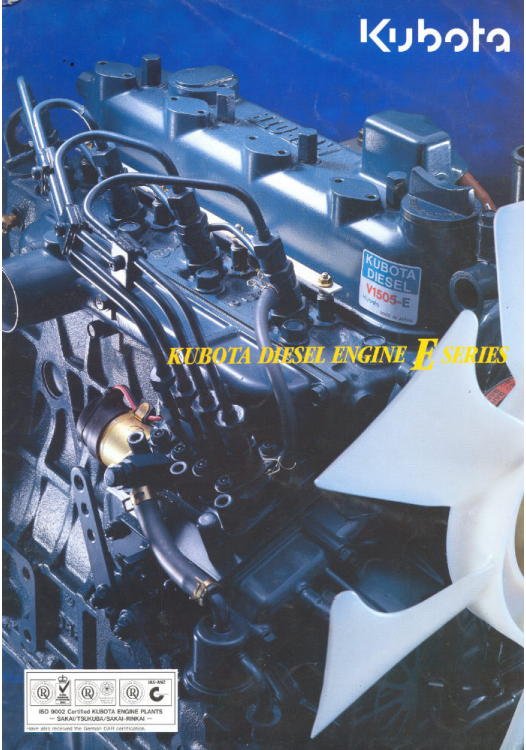
Kubota

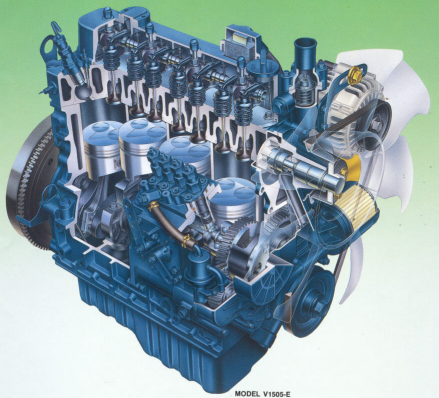


KUBOTA DIESEL ENGINE E SERIES

ISO 9002 Certified KUBOTA ENGINE PLANTS
— SAKAI/TSUKUBA/SAKAI-RINKAI —
Have also received the German KAN certification.

Four Dimensions of Kubota Engine

"High Performance", "Energy Efficient", "Labor Saving", and the utmost "Respect for Humanity" are Kubota's four engine development fundamentals. The essential spirit of Kubota's engine development is to meet the needs of a rapidly changing society with a perfect blend of these four fundamentals. In other word, Kubota's policy is to create a more powerful, economical, quiet running, and virtually maintenance-free engine. The E Series diesel engines reflect Kubota's concern and respect for humanity. Our long technological experience and expanded Research & Development stand behind this World's First Clean Emission Series.



MODEL V1505-E

*Automatic injection timer and water temperature switch are options.

Kubota's Clean, Efficient and Versatile Diesel Engines

Kubota E Series Features

1. Cleaner Emission

Making a more fuel efficient, cleaner exhaust engine has always been a top priority for Kubota. Our undying pursuit for cleaner emission led to the development of the E Series. This series complies with CARB ULGE* equipments regulations (less than 25 hp) for industrial (off-road) diesel engines. Kubota's next task is to meet the emission control regulations for CARB off-highway vehicles (25 ~ 175 hp), EPA non-road regulations as well as off-road regulations due to come into effect in Europe and Japan.

