controlled determination of G-CN
- Advanced electronically controlled high pressure fuel injection system with piezo electric injector
- Safe operation - integral safety monitoring functions
- Results saved to PC for download
- Stable calibration - fixed test conditions eliminates routine temperature tuning
- Low running costs, single gas supply for combustion air
- Uninterruptable power supply to maintain cooling in the event of power failure



› Sample Carousel



› Piezo Electric Injector

New Generation AFIDA Technology

Direct correlation to ASTM D613 (ISO 5165) engine tests

The traditional Cetane 'CFR' engine methods establish an ignition delay period for the test fuel which is referenced to a primary reference fuel scale.

Existing Constant Volume Combustion Chamber (CVCC) technology (including IQT and CD510 instruments) provide a Derived Cetane Number (DCN) result based on a historical averaged correlation equation applied to the ignition delay of the fuel sample.

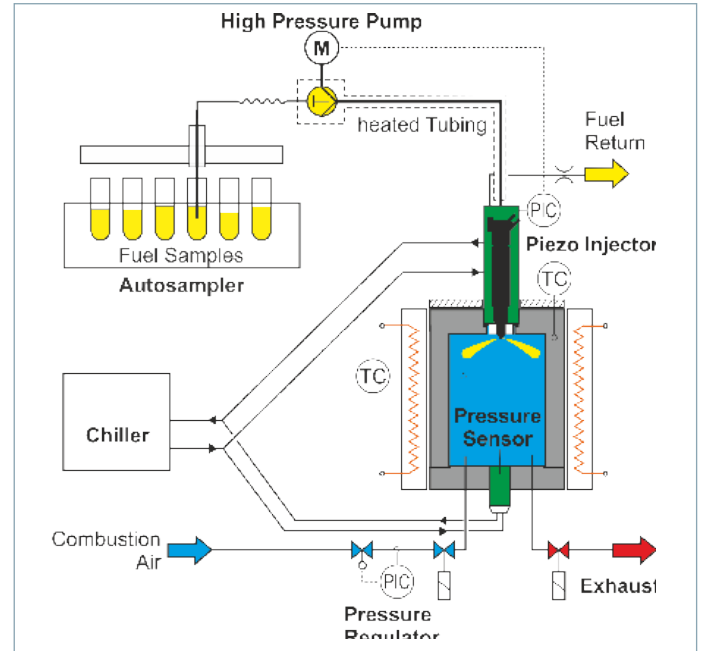
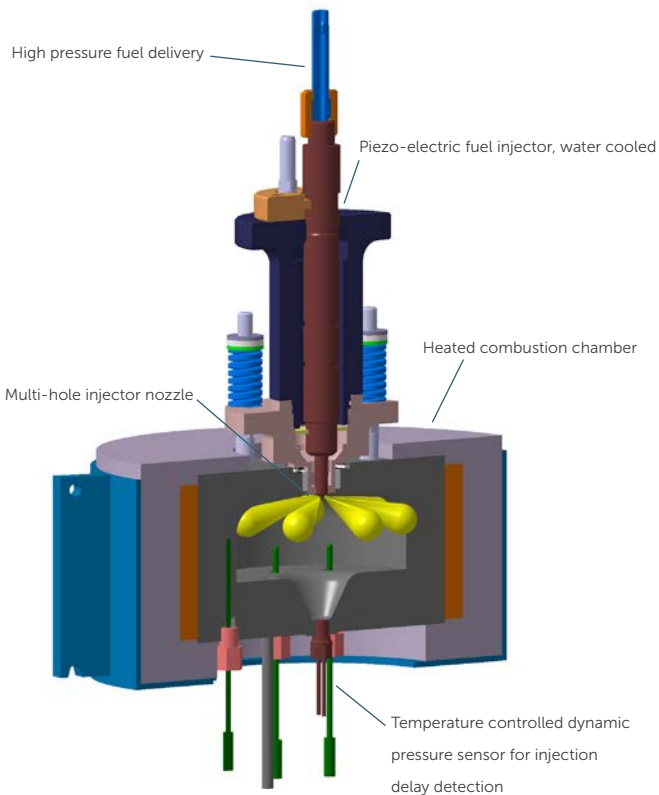
The new generation AFIDA technology is a significant step forward as it uses the same Primary Reference Fuels as specified in the CFR Engine method to provide a calibrated cetane number measurement (see figure 1).

