ONO SOKKI

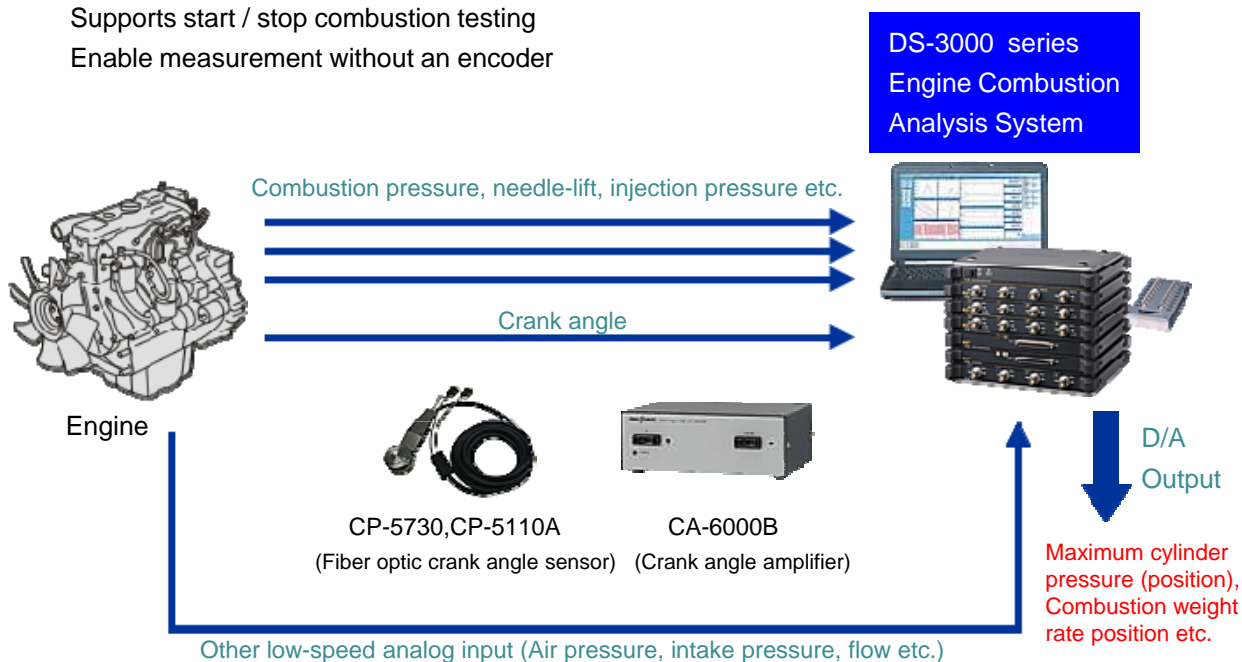# Engine Combustion Analysis System

DS-3000 series

● Overview

With the ongoing research and development for improving combustion technologies (HCCI, EGR, etc.), new power sources (HEV and PHEV) and new fuels (biodiesel and natural gas) , development of more fuel-efficient and smaller engines are increasingly demanded.

