

SHOP MANUAL

KOMATSU 68E-88E SERIES DIESEL ENGINE

As a part of revision of this shop manual, special descriptions of the engines certified by the EPA (Environmental Protection Agency) are added to the latter half of the manual (Chapter 20).

For the descriptions other than the above, see the first half, since they are same as those of the conventional engines.

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●	Page to be replaced	Replace
()	Page to be deleted	Discard

Pages having no marks are those previously revised or made additions.

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Applicable machine, Serial number (Current Production Model)

Engine	Machine model	Machine Serial No.	Engine output (kW{HP}/rpm)	Remarks
3D68E-3G	PC12R-8	10001 and up	10.3{13.8}/2,450	
3D68E-3H	PC15R-8	10001 and up	11.2{15.0}/2,600	
3D74E-3C	PC20R-8	10001 and up	14.0{18.8}/2,600	
3D82AE-3E	PC25R-8	10001 and up	17.7{23.7}/2,400	
3D82AE-3F	PC27R-8	10001 and up	19.1{25.6}/2,600	
3D84E-3F	PC30R-8	10001 and up	20.6{27.6}/2,500	
	PC35R-8	35001 and up	20.6{27.6}/2,500	
4D84E-3B	PC50UU-2	12772-14992	29.4{39.4}/2,800	
4D84E-3C	PC50UU-2	14993 and up	29.4{39.4}/2,800	
4D84E-3D	PC40R-8	30001 and up	28.3{37.9}/2,500	
	PC45R-8	5001 and up	28.3{37.9}/2,500	

Application Category

Application code	Usage	Eng. Rev. type.	Revolution speed (rpm)
CL	Generator drive	Constant	1,500/1,800
CH			3,000/3,600
VM	General use	Variable	2,000 – 3,000
VH			3,000 – 3,600

★ For engine application category described in Chapter 1, Specifications and Performance.

Notice

Pease update the part numbers and codes in this shop manual as follows.

[Method of updating]

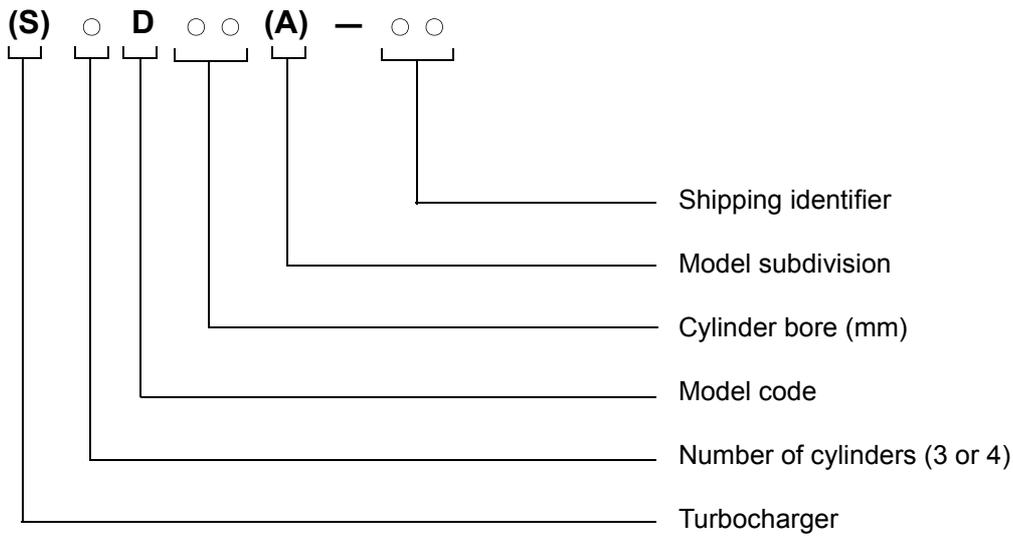
Add YM in front of the part number and code.

(Note: This does not apply to all items. For details, see the Parts Book.)

(Example)

Update the part numbers and codes in this shop mnual: 172187-08520→YM172187-08520

Descriptive Breakdown of Model Name



Application Category

Application code	Usage	Eng. Rev. type.	Revolution speed (rpm)
CL	Generator drive	Constant	1,500/1,800
CH			3,000/3,600
VM	General use	Variable	2,000 – 3,000
VH			3,000 – 3,600

★ For engine application category described in Chapter 1, Specifications and Performance.

1. SPECIFICATIONS AND PERFORMANCE

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1. SPECIFICATIONS AND PERFORMANCE

1.1 2D68E

Item		Model	Unit	2D68E				
Application		—	VM					
Type		—	Vertical, 4-cycle water-cooled diesel engine					
Combustion system		—	Special swirl pre-combustion chamber					
No. of cylinders – bore x Stroke		mm	2 – 68 x 72					
Displacement		ℓ	0.523					
Firing order		—	1 – 2					
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—
	Max. rating	kW {HP}	5.74 {7.8}	6.25 {8.5}	6.84 {9.3}	7.43 {10.1}	7.94 {10.8}	8.46 {11.5}
Max. revolution speed at no load		rpm	2,180 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,570 ⁺⁵⁰ ₀	2,780 ⁺⁵⁰ ₀	2,970 ⁺⁵⁰ ₀	3,180 ⁺⁵⁰ ₀
Min. revolution speed at no load			≤800					
Direction of rotation		—	Counterclockwise (viewed from flywheel)					
Power take off		—	Flywheel					
Compression ratio		—	23.0					
Fuel injection timing (FID, B. T. D. C)		deg	14 ± 1					
Compression pressure		MPa {kg/cm ² }	3.24 ± 0.1{33 ± 1}, at 250 rpm					
Fuel injection pressure		MPa {kg/cm ² }	11.8 ^{+1.0} ₀ {120 ⁺¹⁰ ₀ }					
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Lubrication system		—	Forced lubrication with trochoid pump					
Lubrication oil capacity Max/Effective		ℓ	1.6/0.6					
Recommended lubricating oil		—	API grade CC class or higher					
Cooling system		—	Liquid cooling/Radiator					
Cooling water capacity		ℓ	0.6 (for engine only)					
Cooling fan No. of blade x dia.		mm	Discharge type, 5 x φ290					
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ95/ φ85					
Governor		—	Mechanical centrifugal governor (All speed type)					
Starting system		—	Electrical					
Dimensions L x W x H (*2)		mm	373.5 x 417 x 498 / 383.5 x 417 x 498					
Dry weight (*2)		kg	55/65					
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12				
		Steady state speed band	%	≤9	≤8	≤7	≤6	
		Recovery time	sec	≤6				
		Fluctuation of revolution	rpm	≤30				
Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.25 ± 0.05 {2.5 ± 0.5}		0.29 ± 0.05 {3.0 ± 0.5}		0.34 ± 0.05 {3.5 ± 0.5}	
	Idling		≥0.06 {≥0.6}					

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1.2 3D68E

Item		Model	Unit	3D68E				
Application		—	VM					
Type		—	Vertical, 4-cycle water-cooled diesel engine					
Combustion system		—	Special swirl pre-combustion chamber					
No. cylinders – bore x Stroke		mm	3 – 68 x 72					
Displacement		ℓ	0.784					
Firing order		—	1 – 3 – 2 – 1					
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—
	Max. rating	kW {HP}	8.6 {11.5}	9.4 {12.6}	10.3 {13.8}	11.2 {15.0}	12.0 {16.1}	12.9 {17.3}
Max. revolution speed at no load		rpm	2,180 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,570 ⁺⁵⁰ ₀	2,780 ⁺⁵⁰ ₀	2,970 ⁺⁵⁰ ₀	3,180 ⁺⁵⁰ ₀
Min. revolution speed at no load		—	≤800					
Direction of rotation		—	Counterclockwise (viewed from flywheel)					
Power take off		—	Flywheel					
Compression ratio		—	23.0					
Fuel injection timing (FID, B. T. D. C)		deg	14 ± 1					
Compression pressure		MPa {kg/cm ² }	3.24 ± 0.1{33 ± 1}, at 250 rpm					
Fuel injection pressure		MPa {kg/cm ² }	11.8 ^{+1.0} ₀ {120 ⁺¹⁰ ₀ }					
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Lubrication system		—	Forced lubrication with trochoid pump					
Lubrication oil capacity Max/Effective		ℓ	2.4/1.0					
Recommended lubricating oil		—	API grade CC class or higher					
Cooling system		—	Liquid cooling/Radiator					
Cooling water capacity		ℓ	0.9 (for engine only)					
Cooling fan No. of blade x dia.		mm	Pusher type, 5 x φ310					
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 105/φ 85					
Governor		—	Mechanical centrifugal governor (All speed type)					
Starting system		—	Electrical					
Dimensions L x W x H (*2)		mm	463.5 x 401 x 496 / 473.5 x 401 x 496					
Dry weight (*2)		kg	70/81					
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12				
		Steady state speed band	%	≤9	≤8	≤7	≤6	
		Recovery time	sec	≤6				
		Fluctuation of revolution	rpm	≤30				
Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.25 ± 0.05 {2.5 ± 0.5}		0.29 ± 0.05 {3.0 ± 0.5}		0.34 ± 0.05 {3.5 ± 0.5}	
	Idling	—	≥0.06 {≥0.6}					