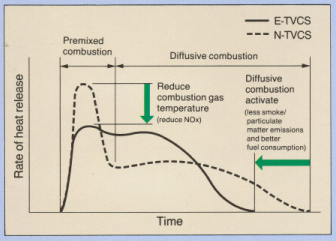
- *Kubota's D1105-E is the world's 1st ULGE diesel engine under 25HP to be certified (certificate shown above) by CARB on Apr. 13, 1993.*

*CARB (California Air Resources Boad) ULGE (Utility, Lawn and Garden Equipments)

Technology Behind Clean Emission

A. E-TVCS Combustion System and Improved Fuel Injection System

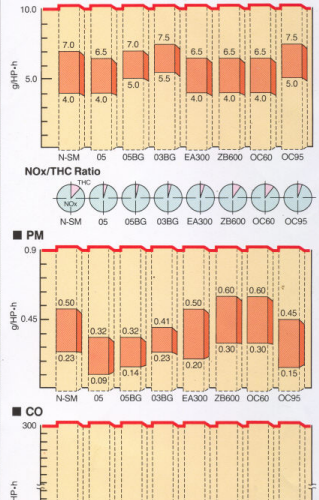
The shape and dimensions of a combustion chamber is the key to successful emission control which responds to diesel engine regulations. Kubota's original E-TVCS combustion chamber (detailed separately) meets emission control by improving the air/fuel mixture and shortening the ignition delay. The fuel injection pump, nozzle, and cam profile designs have also been improved to reduce combustion period while restricting rapid premixed combustion.



CARB ULGE's 6 Mode Exhaust Emission Data

■ CARB Regulation (g/HP·h)

NOx + THC	PM	CO
10.0	0.9	300



indicates the range of emission level of Kubota engines for CARB ULGE's 6 Mode.

N-SM: NEW SUPER MINI Series
05: SUPER 05 Series
05BG: SUPER 05 Series 1800rpm For Generator
03BG: SUPER 03 Series 1800rpm For Generator

Kubota's Clean, Efficient and Ve

B. Introduction of Emission Measuring Equipment, New Manufacturing Facilities and an Improved Quality Control System

Compliance with emission control regulations requires not only purely technical improvements to products, but also introduction of emission measuring equipment, improvement of the quality control system and measuring equipment in the manufacturing process. The following measures were taken to achieve this:

(1) Development of Emission Measuring System

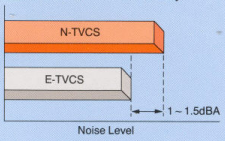
In 1991, Kubota established a new research laboratory for measuring gaseous emissions and particulates. All gas analizer and dilution tunnel are controled by computer system to comply with worldwide authorized test standards.
A dedicated air conditioning system is equipped to control the temperature and humidity of the engine intake air.

(2) Introduction of New Manufacturing Facilities and Improved Quality Control System

Kubota has now incorporated various emission measuring and adjustment facilities, as well as operation inspection equipment and data control systems into assembly lines. The quality control system was also reviewed and improved to ensure a stable emission level for mass-produced engines.

2. Low Noise

Super 05 Series' existing low noise levels during load and no-load operations were further reduced by 1 ~ 1.5dBA.
In addition, the noise spectrum was further improved to ensure more comfortable operation.



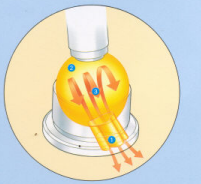
3. Interchangeability Ensures Same Reliable Performance

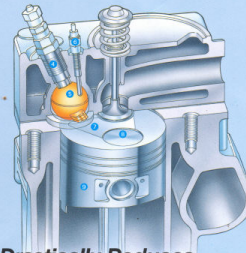
The appearance and weight of the E-Series remain the same as those of each existing series (New Super Mini, Super 05, Super 03, OC and EA300/ZB600 , Horizontal Series), thus requiring no changes when mounting on equipment. The high output, low fuel consumption, superb start-up, and high torque of existing Kubota diesel engines remain the same in all E-Series engines.

4. Variety of Choice

Kubota offers you a variety to choose from. A total of 20 models, ranging from 6.2 hp ~ 57.5 hp, make up the entire E-Series.

