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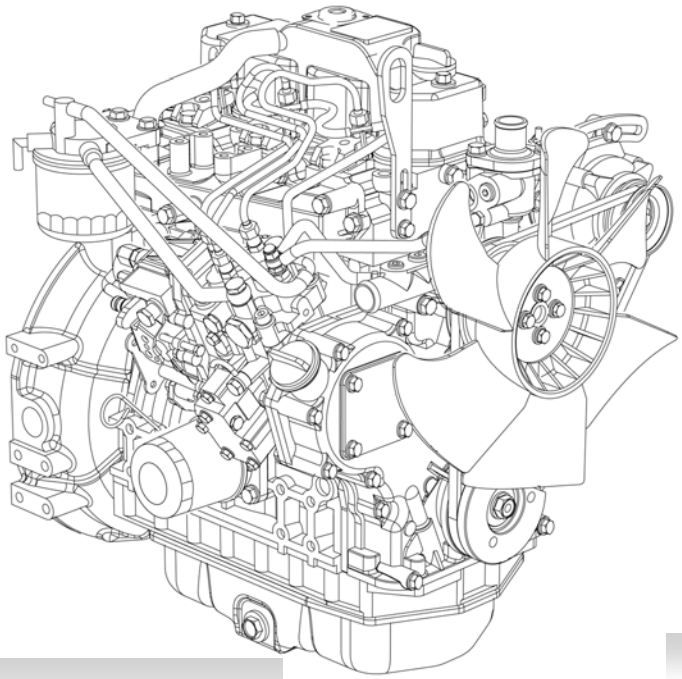
YANMAR
M9961-02E050

YANMAR
SERVICE MANUAL
INDUSTRIAL DIESEL ENGINE
MODEL 3TNV·4TNV series
(Direct Injection System)



4TNV94L
4TNV98
4TNV98T

4TNV106
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3TNV82A
3TNV84(T)・4TNV84(T)
3TNV88・4TNV88

YANMAR CO.,LTD.

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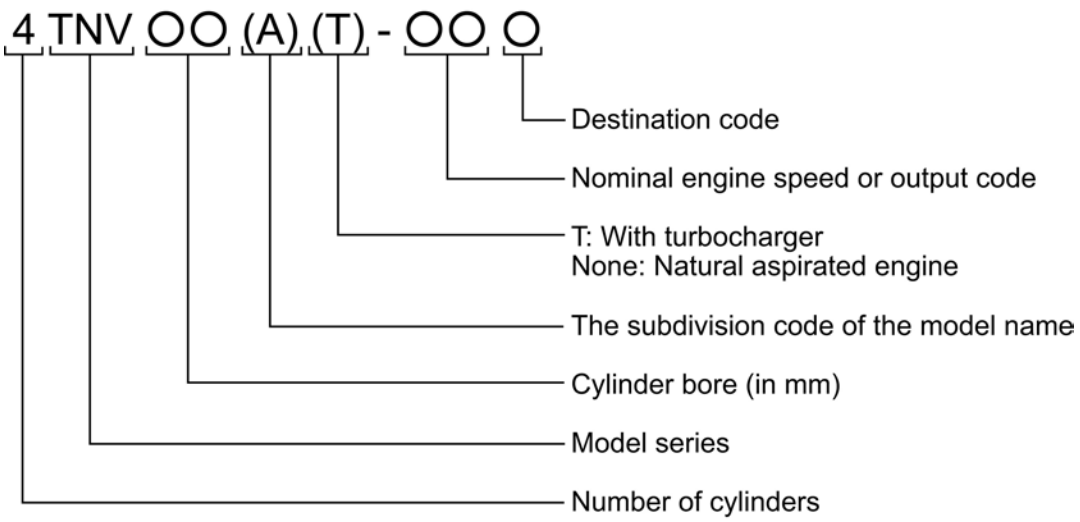
1. General

1.1 Engine Nomenclature



The engine specification class

Classification	Load	Engine speed	Available engine speed (min^{-1})
CL	Constant load	Constant speed	1500/1800
VM	Variable load	Variable speed	2000-3000

※ The engine specification class (CL or VM) is described in the specifications table.