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1. SPECIFICATIONS AND PERFORMANCE

1.3 3D74E

Item		Model	Unit	3D74E				
Application		—	VM					
Type		—	Vertical, 4-cycle water-cooled diesel engine					
Combustion system		—	Special swirl pre-combustion chamber					
No. cylinders – bore x Stroke		mm	3 – 74 x 78					
Displacement		ℓ	1.006					
Firing order		—	1 – 3 – 2 – 1					
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—
	Max. rating	kW {HP}	11.0 {14.8}	12.1 {16.2}	13.2 {17.7}	14.3 {19.2}	15.5 {20.8}	16.6 {22.3}
Max. revolution speed at no load		rpm	2,180 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,570 ⁺⁵⁰ ₀	2,780 ⁺⁵⁰ ₀	2,970 ⁺⁵⁰ ₀	3,180 ⁺⁵⁰ ₀
Min. revolution speed at no load			≤800					
Direction of rotation		—	Counterclockwise (viewed from flywheel)					
Power take off		—	Flywheel					
Compression ratio		—	23.0					
Fuel injection timing (FID, B. T. D. C)		deg	14 ± 1					
Compression pressure		MPa {kg/cm ² }	3.43 ± 0.1{35 ± 1}, at 250 rpm					
Fuel injection pressure		MPa {kg/cm ² }	11.8 ^{+1.0} ₀ {120 ⁺¹⁰ ₀ }					
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Lubrication system		—	Forced lubrication with trochoid pump					
Lubrication oil capacity Max/Effective		ℓ	2.4/1.0					
Recommended lubricating oil		—	API grade CC class or higher					
Cooling system		—	Liquid cooling/Radiator					
Cooling water capacity		ℓ	0.9 (for engine only)					
Cooling fan No. of blade x dia.		mm	Pusher type, 5 x φ310					
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ110/φ85					
Governor		—	Mechanical centrifugal governor (All speed type)					
Starting system		—	Electrical					
Dimensions L x W x H (*2)		mm	469.1 x 440 x 502 / 476.6 x 440 x 502					
Dry weight (*2)		kg	85/102					
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12				
		Steady state speed band	%	≤9	≤8	≤7	≤6	
		Recovery time	sec	≤6				
		Fluctuation of revolution	rpm	≤30				
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.25 ± 0.05 {2.5 ± 0.5}		0.29 ± 0.05 {3.0 ± 0.5}		0.34 ± 0.05 {3.5 ± 0.5}
Idling		≥0.06 {≥0.6}						

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1.4 3D78AE

Item		Model	Unit	3D78AE				
Application		—	VM					
Type		—	Vertical, 4-cycle water-cooled diesel engine					
Combustion system		—	Direct injection system					
No. cylinders – bore x Stroke		mm	3 – 78 x 84					
Displacement		ℓ	1.204					
Firing order		—	1 – 3 – 2 – 1					
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—
	Max.rating	kW {HP}	13.2 {17.7}	14.6 {19.6}	15.9 {21.3}	17.2 {23.1}	18.5 {24.8}	19.9 {26.7}
Max. revolution speed at no load		rpm	2,180 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,570 ⁺⁵⁰ ₀	2,780 ⁺⁵⁰ ₀	2,970 ⁺⁵⁰ ₀	3,180 ⁺⁵⁰ ₀
Min. revolution speed at no load			≤800					
Direction of rotation		—	Counterclockwise (viewed from flywheel)					
Power take off		—	Flywheel					
Compression ratio		—	18.0					
Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1	
Compression pressure		MPa {kg/cm ² }	3.14 ± 0.1{32 ± 1}, at 250 rpm					
Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {120 ⁺¹⁰ ₀ }					
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Lubrication system		—	Forced lubrication with trochoid pump					
Lubrication oil capacity Max/Effective		ℓ	3.6/1.3					5.0/1.7
Recommended lubricating oil		—	API grade CC class or higher					
Cooling system		—	Liquid cooling/Radiator					
Cooling water capacity		ℓ	1.8 (for engine only)					
Cooling fan No. of blade x dia.		mm	Pusher type, 6 x φ 335					
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 110/φ 110					
Governor		—	Mechanical centrifugal governor (All speed type)					
Starting system		—	Electrical					
Dimensions L x W x H (*2)		mm	520.5 x 489 x 565 / 528 x 489 x 565					
Dry weight (*2)		kg	112/128					
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12				
		Steady state speed band	%	≤9	≤8	≤7	≤6	
		Recovery time	sec	≤6				
		Fluctuation of revolution	rpm	≤25				
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.29 ± 0.05 {3.0 ± 0.5}				
Idling		≥0.06 {≥0.6}						

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1. SPECIFICATIONS AND PERFORMANCE

1.5 3D82AE

Item		Model	Unit	3D82AE					
Specifications	Application		—	VM					
	Type		—	Vertical, 4-cycle water-cooled diesel engine					
	Combustion system		—	Direct injection system					
	No. cylinders – bore x Stroke		mm	3 – 82 x 84					
	Displacement		ℓ	1.330					
	Firing order		—	1 – 3 – 2 – 1					
	Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000
	Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—
		Max.rating	kW {HP}	14.6 {19.6}	16.0 {21.5}	17.5 {23.5}	19.0 {25.5}	20.5 {27.5}	21.9 {29.5}
	Max. revolution speed at no load		rpm	2,180 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,570 ⁺⁵⁰ ₀	2,780 ⁺⁵⁰ ₀	2,970 ⁺⁵⁰ ₀	3,180 ⁺⁵⁰ ₀
	Min. revolution speed at no load			≤800					
	Direction of rotation		—	Counterclockwise (viewed from flywheel)					
	Power take off		—	Flywheel					
	Compression ratio		—	18.0					
	Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1	
	Compression pressure		MPa {kg/cm ² }	3.04 ± 0.1{31 ± 1}, at 250 rpm					
	Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }					
	Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
	Lubrication system		—	Forced lubrication with trochoid pump					
	Lubrication oil capacity Max/Effective		ℓ	5.0/1.7					
	Recommended lubricating oil		—	API grade CC class or higher					
	Cooling system		—	Liquid cooling/Radiator					
	Cooling water capacity		ℓ	1.8 (for engine only)					
	Cooling fan		mm	Pusher type, 6 x φ335					
	No. of blade x dia.								
	Crank V-pulley dia./ Fan V-pulley dia.		mm	φ110/φ110					
Governor		—	Mechanical centrifugal governor (All speed type)						
Starting system		—	Electrical						
Dimensions L x W x H (*2)		mm	520.5 x 489 x 565 / 528 x 489 x 565						
Dry weight (*2)		kg	112/128						
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12					
		Steady state speed band	%	≤9	≤8	≤7	≤6		
		Recovery time	sec	≤6					
		Fluctuation of revolution	rpm	≤25					
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.29 ± 0.05 {3.0 ± 0.5}					
		Idling		≥0.06 {≥0.6}					

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1.6 3D82E

Item		Model	Unit	3D82E				
Specifications	Application	—	VM					
	Type	—	Vertical, 4-cycle water-cooled diesel engine					
	Combustion system	—	Direct injection system					
	No. cylinders – bore x Stroke	mm	3 – 82 x 90					
	Displacement	ℓ	1.425					
	Firing order	—	1 – 3 – 2 – 1					
	Revolution speed	rpm	2,000	2,200	2,400	2,600	2,800	3,000
	Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—
		Max.rating	kW {HP}	15.5 {20.8}	16.9 {22.7}	18.4 {24.7}	19.9 {26.7}	21.3 {28.6}
	Max. revolution speed at no load	rpm	2,160 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,570 ⁺⁵⁰ ₀	2,780 ⁺⁵⁰ ₀	2,970 ⁺⁵⁰ ₀	3,180 ⁺⁵⁰ ₀
	Min. revolution speed at no load		≤800					
	Direction of rotation	—	Counterclockwise (viewed from flywheel)					
	Power take off	—	Flywheel					
	Compression ratio	—	18.0					
	Fuel injection timing (FID, B. T. D. C)	deg	12 ± 1		14 ± 1		16 ± 1	
	Compression pressure	MPa {kg/cm ² }	3.04 ± 0.1{31 ± 1}, at 250 rpm					
	Fuel injection pressure	MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }					
	Recommended diesel gas oil	—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
	Lubrication system	—	Forced lubrication with trochoid pump					
	Lubrication oil capacity Max/Effective	ℓ	4.7/1.8					6.9/2.1
	Recommended lubricating oil	—	API grade CC class or higher					
	Cooling system	—	Liquid cooling/Radiator					
	Cooling water capacity	ℓ	2.0 (for engine only)					
	Cooling fan		Pusher type, 6 x φ 335					
	No. of blade x dia.	mm						
	Crank V-pulley dia./ Fan V-pulley dia.	mm	φ 110/φ 110					
Governor	—	Mechanical centrifugal governor (All speed type)						
Starting system	—	Electrical						
Dimensions L x W x H (*2)	mm	556 x 486 x 623 / 564 x 486 x 623						
Dry weight (*2)	kg	138/155						
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12				
		Steady state speed band	%	≤8	≤7		≤6	
		Recovery time	sec	≤6				
		Fluctuation of revolution	rpm	≤25				
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}				
		Idling		≥0.06 {≥0.6}				