/e rsatile Diesel Engines





1. Shape of the combustion chamber throat
2. Combustion chamber
3. Three vortex
4. Injection nozzle
5. Combustion chamber
6. Glow plug
7. Fan-shaped concave
8. Valve recess
9. Piston

E-TVCS Technology Drastically Reduces NOx Emission

By offsetting the direction of fuel injection into the swirl chamber, and designing the throat of the swirl chamber to match the concave recess on the piston head, E-TVCS activates diffusive combustion in the main combustion chamber, thus reducing soot, unburned HC and CO emissions. The spherical combustion chamber type E-TVCS produces far less NOx than the DI (direct injection) system. In order to lower NOx emission even more, the injection pump and nozzle designs are optimized to match the combustion chamber. The volume of fuel injection per crank angle (fuel injection rate) and its pattern are ideally controlled by an optimum matching of the fuel cam profile, Bosch-type injection pump with damping valve, and the double throttle nozzle with flat cuts. The increased compression ratio and the modified injection nozzle angle not only improved normal starting without the aid of any special warm-up device, but also improved low temperature start ups with a glow plug and a considerable reduction of toxic bluish white smoke emission. In short, the E-Series is a well balanced engine series with improved power output, fuel economy, engine start ups, reduced noise and cleaner emission.

*Kubota's proprietary TVCS (Three Vortex Combustion System) obtains optimum air/fuel mixture by generating three intense swirling air flow (vortexes) within the spherical-combustion (swirl) chamber. The New TVCS added a special concave recess on the piston head to force compression air in the swirl chamber and to smooth combustion gas discharging. The E-TVCS, based on New TVCS, is aimed at drastic emission reduction.

*The "E" in E-TVCS and those following the model numbers stand for "Ecology", "Environment", and "Earth", from Kubota's environmental protection campaign slogan, "Loving and Caring for Our Earth."

E-TVCS

A Complete 20 Model Line-Up

NEW SUPER MINI Series

Vertical, water-cooled
4-cycle diesel engine
Number of cylinders: 2 ~ 3
kW range: 9.3 ~ 14.0
HP range: 12.5 ~ 18.8

Z482-E

D722-E

Model		Z482-E	D662-E	D722-E
Type		Vertical, water-cooled, 4-cycle diesel engine		
Number of Cylinders		2	3	3
Bore × Stroke	[in. (mm)]	2.64 x 2.68 (67 x 68)	2.52 x 2.68 (64 x 68)	2.64 x 2.68 (67 x 68)
Total Displacement	[cu. in. (cc)]	29.23 (479)	40.03 (656)	43.88 (719)
SAE J1349 Gross Intermit. HP	[kW (HP)/rpm]	10.4 (13.9)/3600	14.3 (19.2)/3600	15.6 (20.9)/3600
Net Intermit. HP	[kW (HP)/rpm]	9.3 (12.5)/3600	12.9 (17.3)/3600	14.0 (18.8)/3600
Net Cont. HP	[kW (HP)/rpm]	8.1 (10.8)/3600	11.2 (15.0)/3600	12.2 (16.3)/3600

• Specifications are subject to change without notice.

SUPER 05 Series

Vertical, water-cooled
4-cycle diesel engine
Number of cylinders: 3 ~ 4
kW range: 14.7 ~ 31.3
HP range: 20.0 ~ 42.0

D1105-E

V1505-E

*Solenoid is an option.

V1505-TE

*Solenoid is an option.