1.2 Specifications

NOTE:

1) The information described in the engine specifications tables (the next page and after) is for "standard" engine. To obtain the information for the engine installed in each machine unit, refer to the manual provided by the equipment manufacturer.
2) Engine rating conditions are as follows (SAE J1349, ISO 3046/1)
   - Atmospheric condition: Room temp. 25℃, Atmospheric press. 100 kPa (750mm Hg), Relative humidity 30%
   - Fuel temp: 25℃ (Fuel injection pump inlet)
   - With cooling fan, air cleaner, exhaust silencer (Yanmar standard parts)
   - After running-in hours. Output allowable deviation: ±3%

(1) 3TNV82A

Engine name		Unit	3TNV82A								
Engine specification class		-	CL	VM							
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine								
Combustion chamber		-	Direct injection								
Number of cylinders		-	3								
Cylinder bore×stroke		mm×mm	82×84								
Displacement		L	1.331								
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-						
	Output	kW (hp)	9.9 (13.5)	12.0 (16.3)	-						
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600	2800	3000
	Output	kW (hp)	11.0 (14.9)	13.2 (17.9)	14.6 (19.9)	16.0 (21.8)	17.5 (23.8)	18.2 (24.8)	19.0 (25.8)	20.4 (27.8)	21.9 (29.8)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2375	2570	2675	2780	2995	3180
Ignition order		-	1-3-2-1(No.1 cylinder on flywheel side)								
Power take off		-	Flywheel								
Direction of rotation		-	Counterclockwise (viewed from flywheel)								
Cooling system		-	Radiator								
Lubrication system		-	Forced lubrication with trochoid pump								
Starting system		-	Electric								
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)								
Applicable lubricant		-	API grade class CD or CF								
Lubricant capacity (oil pan) *	Total	L	3.6								5.5
	Effective	L	1.2								2.2
Coolant water capacity (engine only)		L	1.8								
Engine Dimensions ** (with flyw Crankshaft V pulley diameter & heel housing)	Overall length	mm	553	528							
	Overall width	mm	489								
	Overall height	mm	565								
Engine mass (dry) ** (with flywheel housing)		kg	138	128							
Cooling fan (std.)		mm	335 mm O/D, 6 blades pusher type								
Fun V pulley diameter (std.)		mm	120×90	110×110							

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(2) 3TNV84

Engine name		Unit	3TNV84								
Engine specification class		-	CL		VM						
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine								
Combustion chamber		-	Direct injection								
Number of cylinders		-	3								
Cylinder bore×stroke		mm×mm	84×90								
Displacement		L	1.496								
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-						
	Output	kW (hp)	11.3 (15.3)	13.5 (18.3)	-						
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600	2800	3000
	Output	kW (hp)	12.4 (16.8)	14.8 (20.1)	16.4 (22.3)	18.1 (24.6)	19.7 (26.8)	20.5 (27.9)	21.3 (29.0)	23.0 (31.3)	24.6 (33.5)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2690	2810	2995	3210
Ignition order		-	1-3-2-1(No.1 cylinder on flywheel side)								
Power take off		-	Flywheel								
Direction of rotation		-	Counterclockwise (viewed from flywheel)								
Cooling system		-	Radiator								
Lubrication system		-	Forced lubrication with trochoid pump								
Starting system		-	Electric								
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)								
Applicable lubricant		-	API grade class CD								
Lubricant capacity (oil pan) *	Total	L	6.7								
	Effective	L	1.9								
Coolant water capacity (engine only)		L	1.8								
Engine dimensions ** (with flywheel housing)	Overall length	mm	589	564							
	Overall width	mm	486								
	Overall height	mm	622								
Engine mass (dry) ** (with flywheel housing)		kg	161	155							
Cooling fan (std.)		mm	335 mm O/D, 6 blades pusher type								
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	120×90	110×110							