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1. SPECIFICATIONS AND PERFORMANCE

1.7 3D84E

Item		Model	Unit	3D84E				
Application		—	VM					
Type		—	Vertical, 4-cycle water-cooled diesel engine					
Combustion system		—	Direct injection system					
No. cylinders – bore x Stroke		mm	3 – 84 x 90					
Displacement		ℓ	1.496					
Firing order		—	1 – 3 – 2 – 1					
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—
	Max.rating	kW {HP}	16.4 {22.0}	18.1 {24.3}	19.7 {26.4}	21.3 {28.6}	23.0 {30.8}	24.6 {33.0}
Max. revolution speed at no load		rpm	2,175 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,600 ⁺⁵⁰ ₀	2,800 ⁺⁵⁰ ₀	3,000 ⁺⁵⁰ ₀	3,225 ⁺⁵⁰ ₀
Min. revolution speed at no load			≤800					
Direction of rotation		—	Counterclockwise (viewed from flywheel)					
Power take off		—	Flywheel					
Compression ratio		—	18.0					
Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1	
Compression pressure		MPa {kg/cm ² }	3.24 ± 0.1{33 ± 1}, at 250 rpm					
Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }					
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Lubrication system		—	Forced lubrication with trochoid pump					
Lubrication oil capacity Max/Effective		ℓ	4.7/1.8					
Recommended lubricating oil		—	API grade CC class or higher					
Cooling system		—	Liquid cooling/Radiator					
Cooling water capacity		ℓ	2.0 (for engine only)					
Cooling fan		mm	Pusher type, 6 x φ 335					
No. of blade x dia.								
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 110/φ 110					
Governor		—	Mechanical centrifugal governor (All speed type)					
Starting system		—	Electrical					
Dimensions L x W x H (*2)		mm	556 x 486 x 623 / 564 x 486 x 623					
Dry weight (*2)		kg	138/155					
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12				
		Steady state speed band	%	≤9	≤8		≤7	
		Recovery time	sec	≤6				
		Fluctuation of revolution	rpm	≤25				
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}				
Idling		≥0.06 {≥0.6}						

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1.8 3D88E

Item		Model	Unit	3D88E					
Specifications	Application	—	VM						
	Type	—	Vertical, 4-cycle water-cooled diesel engine						
	Combustion system	—	Direct injection system						
	No. cylinders – bore x Stroke	mm	3 – 88 x 90						
	Displacement	ℓ	1.642						
	Firing order	—	1 – 3 – 2 – 1						
	Revolution speed	rpm	2,000	2,200	2,400	2,600	2,800	3,000	
	Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—
		Max.rating	kW {HP}	18.0 {24.1}	19.9 {26.7}	21.6 {29.0}	23.5 {31.5}	25.2 {33.8}	27.1 {36.3}
	Max. revolution speed at no load	rpm	2,175 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,600 ⁺⁵⁰ ₀	2,800 ⁺⁵⁰ ₀	3,000 ⁺⁵⁰ ₀	3,225 ⁺⁵⁰ ₀	
	Min. revolution speed at no load		≤800						
	Direction of rotation	—	Counterclockwise (viewed from flywheel)						
	Power take off	—	Flywheel						
	Compression ratio	—	18.0						
	Fuel injection timing (FID, B. T. D. C)	deg	12 ± 1		14 ± 1		16 ± 1		
	Compression pressure	MPa {kg/cm ² }	3.43 ± 0.1{35 ± 1}, at 250 rpm						
	Fuel injection pressure	MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }						
	Recommended diesel gas oil	—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)						
	Lubrication system	—	Forced lubrication with trochoid pump						
	Lubrication oil capacity Max/Effective	ℓ	4.7/1.8			6.9/2.1			
	Recommended lubricating oil	—	API grade CC class or higher						
	Cooling system	—	Liquid cooling/Radiator						
	Cooling water capacity	ℓ	2.0 (for engine only)						
	Cooling fan	mm	Pusher type, 6 x φ 335						
No. of blade x dia.									
Crank V-pulley dia./ Fan V-pulley dia.	mm	φ 110/φ 110							
Governor	—	Mechanical centrifugal governor (All speed type)							
Starting system	—	Electrical							
Dimensions L x W x H (*2)	mm	556 x 486 x 623 / 564 x 486 x 623							
Dry weight (*2)	kg	138/155							
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12					
		Steady state speed band	%	≤9	≤8	≤7			
		Recovery time	sec	≤6					
		Fluctuation of revolution	rpm	≤25					
	Lubrication oil pressure	Rated operation	MP {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}					
		Idling		≥0.06 {≥0.6}					

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1. SPECIFICATIONS AND PERFORMANCE

1.9 4D82E

Item		Model	Unit	4D82E					
Application		—	—	VM					
Type		—	—	Vertical, 4-cycle water-cooled diesel engine					
Combustion system		—	—	Direct injection system					
No. cylinders – bore x Stroke		mm	—	4 – 82 x 90					
Displacement		ℓ	—	1.901					
Firing order		—	—	1 – 3 – 4 – 2 – 1					
Revolution speed		rpm	—	2,000	2,200	2,400	2,600	2,800	3,000
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—	—
	Max.rating	kW {HP}	20.6 {27.6}	22.6 {30.3}	24.5 {32.9}	26.5 {35.5}	28.5 {38.2}	30.5 {40.9}	
Max. revolution speed at no load		rpm	2,160 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,570 ⁺⁵⁰ ₀	2,780 ⁺⁵⁰ ₀	2,970 ⁺⁵⁰ ₀	3,180 ⁺⁵⁰ ₀	
Min. revolution speed at no load		—	≤800						
Direction of rotation		—	Counterclockwise (viewed from flywheel)						
Power take off		—	Flywheel						
Compression ratio		—	18.0						
Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1		
Compression pressure		MPa {kg/cm ² }	3.04 ± 0.1{31 ± 1}, at 250 rpm						
Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }						
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)						
Lubrication system		—	Forced lubrication with trochoid pump						
Lubrication oil capacity Max/Effective		ℓ	5.8/2.3						
Recommended lubricating oil		—	API grade CC class or higher						
Cooling system		—	Liquid cooling/Radiator						
Cooling water capacity		ℓ	2.7 (for engine only)						
Cooling fan		mm	Pusher type, 6 φ 370						
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 110/φ 110						
Governor		—	Mechanical centrifugal governor (All speed type)						
Starting system		—	Electrical						
Dimensions L x W x H (*2)		mm	632 x 448.5 x 618 / 658 x 498.5 x 618						
Dry weight (*2)		kg	160/170						
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12					
		Steady state speed band	%	≤8	≤7		≤6		
		Recovery time	sec	≤6					
		Fluctuation of revolution	rpm	≤25					
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}					
Idling		—	≥0.06 {≥0.6}						