Model		D905-E	D1005-E	V1205-E	V1205-TE
Type		Vertical, water-cooled, 4-cycle diesel engine			
Number of Cylinders		3	3	4	4
Bore × Stroke	[in. (mm)]	2.83 x 2.90 (72 x 73.6)	2.99 x 2.90 (76 x 73.6)	2.83 x 2.90 (72 x 73.6)	2.83 x 2.90 (72 x 73.6)
Total Displacement	[cu. in. (cc)]	54.86 (898)	61.12 (1001)	73.15 (1198)	73.15 (1198)
SAE J1349 Gross Intermit. HP	[kW (HP)/rpm]	19.4 (26.0)/3600 16.8 (22.5)/3000	21.4 (28.7)/3600 18.7 (25.1)/3000	28.1 (35.5)/3600 23.4 (30.6)/3000	32.8 (44.0)/3600 28.0 (37.5)/3000
Net Intermit. HP	[kW (HP)/rpm]	17.5 (23.5)/3600 14.9 (20.0)/3000	19.4 (26.0)/3600 16.8 (22.5)/3000	23.5 (31.5)/3600 20.1 (27.0)/3000	29.8 (40.0)/3600 25.4 (34.0)/3000
Net Cont. HP	[kW (HP)/rpm]	15.3 (20.5)/3600 12.7 (17.0)/3000	16.8 (22.5)/3600 14.2 (19.0)/3000	20.1 (27.0)/3600 17.2 (23.0)/3000	25.7 (34.5)/3600 21.8 (29.0)/3000

Model		V1305-E	D1105-E	V1505-E	V1505-TE
Type		Vertical, water-cooled, 4-cycle diesel engine			
Number of Cylinders		4	3	4	4
Bore × Stroke	[in. (mm)]	2.99 x 2.90 (76 x 73.6)	3.07 x 3.09 (78 x 78.4)	3.07 x 3.09 (78 x 78.4)	3.07 x 3.09 (78 x 78.4)
Total Displacement	[cu. in. (cc)]	81.50 (1335)	68.58 (1123)	91.44 (1498)	91.44 (1498)
SAE J1349 Gross Intermit. HP	[kW (HP)/rpm]	28.7 (38.5)/3600 25.3 (33.9)/3000	20.9 (28.0)/3000	28.0 (37.5)/3000	34.7 (46.5)/3000
Net Intermit. HP	[kW (HP)/rpm]	25.7 (34.5)/3600 22.4 (30.0)/3000	18.7 (25.0)/3000	25.0 (33.5)/3000	31.3 (42.0)/3000
Net Cont. HP	[kW (HP)/rpm]	22.4 (30.0)/3600 19.9 (26.5)/3000	16.4 (22.0)/3000	21.6 (29.0)/3000	27.2 (36.5)/3000

• Specifications are subject to change without notice.

SUPER 03 Series

Vertical, water-cooled
4-cycle diesel engine
Number of cylinders: 3 – 5
kW range: 21.6 – 42.9
HP range: 29.0 – 57.5


D1403-E


V2203-E


F2803-E

* Solenoid is an option.

Model		D1403-E	D1703-E
Type		Vertical, water-cooled, 4-cycle diesel engine	
Number of Cylinders		3	3
Bore × Stroke	[in. (mm)]	3.15 × 3.64 (80 × 92.4)	3.43 × 3.64 (87 × 92.4)
Total Displacement	[cu. in. (cc)]	85.01 (1393)	100.55 (1647)
SAE J1349 Gross Intermit. HP	[kW (HP)/rpm]	23.1 (31.0)/2800	27.6 (37.0)/2800
SAE J1349 Net Intermit. HP	[kW (HP)/rpm]	21.6 (29.0)/2800	25.7 (34.5)/2800
SAE J1349 Net Cont. HP	[kW (HP)/rpm]	18.6 (25.0)/2800	22.4 (30.0)/2800

Model		V1903-E	V2203-E	F2803-E
Type		Vertical, water-cooled, 4-cycle diesel engine		
Number of Cylinders		4	4	5
Bore × Stroke	[in. (mm)]	3.15 × 3.64 (80 × 92.4)	3.43 × 3.64 (87 × 92.4)	3.43 × 3.64 (87 × 92.4)
Total Displacement	[cu. in. (cc)]	113.37 (1857)	134.08 (2197)	167.59 (2746)
SAE J1349 Gross Intermit. HP	[kW (HP)/rpm]	31.3 (42.0)/2800	36.9 (49.5)/2800	46.2 (62.0)/2800
SAE J1349 Net Intermit. HP	[kW (HP)/rpm]	29.1 (39.0)/2800	34.3 (46.0)/2800	42.9 (57.5)/2800
SAE J1349 Net Cont. HP	[kW (HP)/rpm]	25.4 (34.0)/2800	29.8 (40.0)/2800	37.3 (50.0)/2800

• Specifications are subject to change without notice.