Standardisation: industry stakeholders recognise the advantages of the AFIDA with CEN, ASTM and the Energy Institute forming new working groups to develop test methodology; IP 617 is already published as an approved test method. Inter-laboratory studies showed outstanding precision and excellent correlation when compared with samples with known Cetane Numbers. The coefficient of determination (R^2) is 0.98 (see figure 2).

An investigation into carryover with 2-EHN Cetane Improver showed no effect.

Operating Sequence

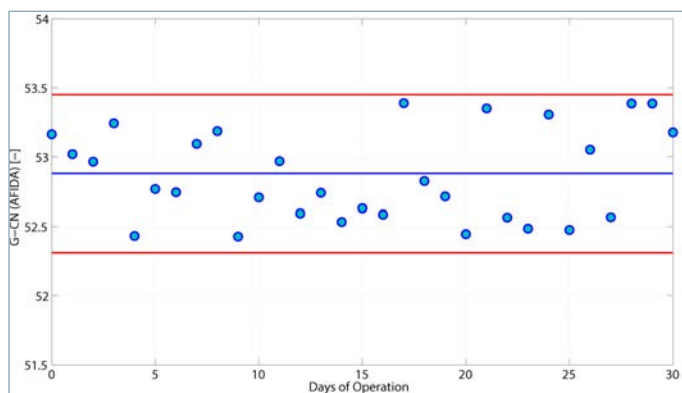
- Prior to the analysis each sample is filtered by the operator using a 0.45 µm filter
- Software controlled auto sample selects the sample to be analysed
- System is cleaned automatically with the selected sample
- High pressure pump generates the injection pressure, while the heating tubes keeps the fuel at a constant temperature
- Test sample is injected into the pressurised combustion chamber
- Nebulized fuel ignites spontaneously and leads to a pressure increase, see figure 4
- The pressure variation curve is recorded at high resolution by a dynamic pressure sensor
- G-CN is read directly from the calibration curve, see figure 1



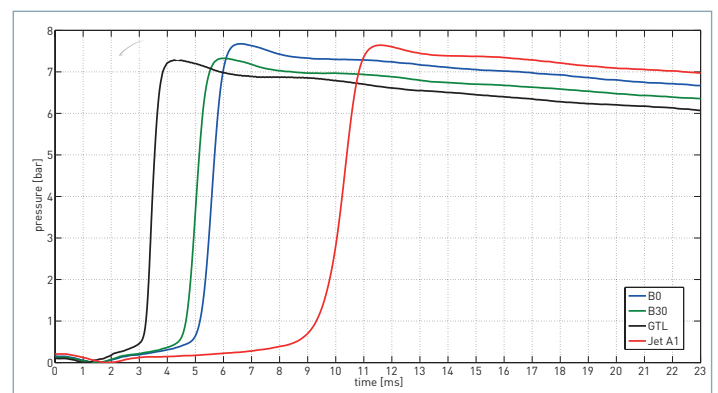
Features of the Chamber and Injector

- Fuel reservoir maintains high fuel pressure during injection
- Piezo-electric fuel injector as used in modern passenger cars' diesel engines
- Water-cooled injector jacket maintains constant fuel temperature during operation
- Effective nozzle tip cooling to avoid fuel degradation due to high temperatures
- Large internal chamber diameter to prevent any fuel impingement
- Real internal chamber temperature measurement
- Pressure transmitter connection free of acoustic oscillation