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1.10 4D84E

Item		Model	Unit	4D84E					
Application		—	VM						
Type		—	Vertical, 4-cycle water-cooled diesel engine						
Combustion system		—	Direct injection system						
No. cylinders – bore x Stroke		mm	3 – 84 x 90						
Displacement		ℓ	1.995						
Firing order		—	1 – 3 – 4 – 2 – 1						
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000	
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—	
	Max.rating	kW {HP}	21.9 {29.4}	24.1 {32.3}	26.3 {35.3}	28.5 {38.2}	30.7 {41.2}	32.9 {44.1}	
Max. revolution speed at no load		rpm	2,180 ⁺⁵⁰ ₀	2,400 ⁺⁵⁰ ₀	2,590 ⁺⁵⁰ ₀	2,810 ⁺⁵⁰ ₀	2,995 ⁺⁵⁰ ₀	3,210 ⁺⁵⁰ ₀	
Min. revolution speed at no load			≤800						
Direction of rotation		—	Counterclockwise (viewed from flywheel)						
Power take off		—	Flywheel						
Compression ratio		—	18.0						
Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1		
Compression pressure		MPa {kg/cm ² }	3.24 ± 0.1{33 ± 1}, at 250 rpm						
Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }				19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }		
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)						
Lubrication system		—	Forced lubrication with trochoid pump						
Lubrication oil capacity Max/Effective		ℓ	5.8/2.3						
Recommended lubricating oil		—	API grade CC class or higher						
Cooling system		—	Liquid cooling/Radiator						
Cooling water capacity		ℓ	2.7 (for engine only)						
Cooling fan		mm	Pusher type, 6 φ 370						
No. of blade x dia.									
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 110/φ 110						
Governor		—	Mechanical centrifugal governor (All speed type)						
Starting system		—	Electrical						
Dimensions L x W x H (*2)		mm	632 x 498.5 x 618 / 658 x 498.5 x 618						
Dry weight (*2)		kg	160/170						
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12					
		Steady state speed band	%	≤9	≤8		≤7		
		Recovery time	sec	≤6					
		Fluctuation of revolution	rpm	≤25					
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}					
Idling		≥0.06 {≥0.6}							

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1. SPECIFICATIONS AND PERFORMANCE

1.11 4D88E

Item		Model	Unit	4D88E					
Application		—	VM						
Type		—	Vertical, 4-cycle water-cooled diesel engine						
Combustion system		—	Direct injection system						
No. cylinders – bore x Stroke		mm	4 – 88 x 90						
Displacement		ℓ	2.189						
Firing order		—	1 – 3 – 4 – 2 – 1						
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000	
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—	
	Max. rating	kW {HP}	24.1 {32.3}	26.5 {35.5}	28.8 {38.6}	31.3 {42.0}	33.7 {45.2}	36.0 {48.3}	
Max. revolution speed at no load		rpm	2,180 ⁺⁵⁰ ₀	2,400 ⁺⁵⁰ ₀	2,590 ⁺⁵⁰ ₀	2,810 ⁺⁵⁰ ₀	2,995 ⁺⁵⁰ ₀	3,210 ⁺⁵⁰ ₀	
Min. revolution speed at no load			≤800						
Direction of rotation		—	Counterclockwise (viewed from flywheel)						
Power take off		—	Flywheel						
Compression ratio		—	18.0						
Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1		
Compression pressure		MPa {kg/cm ² }	3.43 ± 0.1{35 ± 1}, at 250 rpm						
Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }				19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }		
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)						
Lubrication system		—	Forced lubrication with trochoid pump						
Lubrication oil capacity Max/Effective		ℓ	5.8/2.3				7.9/2.5		
Recommended lubricating oil		—	API grade CC class or higher						
Cooling system		—	Liquid cooling/Radiator						
Cooling water capacity		ℓ	2.7 (for engine only)						
Cooling fan		mm	Pusher type, 6 φ 370						
No. of blade x dia.									
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 110/φ 110						
Governor		—	Mechanical centrifugal governor (All speed type)						
Starting system		—	Electrical						
Dimensions L x W x H (*2)		mm	632 x 498.5 x 618 / 658 x 498.5 x 618						
Dry weight (*2)		kg	160/170						
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12					
		Steady state speed band	%	≤9	≤8		≤7		
		Recovery time	sec	≤6					
		Fluctuation of revolution	rpm	≤25					
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}					
Idling		≥0.06 {≥0.6}							

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1.12 S3D84E

Item		Model	Unit	S3D84E					
Application		—	VM						
Type		—	Vertical, 4-cycle water-cooled diesel engine						
Combustion system		—	Direct injection system						
No. cylinders – bore x Stroke		mm	3 – 84 x 90						
Displacement		ℓ	1.496						
Firing order		—	1 – 3 – 2 – 1						
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000	
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—	
	Max.rating	kW {HP}	21.0 {28.2}	22.8 {30.6}	25.0 {33.5}	26.9 {36.1}	29.1 {39.0}	30.9 {41.4}	
Max. revolution speed at no load		rpm	2,175 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,600 ⁺⁵⁰ ₀	2,800 ⁺⁵⁰ ₀	3,020 ⁺⁵⁰ ₀	3,240 ⁺⁵⁰ ₀	
Min. revolution speed at no load			≤800 ⁺⁵⁰ ₀						
Direction of rotation		—	Counterclockwise (viewed from flywheel)						
Power take off		—	Flywheel						
Compression ratio		—	18.0						
Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1		
Compression pressure		MPa {kg/cm ² }	2.94 ± 0.1{30 ± 1}, at 250 rpm						
Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }				19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }		
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)						
Lubrication system		—	Forced lubrication with trochoid pump						
Lubrication oil capacity Max/Effective		ℓ	4.8/1.9						
Recommended lubricating oil		—	API grade CC class or higher						
Cooling system		—	Liquid cooling/Radiator						
Cooling water capacity		ℓ	2.0 (for engine only)						
Cooling fan		mm	Pusher type, 6 x φ 335						
No. of blade x dia.									
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 110/φ 110						
Governor		—	Mechanical centrifugal governor (All speed type)						
Starting system		—	Electrical						
Dimensions L x W x H (*2)		mm	632 x 540 x 629 / 632 x 540 x 629						
Dry weight (*2)		kg	147/160						
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12					
		Steady state speed band	%	≤9	≤8		≤8		
		Recovery time	sec	≤6					
		Fluctuation of revolution	rpm	≤22					
Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}						
	Idling		≥0.06 {≥0.6}						

*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

1. SPECIFICATIONS AND PERFORMANCE

1.13 S4D84E

Item		Model	Unit	S4D84E					
Application		—	VM						
Type		—	Vertical, 4-cycle water-cooled diesel engine						
Combustion system		—	Direct injection system						
No. cylinders – bore x Stroke		mm	4 – 84 x 90						
Displacement		ℓ	1.995						
Firing order		—	1 – 3 – 4 – 2 – 1						
Revolution speed		rpm	2,000	2,200	2,400	2,600	2,800	3,000	
Output (*1)	Continuous rating	kW {HP}	—	—	—	—	—	—	
	Max.rating	kW {HP}	28.0 {37.5}	30.5 {40.9}	33.5 {44.9}	35.7 {47.9}	38.6 {51.8}	41.2 {55.3}	
Max. revolution speed at no load		rpm	2,175 ⁺⁵⁰ ₀	2,375 ⁺⁵⁰ ₀	2,600 ⁺⁵⁰ ₀	2,800 ⁺⁵⁰ ₀	3,000 ⁺⁵⁰ ₀	3,225 ⁺⁵⁰ ₀	
Min. revolution speed at no load			≤800 ⁺⁵⁰ ₀						
Direction of rotation		—	Counterclockwise (viewed from flywheel)						
Power take off		—	Flywheel						
Compression ratio		—	18.0						
Fuel injection timing (FID, B. T. D. C)		deg	12 ± 1		14 ± 1		16 ± 1		
Compression pressure		MPa {kg/cm ² }	2.94 ± 0.1{30 ± 1}, at 250 rpm						
Fuel injection pressure		MPa {kg/cm ² }	19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }				19.6 ^{+1.0} ₀ {200 ⁺¹⁰ ₀ }		
Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)						
Lubrication system		—	Forced lubrication with trochoid pump						
Lubrication oil capacity Max/Effective		ℓ	5.8/2.3						
Recommended lubricating oil		—	API grade CC class or higher						
Cooling system		—	Liquid cooling/Radiator						
Cooling water capacity		ℓ	2.7 (for engine only)						
Cooling fan		mm	Pusher type, 6 φ 370						
No. of blade x dia.									
Crank V-pulley dia./ Fan V-pulley dia.		mm	φ 110/φ 110						
Governor		—	Mechanical centrifugal governor (All speed type)						
Starting system		—	Electrical						
Dimensions L x W x H (*2)		mm	641 x 498.5 x 713 / 649 x 498.5 x 713						
Dry weight (*2)		kg	165/175						
Performance	Governing performance (full speed range)	Transient speed difference	%	≤12					
		Steady state speed band	%	≤9	≤8		≤7		
		Recovery time	sec	≤6					
		Fluctuation of revolution	rpm	≤22					
	Lubrication oil pressure	Rated operation	MPa {kg/cm ² }	0.34 ± 0.05 {3.5 ± 0.5}					
Idling		≥0.06 {≥0.6}							

