DS SERIES
ENGINE COMBUSTION
ANALYSIS SYSTEM

Improved high speed real time analysis and function cover widely the data processing of engine matching test such as knocking detection, combustion efficiency analysis, which are useful for aiming at not only the improvement of engine performance but also the clean engine.

Suitable for on-vehicle usage owing to the portable size of small and light weight.

Discontinued
(Reference only)

ONO SOKKI

■ Features

- ● Specific heat ratio calculations are possible, based on the entered fuel composition corresponding to thermodynamic calculation of liquid and gaseous fuel.
  - Liquid fuel : Setting of composition weight ratio for C, H, H_2O, O, S
  - Gaseous fuel : Setting of element ratio for C, H, O
- ● EGR ratio, i.e. re-circulated gas weight, is calculated.
- ● Many optional functionality.
  - DS-0229 : Real-Time Knocking Monitor and Analysis
  - DS-0236 : Data Link Function
  - DS-0237 : CPL & Combustion Noise Calculation
  - DS-0258 : Calculation of Multiple Injection

- ● Calculation monitor function including thermodynamic calculation.
- ● Trend monitor and statistical calculation of real-time Pi,Pmax etc.
- ● Compact (B5 size) and light weight of hardware can be used on-vehicle. (DC-Power supply)
- ● TDC correction function : Corrections based by motoring and gap sensor.
- ● Smoothing calculation function : Digital filtering and moving average methods.
- ● Graphic layout setting for arbitrary users is possible.
- ● In calculation techniques, selection of simple or precise calculation is possible.

HARDWARE

Hardware Specifications

DS-0280   4-ch High Speed A/D Unit

● No. of Input Channel	4-ch/unit (Maximum up to 20-ch , 5 units)	● A/D Resolution	14 bits
● Input Method	Single end	● Sampling Speed	Maximum 1MHz
● Isolation	Non-Insulation	● Data Memory	28 MB/ch
● Connection	BNC	● Dimensions	257 (W) x 30 (H) x 182 (D)mm
● Input Impedance	1MΩ	● DC Input Voltage	9V ~ 16.5V
● Coupling	DC	● Power Consumption	At 12V DC, below 500mA (6W)
● Input Voltage Range	± 0.1/0.2/0.5/1.0/2.0/5.0/10.0V	● Operating Temperature Range	0 ~ + 40°C (without condensation)
● Level Monitor LED	- 20dB (green), - 0.915dB (red)	● Stored Temperature Range	- 10 ~ + 60°C
● Offset Voltage	± 300% Voltage Range FS	● Weight	Approx. 900g

DS-0278   Pulse Input Unit

■ Pulse Input Section

● Input Impedance	100kΩ
● Input Method	Single end
● Isolation	Non-Insulation.
● Connection	BNC
● Coupling	AC and DC
● Input Voltage Range	±10 V
● Monitor LED	Signal detection OK (green), NG (red)
● Trigger Level	± 10 V, setting resolution at 10 bits
● Trigger Slope	+ (up), - (down)
● Input Pulse Number	180/360/720 P/R

■ Multiplying Function

● Clock Generating Mode	Angle sampling or time sampling
● Angle Sampling	Resolution at 0.05/0.1/0.25/0.5/1.0°
● Time Sampling Frequency	1k/2k/5k/10k/20k/50k/100k/200kHz

● Rotation Range Input	0.05°	10 ~ 7,000 r/min
	0.1°	10 ~ 10,000 r/min
	0.25°, 0.5°, 1.0°	10 ~ 25,000 r/min

■ Digital Pulse Output Function (option/DS-0275)
In the options, parallel output of Pi calculated values is possible.

■ External Start Function
TTL level or in no voltage contact signal, up or down signal as trigger signal, which is input at BNC connection, is used.

■ General Specifications

● Dimension	257 (W) x 30 (H) x 182 (D) mm
● DC Input Voltage	9 V ~ 16.5 V
● Power Consumption	At 12V DC, below 500mA (6W)
● Operating Temperature Range	0 ~ + 40°C (without condensation)
● Stored Temperature Range	- 10 ~ + 60°C
● Weight	Approx. 800g

DS-0281   16-ch Low Speed A/D Unit

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● No. of Input Channel	16-ch/unit (Maximum up to 32-ch, 2 units)	● Calculation	Calculation of average value of sample data upto maximum of 16 times per cycle.
● Input Method	Single end		
● Isolation	Non-Insulation	● Dimension	257 (W) x 30 (H) x 182 (D) mm
● Connection	D-SUB 37pin	● DC Input Voltage	9V ~ 16.5 V
● Input Impedance	1MΩ	● Power Consumption	At 12V DC, below 500mA (6W)
● Coupling	DC	● Operating Temperature Range	0 ~ + 40°C (without condensation)
● Voltage Range	+ 1.0/2.0/5.0/10.0V	● Stored Temperature Range	- 10 ~ + 60°C
● A/D Resolution	16 bits	● Weight	Approx.1.0 Kg
● Sampling Speed	100/200/500/1k/2k/5k/10kHz	● Accessories	Connector box, cable (1.5 meter)
● Sample Formula	Multiple		

Caution: Hardware configuration

DS-2100 main unit is essential unit for this system.