View a demo video: www.stanhope-seta.co.uk/afida-video.asp



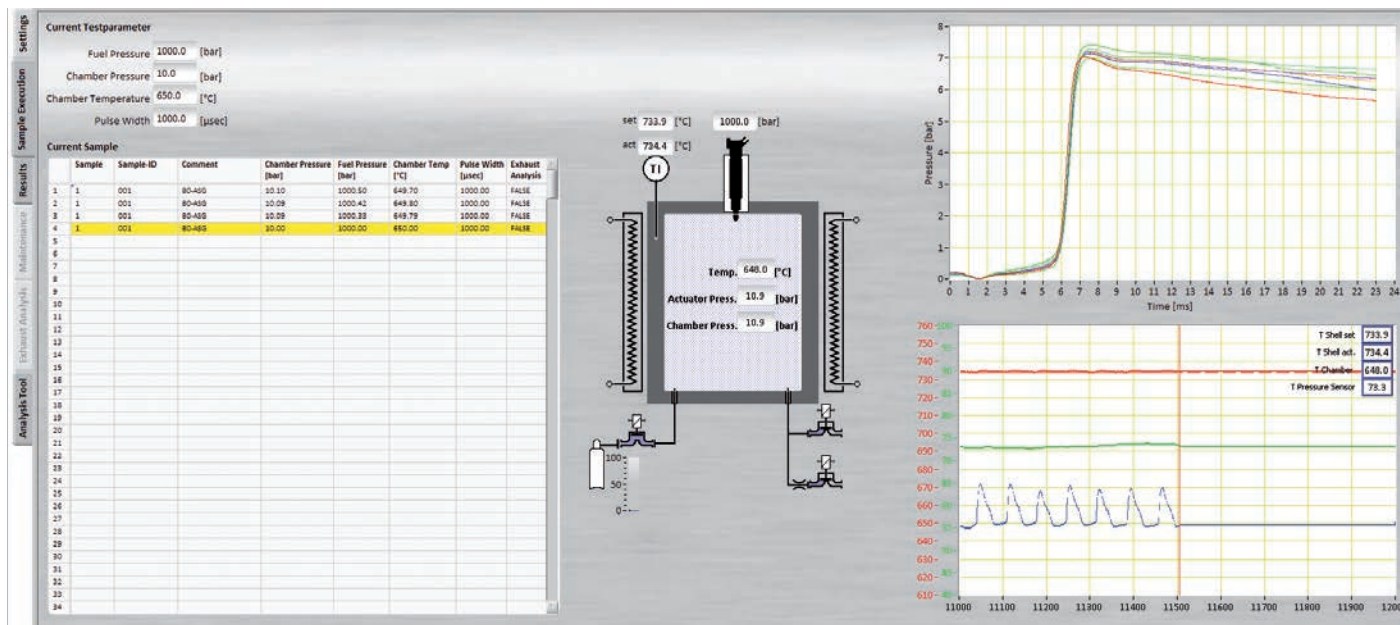
› Figure 3: G-CN variation during operation time



› Figure 4: Pressure variation curves of four different fuels (B0, B30, GTL and Jet A1)

Software

AFIDA is controlled via a PC with user friendly 'LabView' operating software. After selecting 'start' all sample analysis is fully automatic and needs no user intervention. Measurement conditions and a detailed report of results are stored in separate text-files for each sample. A complete overview of G-CN results of the test sequence is saved.



Technical Specification

Product Number:	SA6000-0
Operation	
Measurement Conditions:	Chamber temperature: 580°C Chamber pressure: 17.5 bar Injection pressure: 1000 bar Compressed air (20.9 ± 0.5 % O ₂)
Sample Volume:	approx. 40 ml for analysis and cleaning
Warm-up Time:	approx. 45 min
Analysis Time:	approx. 20 min per sample
Range for G-CN:	35 – 85 in standard mode
Carousel Capacity:	36 samples
Reporting	
Software:	LabView-based program with text export
Test Parameters:	All measurement values are stored in the data file
Reports:	Detailed report of test results, date and time, operator name and calibration data
Safety	
External Cooling:	Backup power supply and liquid level sensor
Waste:	Liquid level sensor
Various:	Programmable Logic Controller (PLC)-based
Requirements	
Operating Requirements:	Ambient Temperature: 10°C to 35°C (recommended 15°C to 25°C) Humidity: up to 80% non-condensing
Size (WxHxD)/Weight:	1300mm x 800mm x 600mm /Approx 100kg (excluding platform)
*Manufactured under licence from ASG Analytik-Service Gesellschaft mbH	

Research Option

Fully automated research options are available for the AFIDA which provide the following features:

- Complete access to all chamber parameters
- Internal chamber temperature user adjustable up to 700°C
- Chamber pressure adjustable up to 50 bar
- Fuel injection pressure adjustable up to 1200 bar
- Adjustable fuel injection duration with multiple injections comparable to modern diesel engines
- Gas mixing unit for two user-defined gases, for example:
 - > Nitrogen and oxygen for variation of the atmosphere's oxygen content
 - > Argon and oxygen to eliminate the effect of nitrogen on combustion
 - > Compressed air and carbon dioxide for an EGR (exhaust gas recirculation) simulation
 - > Methane and compressed air to investigate pilot injection controlled combustion
- Exhaust gas interface to connect the AFIDA to exhaust gas analysers
- Sample heating for viscous fuels, such as plant oils
- Sample cooling for low boiling fuels

More research options can be developed on request.