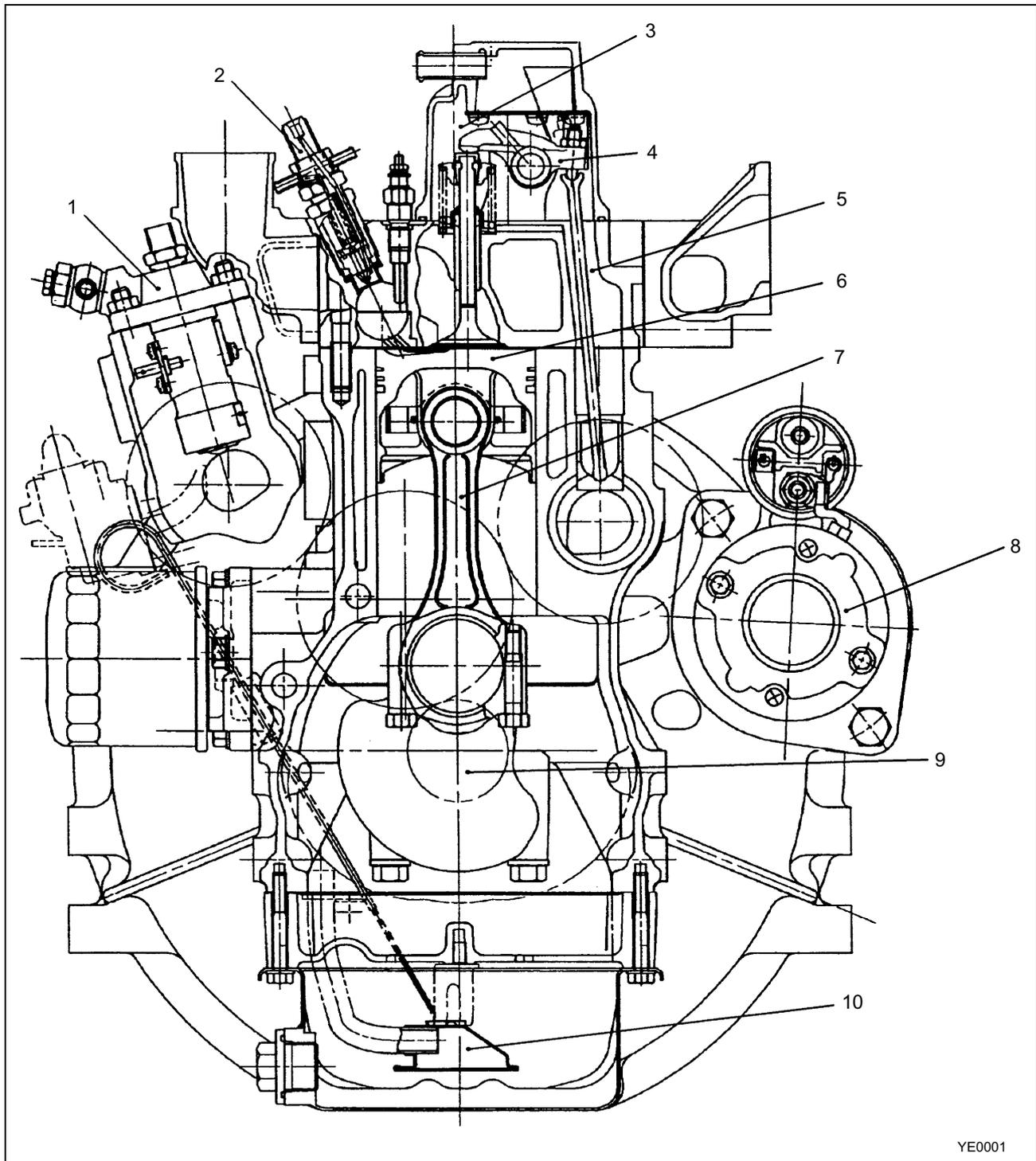
*1 Output conditions: Intake back pressure ≤ 2.45 kPa {250 mmH₂O}, Exhaust back pressure ≤ 5.39 kPa {550 mmH₂O}, other conditions complying with JIS D 1005-1986. After minimum 30 hour's run-in.

*2 Designation of engine dimension and dry weight in numerals.
Engine with back plate/with flywheel housing

2. CROSS SECTIONAL VIEWS

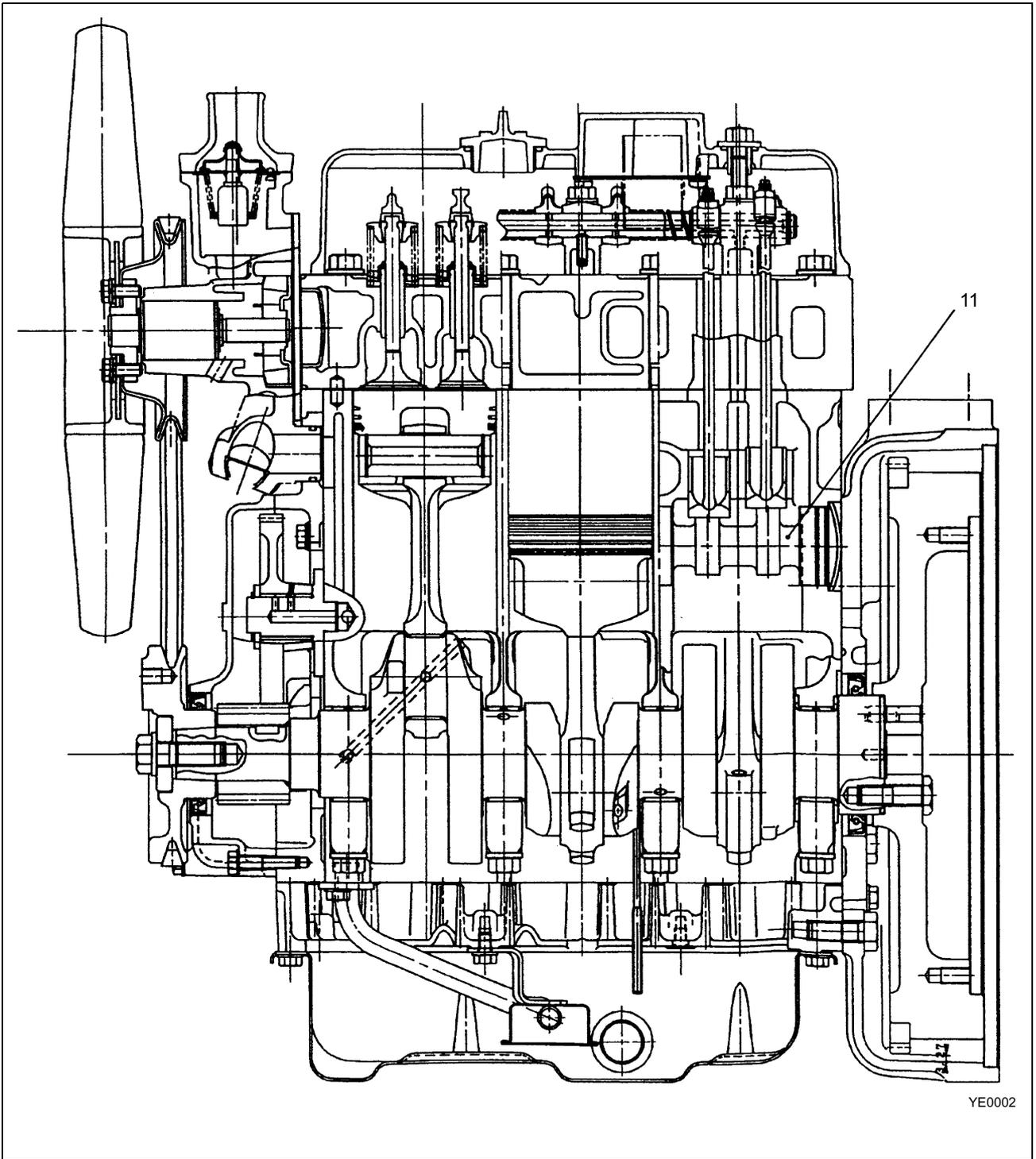
2.1	Special swirl pre-combustion chamber system (Indirect injection system).....	2-2
2.2	Direct injection system.....	2-4