Further, the DS-0290 AC power supply unit will be necessary when number of unit is more than four(4).

SOFT WARE

Software Specifications

### DS-0228 Combustion Analysis Basic Package

This basic package provides for combustion analysis in gasoline and diesel engines, executing measurements and calculations
from combustion pressure to the thermodynamic calculations.
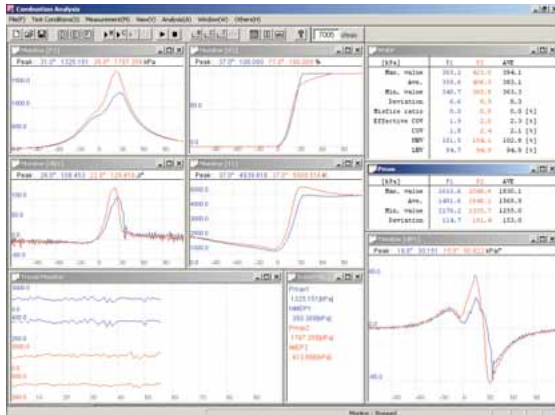
- Parameter Setting (Environment parameter/ Engine parameter/Fuel parameter) ● Voltage Monitor Function
- Top Corrective Function ● Calculating Monitor Function
- Drift Correction/Physical Quantity Setting Function
- Pulse Input Setting Function ● Measurements
- Analysis Function
  List View / Different Calculation Functions (Crank angle base and Cycle base) / Average Calculation and Cycle Calculation / Smoothing Process (Moving Average/Digital Filter) / Calculation Mode (Simple/Precise) / Coolant Heat Loss ON/OFF / Selecting the Rate of Heat Transfer Formula and Co-efficient
- Calculating Functions :
  Waveform Display
  • Crank Angle Base : Combustion Pressure, Injection Pressure Rise, Rate of Injection Pressure Rise, Needle Valve Lift, Rate of Needle Valve Lift, Arbitrary Physical Quantities Rate of Rise Arbitrary Physical Quantities.
  • Cycle Base : Engine Speed, Pmax, θ pmax, dP/dθ max, θ dp/dθ max, Pi, Picov etc.,
  • Others : P-V, log (P-V)
  Digital Display
  • With reference to Pi, Pmax, θpmax, dP/dθmax, θdp/dθmax, Ratio of Combustion Mass Position (every 10%), Heat Released, Combustion Start & End Position, Center of Gravity for Rate of Heat Release, Constant Volume Ratio, Statistically calculated, Single and Double Weibe Parameter, Injection Amount, Injection Start and End Position, Ratio of Combustion Efficiency etc.

DS-0229 Real-Time Knocking Monitor and Analysis Software (option)

Real time trend display will be done for knocking peak value, peak integral value, rms value and knocking rate by combustion pressure data.
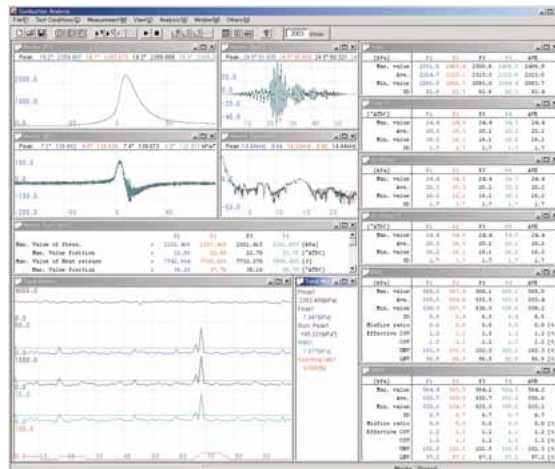
Even after measurement, it also the same knock analysis is possible.

DS-0236 Data Link Software (option)

The average value of engine performance data is acquired at performance bench and sent to combustion PC by LAN. As per environment data, the necessary calculations will be done in combustion analysis. The transmission is done at the TCP/IP socket interface.
- The Pi, Pmax etc., data is transmitted when calculation is monitored.
- After measurements at the bench site, the average value of measurement is received and the analysis result text file is sent.