The DS-3000 series Engine Combustion Analyzer meets such growing expectations with the new developed, powerful hardware.
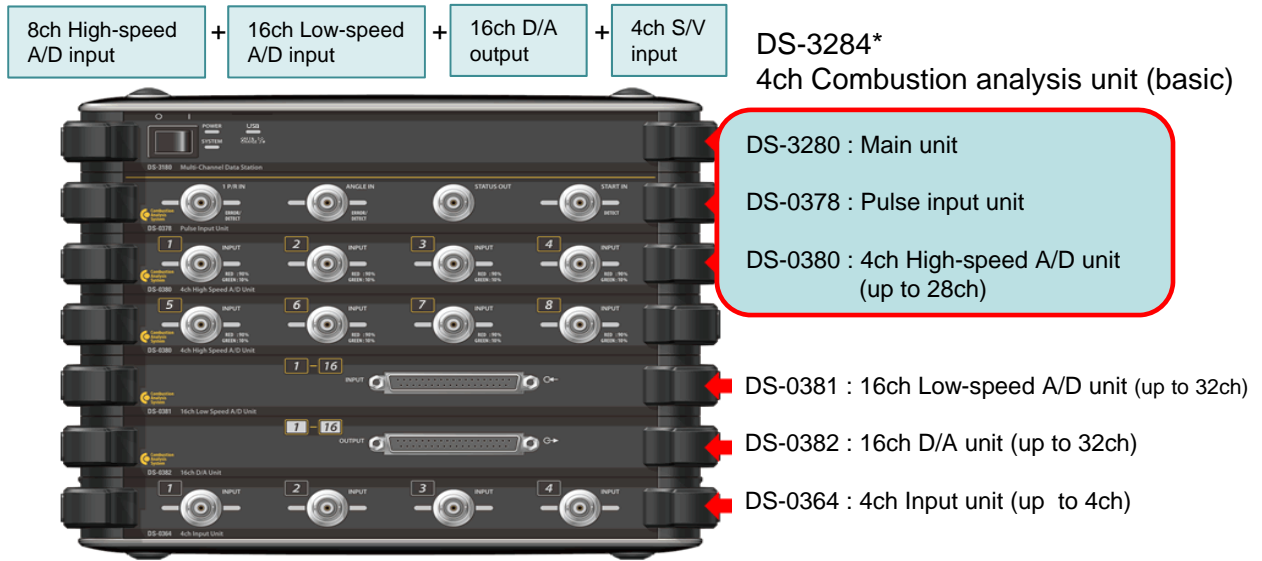
● Features

Supports multiple types of fuels (liquid fuel, gas fuel)
Measurement and calculation in real-time
Trend display in real-time
Supports start / stop combustion testing
Enable measurement without an encoder

DS-3000 series
Engine Combustion
Analysis System

Combustion pressure, needle-lift, injection pressure etc.

Crank angle

Engine

CP-5730,CP-5110A
(Fiber optic crank angle sensor)

CA-6000B
(Crank angle amplifier)

D/A
Output

Maximum cylinder pressure (position), Combustion weight rate position etc.

Other low-speed analog input (Air pressure, intake pressure, flow etc.)

http://www.onosokki.co.jp/English/english.htm

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● Hardware : configuration example

8ch High-speed A/D input	+	16ch Low-speed A/D input	+	16ch D/A output	+	4ch S/V input

DS-3284*
4ch Combustion analysis unit (basic)

DS-3280 : Main unit

DS-0378 : Pulse input unit

DS-0380 : 4ch High-speed A/D unit
(up to 28ch)

DS-0381 : 16ch Low-speed A/D unit (up to 32ch)

DS-0382 : 16ch D/A unit (up to 32ch)

DS-0364 : 4ch Input unit (up to 4ch)

*5 or more units: Cooling fan is attached. 150W type AC adapter is required.(option)

● Software

Model / Product name		Function
DS-0328 **Combustion analysis**	Basic	Basic software of combustion analysis including monitor function, measurement/calculation, and data storage. The analysis result of a channel can be displayed in various types of graphs and lists on one window. Basic combustion analysis can be performed easily just to click the buttons in order from the front on the simple operation measurement panel.
DS-0328T **Transient combustion analysis**	Option	Designed for multiple cycle (extended) measurement such as transient mode tests (WHSC and WHTC). Efficient analysis can be achieved by processing only the areas specified by cycle trends in transient measurement.
DS-0329 **Knocking analysis**	Option	Engine knocking is detected by monitoring for disturbance in cylinder pressure signals. Real-time calculations for knocking values and occurrence rates are available.
DS-0336 **Combustion link function**	Option	Data communication through TCP/IP sockets enables various processing such as specification setup, measurement conditions.
DS-0337 **Combustion noise analysis**	Option	CPL (Cylinder Pressure Level) is computed based on cylinder pressure while CNL (Combustion Noise Level) is calculated based on the magnitude of engine structural attenuation. Calculation monitoring, trend display and numerical display are available.
DS-0349 **Crank angle pulse cycle measurement**	Option	This function measures crank angle pulse cycle and performs calculations.
DS-0358 **Multiple injection analysis**	Option	Measurement items related to fuel injection and combustion can be calculated. (Up to 10 stages)
DS-0360 **Encoderless measurement**	Option	A new algorithm offers encoder-less stable measurements even during acceleration and deceleration. En bles measurement based on small number pulses such as missing teeth pulse signals and ring gears. Delay correction is also available.
DS-0361 **Torque variation analysis**	Option	By using the cylinder pressure for each cylinder, friction/inertial- adjusted engine torque data is calculated.
DS-0363 **Customizing calculation**	Option	Calculation formulas can easily be created as required as part of basic combustion analysis functions.
DS-0383 **CAN measurement**	Option	Cycle-by-cycle analysis can be made by synchronizing combustion analysis data with CAN data, which is becoming increasingly important as the basis for automotive control. (Hardware option VN1610 CAN interface is required.)