2.1 Special swirl pre-combustion chamber system (Indirect injection system)



YE0001

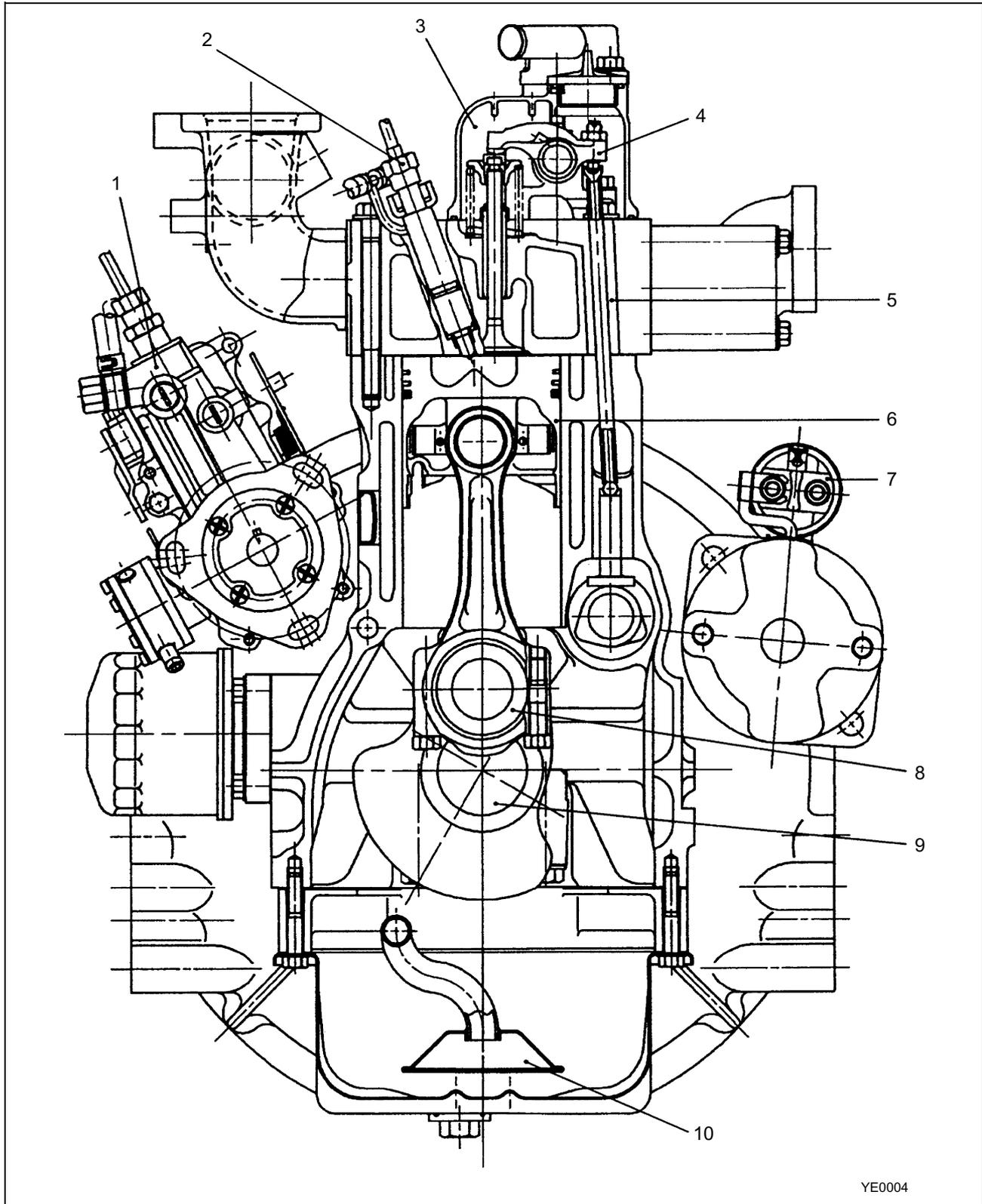
- | | |
|---------------------------|----------------------------------|
| 1) Fuel injection pump | 6) Piston |
| 2) Fuel injection valve | 7) Connecting rod |
| 3) Valve rocker arm cover | 8) Starting motor |
| 4) Valve rocker arm | 9) Crankshaft |
| 5) Cylinder head | 10) Lubricating oil suction pipe |



YE0002

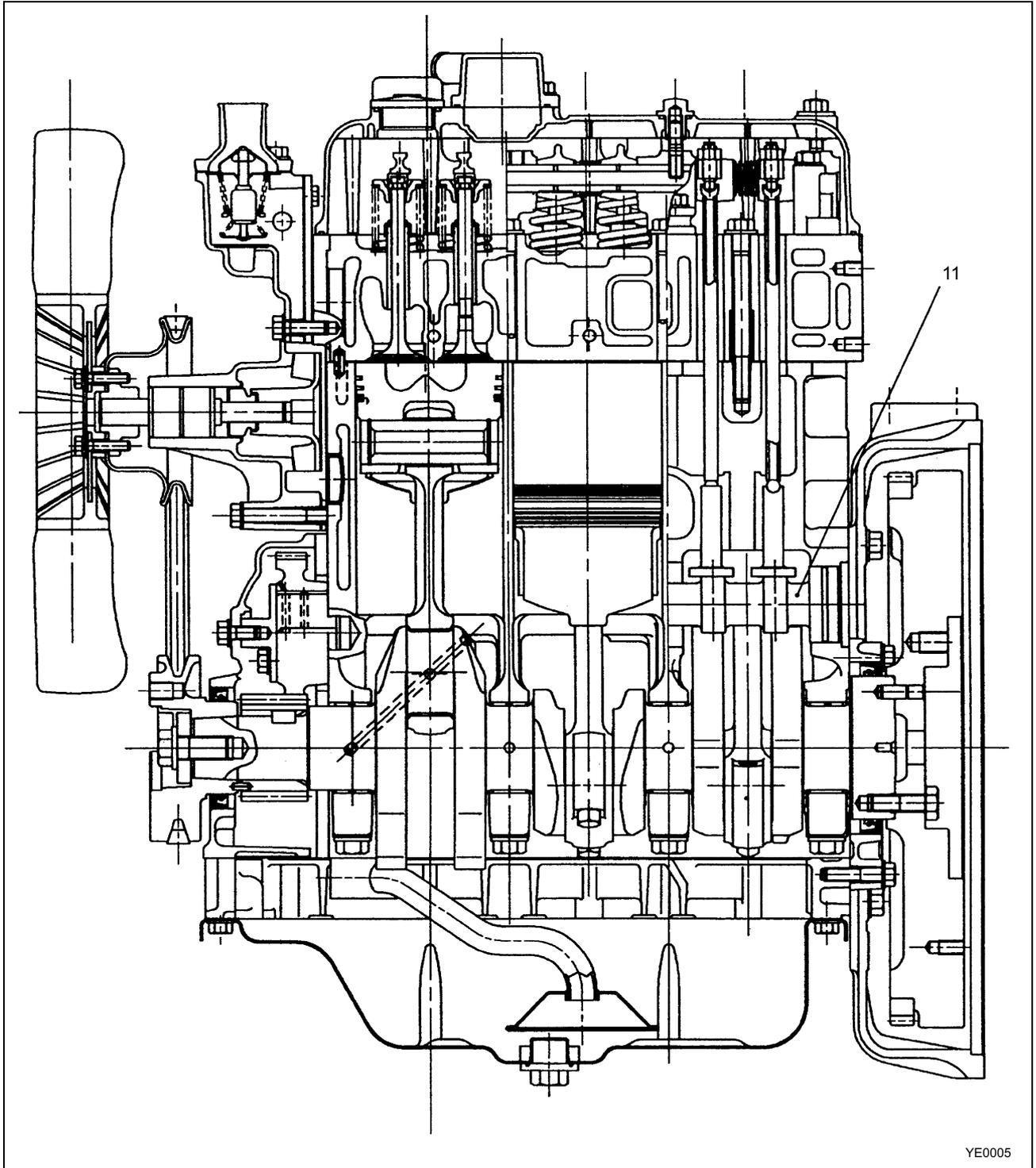
11) Camshaft

2.2 Direct injection system



YE0004

- | | | |
|---------------------------|-------------------|----------------------------------|
| 1) Fuel injection pump | 5) Cylinder head | 9) Crankshaft |
| 2) Fuel injection valve | 6) Piston | 10) Lubricating oil suction pipe |
| 3) Valve rocker arm cover | 7) Starting motor | |
| 4) Valve rocker arm | 8) Connecting rod | |