DS-0237 CPL & Combustion Noise Calculation Software (option)

The cylinder pressure level (spectrum) is calculated by the cylinder pressure and the combustion noise is calculated from the previously set structure attenuation of the engine. And, if the CPL dynamic range is should be more gained, then a filter unit is needed at the output of charge amplifier.
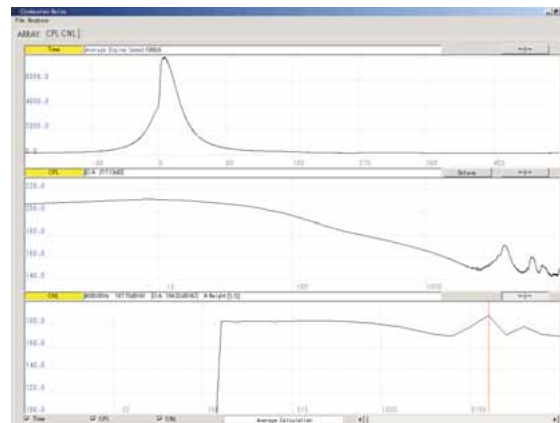
DS-0258 Calculation of Multiple Injection Software (option)

A single nozzle with a pilot injection including, DS-0258 does the combustion computation of injection maximum 10 times.
Also wearing the maximum value and on this position, injection efficiency, open valve pressure, injection start and completion timing, injections rate center of gravity and also the position, of injection pressure to, except for the multi-injections combustion graph even the computation listing output of the fire delay etc. is possible.
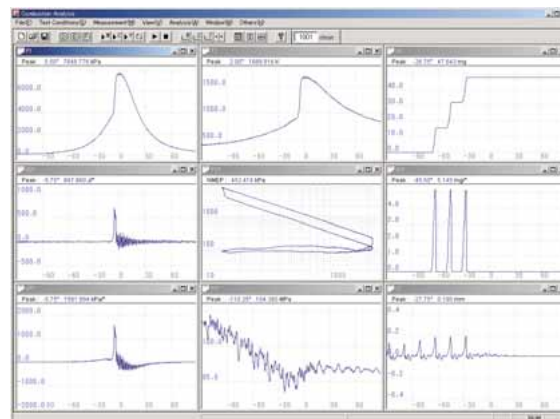
■ Environment of personal computer

CPU   : Pentium 4/1 GHz & above
OS   : Windows 2000 or XP
Memory   : 256 MB and above
(Varies according to the number of channels)

■ System Configuration

Category	Function	Model	Remarks
Hardware	Main Unit	DS-2100	
	Pulse input and External start	DS-0278	
	4-ch high speed A/D unit	DS-0280	Up to a Max. of 5 units
	16-ch low speed A/D Unit	DS-0281	Up to a Max. of 2 units
	AC supply unit	DS-0290	Required when number of unit is more than four(4)
	ONO-LINK II PCI Board	DS-0296	For Desk top PC
	ONO-LINK II PCMCIA Card	DS-0297	For Note PC
	PS-D10144A 2M 2m cable		For DS-0296
	PS-D10144A 10M 10m cable		For DS-0296
	PD-D10145A 2M 2m Cable		For DS-0297
	PS-D10145A 10M 10m Cable		For DS-0297
	Digital pulse output function	DS-0275	Option
	Vertical Stand	DS-0001	Option
Software	Constant combustion analysis package	DS-0228	
	Knocking monitor and analysis function	DS-0229	Option
	Data link function with performance bench PC	DS-0236	Option
	CPL and combustion noise calculation function	DS-0237	Option
	Calculation function of multiple injection	DS-0258	Option

■ Crank Angle Measurement Equipment

CP-5200
Cranke angle measurement detector (Optical fiber type)

● **Features**

*Combined with model CA-500A amplifier, high accurate measurement of cranke angle is possible.

*Suitable for engine performance test such as combustion analysis.

*Durable against electrical noise thanks to the fiber cable.

*Small and light weight for high performance against vibration resistance.

*Can be extended to 5 meter or 10 meter by optional signal cable (model IX-041 or IX-042).

● **Specification**

Suitable amplifier : Model CA-500A

Output pulse   : 720 P/R & 1 P/R

Revolution range : 0 to 12000 r/min

Allowable Max.
acceleration   : 500m/s^2

Cable   : Direct connection type
                    (1 meter/optical fiber type)

Weight   : Approx. 380g

*Attachment is provided optionally.

CA-500A
Amplifier for CP-5200

● **Features**

*Suitable for engine performance test such as combustion analysis.

*TTL signal is output as crank angle by input signal from CP-5200/5100 detector.

*Offset adjustment is easy because the pulse counter is built in.

● **Specification**

Suitable detector : Model CP-5110 or 5200

Output signal   : 1 P/R
                     Angle(360 P/R, 720 P/R)
                     Monitor signal
                     (both 1 P/R and Angle)

Pulse width   : 1 P/R equivalent to
                     1° or 0.5°
                     Duty ratio of ANGLE is
                     adjusted by OFFSET
                     volume.

Signal level   : TTl level, positive logic

Response frequency : 300 kHz

Power supply   : AC100 to 240V 50/60Hz

External dimension : 80(W) x 130(H) x 184(D) mm

Weight   : Approx. 1.5 kg

★Outer appearance and specifications are subject to change without prior notice.
URL: http://www.onosokki.co.jp/English/english.htm