HORIZONTAL Series

Horizontal, water-cooled
4-cycle diesel engine
Number of cylinders: 1 – 2
kW range: 5.2 – 9.3
HP range: 7.0 – 12.5


EA300-E


ZB600-E

OIL-AIR COOLED Series

Vertical, oil-air cooled
4-cycle diesel engine
Number of cylinder: 1
kW range: 4.6 – 7.1
HP range: 6.2 – 9.5


OC95-E

Model		EA300-E	ZB600-E	OC60-E	OC95-E
Type		Horizontal, water-cooled, 4-cycle diesel engine		Oil-air cooled diesel engine	
Number of Cylinders		1	2	1	1
Bore × Stroke	[in. (mm)]	2.95 × 2.76 (75 × 70)	2.83 × 2.76 (72 × 70)	2.83 × 2.68 (72 × 68)	3.27 × 3.03 (83 × 77)
Total Displacement	[cu. in. (cc)]	18.86 (309)	34.78 (570)	16.84 (276)	25.42 (416)
SAE J1349 Gross Intermit. HP	[kW (HP)/rpm]	5.7 (7.7)/3000	10.3 (13.8)/3200	—	—
SAE J1349 Net Intermit. HP	[kW (HP)/rpm]	5.2 (7.0)/3000	9.3 (12.5)/3200	4.6 (6.2)/3600	7.1 (9.5)/3600
SAE J1349 Net Cont. HP	[kW (HP)/rpm]	4.5 (6.0)/3000	8.2 (11.0)/3200	4.2 (5.6)/3600	6.3 (8.5)/3600

*ZB600-E is equipped with standard spherical type combustion system.

• Specifications are subject to change without notice.

Kubota

KUBOTA Corporation

Head Office: 2-47, Shikitsuhigashi 1-chome, Naniwa-ku, Osaka, Japan
Fax 06-648-3521 Telex 5287785 KUBOTA J
Tokyo Office: 1-3, Nihonbashi-Muromachi 3-chome, Chuo-ku, Tokyo, Japan
Fax 03-3245-3629 Telex 222-3671 KUBOTA J

KUBOTA TRACTOR CORPORATION

Engine Division:
1300 Remington Road, Suite K, Schaumburg IL 60173, U.S.A.
Phone 708-884-0212 Fax 708-884-8410 Telex 9102221648 KUBOTA ELGR

KUBOTA CANADA LTD.

1480 Denison St. Markham, Ontario L3R 9H1, Canada
Phone 905-475-1090 Fax 905-475-3032 Telex 06-986828 KUBOTA TRA MKHM

KUBOTA (U.K.) LTD.

Dormer Road, Thame Oxfordshire, OX9 3UN United Kingdom
Phone 084-421-4020 Fax 084-421-5695 Telex 837551 KUBOTA G

S.A. KUBOTA EUROPE

Engine Division:
19-25 rue Jules Vercruysse Z.I., BP 86, 95101 Argenteuil Cedex France
Phone 33-1-3426-3434 Fax 33-1-3426-3486 Telex 42-609382 KUBOTA F

KUBOTA (DEUTSCHLAND) GmbH

Engine Division:
Senefelder Str. 3-5 63110 Rodgau/Nieder-Roden, Germany
Phone 6106-873-0 Fax 6106-873-199 Telex 411714 kbd d.

EBRO KUBOTA, S.A.

Carta. Arenzubi S/N, Cuatro Vientos 28044 Madrid, Spain
Phone 34-1-508-5040 Fax 34-1-508-5525 Telex 43845 EKUBO-E