YE0005

11) Camshaft

3. COOLING WATER, LUBRICATING OIL AND FUEL OIL

3.1	Cooling water	3-2
3.2	Lubricating oil.....	3-3
3.3	Fuel oil	3-5

3.1 Cooling water

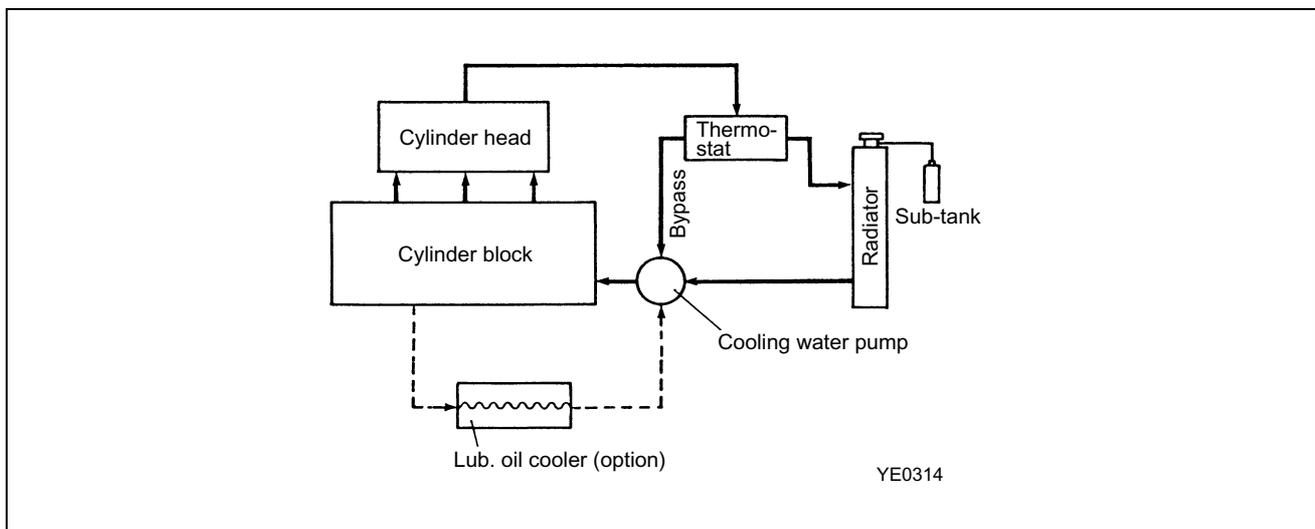
1. Proper use of cooling water

Impurities in cooling water are deposited in the engine and radiator in the form of scale and cause rusting. For this reason, heat conduction of the cooling system and cooling water flow are impaired, and cause cooling functions to reduce and the engine to over-heat. Therefore, drain the cooling water at intervals of 400 hours or one year. Never use hard water as the cooling water.

In order to prevent the cooling water from freezing in cold weather, be sure to use an antifreeze agent. For further information on and proper usage and type of rust-preventive agents, antifreezes, and cleaning agents, contact your nearest dealer.

2. Cooling water system diagram

Indirect injection system and direct injection system.



3.2 Lubricating oil

1. Proper use of lubricating oil

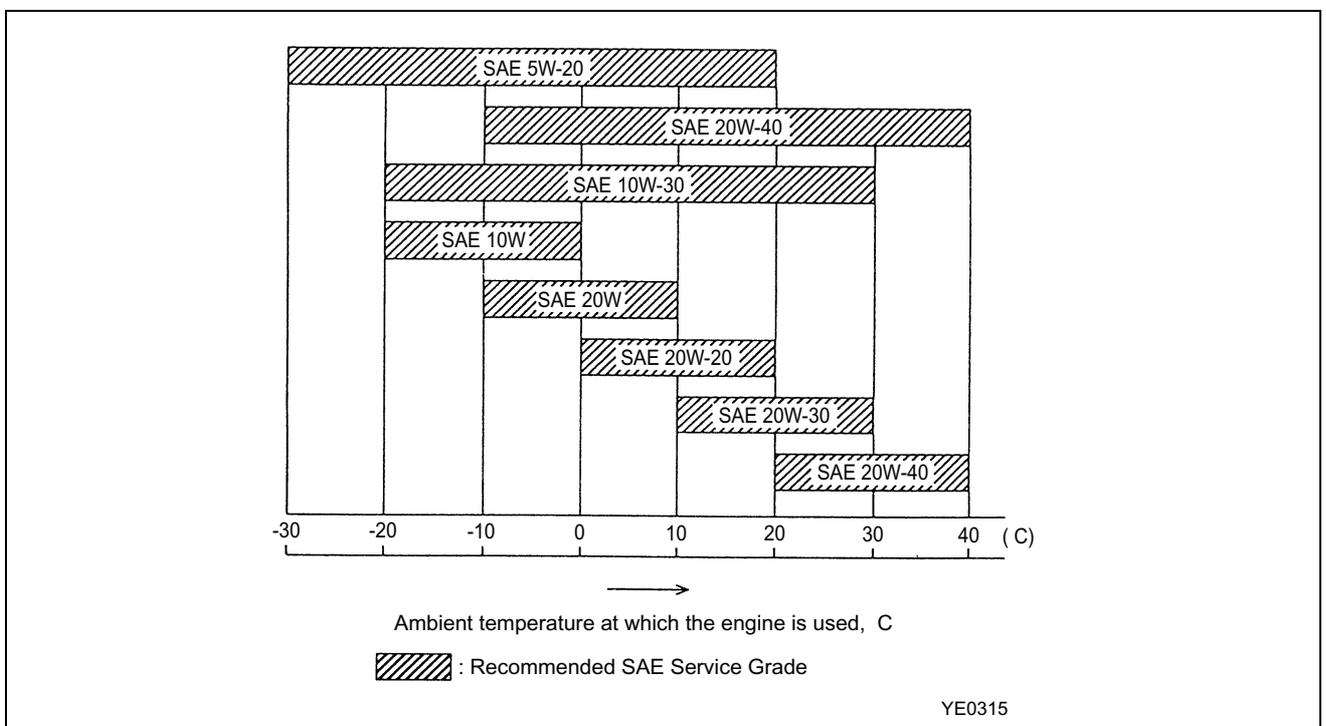
Use of proper lubricating oil brings about the following effects.

- (1) The friction part of the engine is protected from friction and wear.
- (2) The engine parts is protected from rusting and corrosion.
- (3) The high temperature part of the engine is effectively cooled.
- (4) The engine is protected from leakage of combustion gas.
- (5) The engine parts are protected from sludge deposits.

For the above reasons, use lubricating oil API Service Classification Class CC or better.

[Reference:Lubricating oil to be used at ambient temperature]

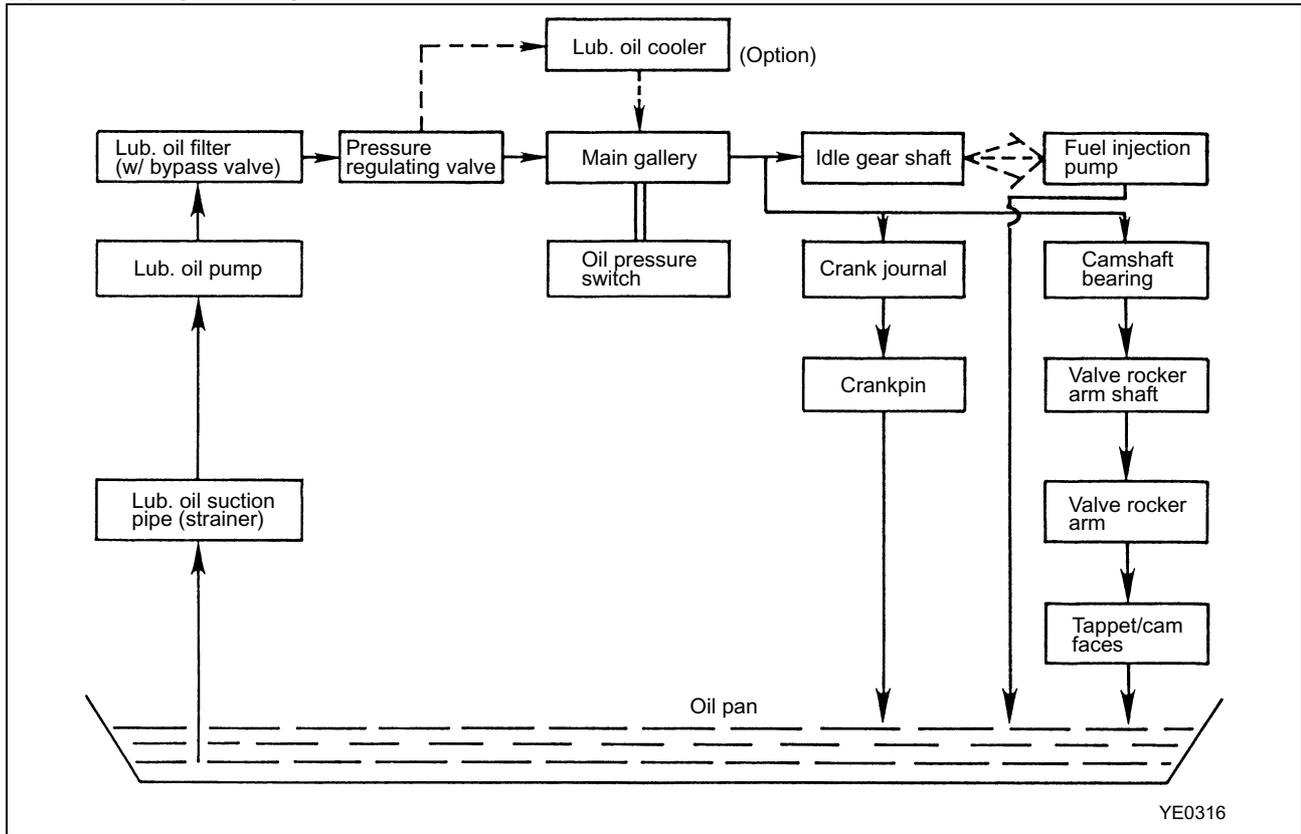
Select the viscosity of lubricating oil depending on ambient temperature at which the engine is used, according to SAE Service Grade shown below.