Hardware specification

DS-0380 4ch High-speed A/D unit

The number of input channels	4 ch / unit max.28 ch, up to 5 unit	Input voltage range	±0.1/0.2/0.5/1.0/2.0/5.0/10.0 V
Input method	Single-ended	Level monitor LED	-20 dB green , -0.915 dB (red)
Isolation	Isolated between units COM signal of 4 inputs in an unit is shared.	Offset voltage	±100 % voltage range FS error: ±1.0 % or less
		A/D resolution	16-bit
Terminal type	BNC terminal	Sampling frequency	Max. 1 MHz
Input impedance	1 MΩ	Data memory	56 MB/ch
Coupling	DC coupling	Weight	Approx. 900 g

DS-0378 Pulse input unit

Pulse input section			
Input impedance	100 kΩ	Isolation	Isolated between 1 P/R input, angle pulse input External start input and Status output Common of 1 P/R input and angle pulse input is shared.
Input method	Single-ended		
Isolation	Non-isolated	External start input	
Terminal type	BNC terminal	Input format	TTL or non-voltage contact signal
Coupling	AC or DC coupling	Internal pull-up resistor	100 kΩ connected to internal +5 V
Input voltage range	±10 V	Min. pulse width	10 ms
Absolute max. input range	±45 V	Status output	
Min. input voltage	1.0 Vp-p	Output format	TTL
Monitor LED	Normal signal (green) / abnormal signal (red)	External start function	BNC input terminal to start measurement by TTL level or non-voltage contact signal
Trigger level	±10 V, setup resolution 10-bits		Detection slope: Rising or falling
Trigger slope	rising , −(falling	Weight	Approx. 800 g

DS-0381 16ch Low-speed A/D unit

The number of input channels	16 ch / unit max.32 ch, up to 2 units	Voltage range	±1.0/2.0/5.0/10.0 V
Input method	Single-ended	A/D resolution	16 bit
Isolation	Non-isolated	Sampling angle	45 °
Terminal shape	D-SUB 37-pin	Sampling method	Multiplex method
Input impedance	1 MΩ	Weight	Approx. 800 g
Coupling	DC coupling	Accessory	BNC connector box, signal cable 1.5 m

DS-0382 16ch D/A unit

The number of output channels	16 ch / unit max. 32 ch, 2 units	Max. output current	±1 mA
Output method	Single-ended GND common to each channel	Output coupling	DC coupling
Isolation	Non-isolated	Output voltage range	±10.0 V
Terminal shape	D-SUB 37-pin (with external BNC connector box)	D/A resolution	14-bit
		Rising time	100 µs or less
Output impedance	1 Ω or less	Weight	Approx. 800 g
Load impedance	10 kΩ or more	Accessory	BNC connector box, signal cable 1.5 m

DS-3284 Combustion analysis unit

AC power voltage	100 to 240 VAC	The number of max.units	9 units
DC power voltage	10.5 to 16.5 V [1]	PC interface	USB3.0 interface USB 2.0 can also be used, however the speed of USB 3.0 is faster than USB 2.0.
Power consumption	Approx. 27 to 67 W [2]		
Operating temperature range	0 to 40 non-isolated		
Storage temperature range	−10 to 60	Outer dimensions	257 W ×104 to 344 H ×182 D mm [2]
CE marking	Conformed	weight	Approx. 3.1 to 8.5 kg [2]

Note:5 or more units; Cooling fan is attached. 150W type AC adapter

1   10.5 to 16.5 V in 4 units   2   The value will be changed depending on the number of channels.

Operating environment

CPU	Intel® Core™ i5 or more	OS	Microsoft® Windows® 7 Ultimate/Professional 64-bit / 32-bit version Microsoft® Windows® XP Professional SP2 or later/32-bit version only
Memory capacity	4 GB or more		
Interface	USB 3.0 interface USB 2.0 can also be used, however the speed of USB 3.0 is faster than USB 2.0.		

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