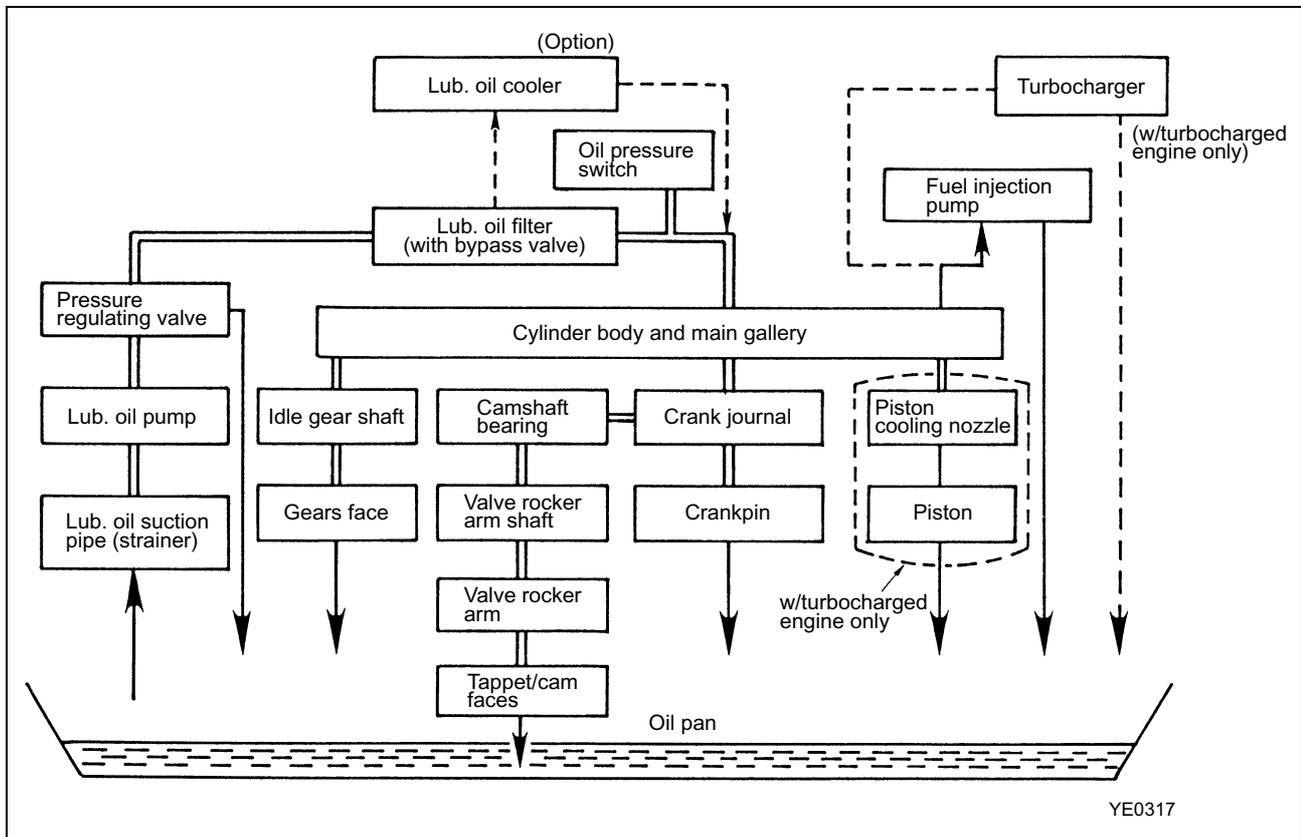
3. COOLING WATER, LUBRICATING OIL AND FUEL OIL

2. Lubrication system diagram

(1) Indirect injection system



(2) Direct injection system



3. COOLING WATER, LUBRICATING OIL AND FUEL OIL

3.3 Fuel oil

1. Proper use of diesel gas oil

Use a diesel gas oil equivalent to or better than ISO 8217 DMA BS 2869 Part 1 class A1 or Part 2 class A2. (Cetane Number: 45min.) Give your customers instructions on proper use of fuel oil, or the customers may suffer from troubles stated below.

(1) Deposits on the exhaust valve

Deposits on the exhaust valve cause unburnt oil mixture in exhaust gas and erosion of the exhaust valve seat, to occur in addition to poor compression, imperfect combustion, excessive fuel consumption, etc.

(2) Deposits in the piston ring groove

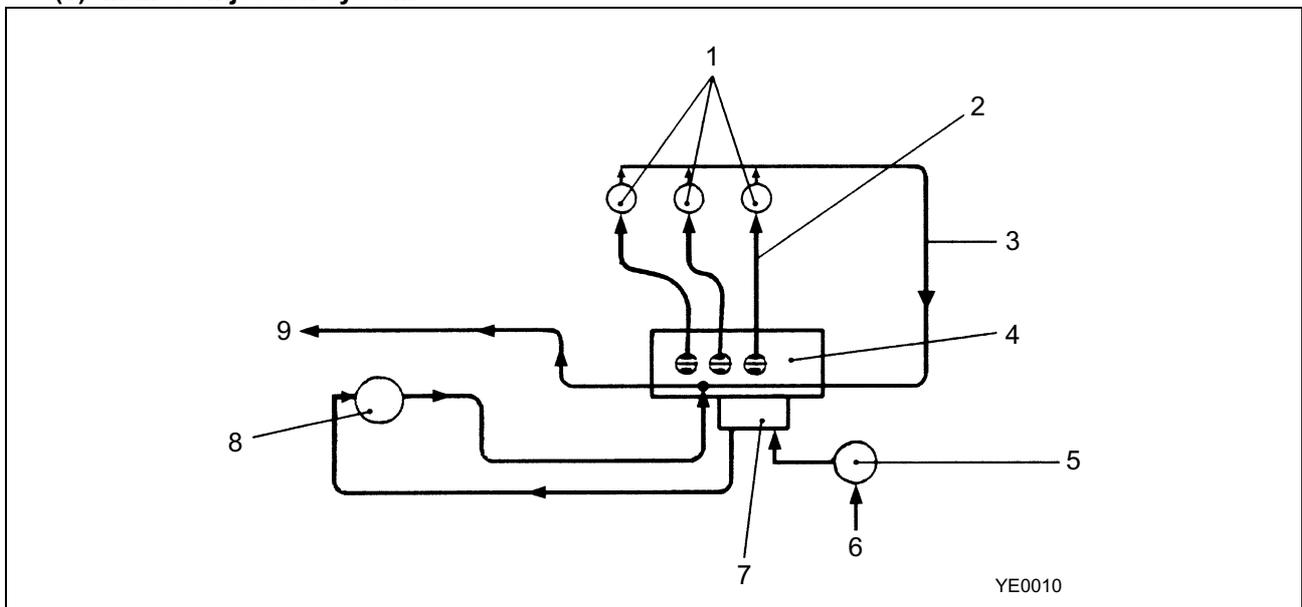
Deposits in the piston ring groove cause blow-by gas, poor lubrication, imperfect combustion, excessive fuel consumption, contamination of lubricating oil, premature wear, etc. of the cylinder liner and piston ring.

(3) Clogging or corrosion of nozzle hole in fuel injection valve

Imperfect combustion causes the fuel injection mechanism to wear and corrode and the nozzle to be clogged.

2. Fuel system diagram

(1) Indirect injection system



- 1) Fuel injection valve
- 2) Fuel injection pipe
- 3) Fuel oil return pipe
- 4) Fuel injection pump
- 5) Water separator (option)

- 6) from fuel tank
- 7) Fuel feed pump
- 8) Fuel filter
- 9) to tank