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(3) 3TNV84T

Engine name		Unit	3TNV84T								
Engine specification class		-	CL	VM							
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine								
Combustion chamber		-	Direct injection								
Number of cylinders		-	3								
Cylinder bore×stroke		mm×mm	84×90								
Displacement		L	1.496								
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-						
	Output	kW (hp)	14.0 (19.0)	16.5 (22.5)	-						
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600	2800	3000
	Output	kW (hp)	15.8 (21.5)	18.8 (25.5)			25.0 (34.0)	25.9 (35.2)	26.8 (36.5)	29.1 (39.5)	30.9 (42.0)
Max. no-load speed (±25)		min^{-1}	1600	1895			2590	2700	2810	2995	3210
Ignition order		-	1-3-2-1(No.1 cylinder on flywheel side)								
Power take off		-	Flywheel								
Direction of rotation		-	Counterclockwise (viewed from flywheel)								
Cooling system		-	Radiator								
Lubrication system		-	Forced lubrication with trochoid pump								
Starting system		-	Electric								
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (cetane No.45 min.)								
Applicable lubricant		-	API grade class CD or CF								
Lubricant capacity (oil pan) *	Total	L	6.7								
	Effective	L	1.9								
Coolant water capacity (engine only)		L	2.0								
Engine dimensions ** (with flywheel housing)	Overall length	mm	589	564							
	Overall width	mm	486								
	Overall height	mm	622								
Engine mass (dry) ** (with flywheel housing)		kg	161	155							
Cooling fan (std.)		mm	350 mm O/D, 6 blades pusher type								
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	120×90	110×110							

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(4) 3TNV88

Engine name		Unit	3TNV88								
Engine specification class		-	CL		VM						
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine								
Combustion chamber		-	Direct injection								
Number of cylinders		-	3								
Cylinder bore×stroke		mm×mm	88×90								
Displacement		L	1.642								
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-						
	Output	kW (hp)	12.3 (16.7)	14.8 (20.1)	-						
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600	2800	3000
	Output	kW (hp)	13.5 (18.4)	16.3 (22.1)	18.0 24.5)	19.9 (27.0)	21.6 (29.4)	22.6 (30.7)	23.5 (31.9)	25.2 (34.2)	27.1 (36.8)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700	2810	2995	3210
Ignition order		-	1-3-2-1(No.1 cylinder on flywheel side)								
Power take off		-	Flywheel								
Direction of rotation		-	Counterclockwise (viewed from flywheel)								
Cooling system		-	Radiator								
Lubrication system		-	Forced lubrication with trochoid pump								
Starting system		-	Electric								
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)								
Applicable lubricant		-	API grade class CD or CF								
Lubricant capacity (oil pan) *	Total	L	4.7								7.2
	Effective	L	1.8								3.5
Coolant water capacity (engine only)		L	2.0								
Engine dimensions ** (with flywheel housing)	Overall length	mm	589			564					
	Overall width	mm	486								
	Overall height	mm	622								
Engine mass (dry) ** (with flywheel housing)		kg	155								
Cooling fan (std.)		Mm	350 mm O/D, 6 blades pusher type								
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		Mm	120×90			120×90					

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(5) 4TNV84

Engine name		Unit	4TNV84								
Engine specification class		-	CL	VM							
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine								
Combustion chamber		-	Direct injection								
Number of cylinders		-	4								
Cylinder bore×stroke		mm×mm	84×90								
Displacement		L	1.995								
Continuous Rating	Revolving speed	Min^{-1}	1500	1800	-						
	Output	kW (hp)	14.9 (20.3)	17.7 (24.1)	-						
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600	2800	3000
	Output	kW (hp)	16.4 (22.3)	19.5 (26.5)	21.9 (29.8)	24.1 (32.8)	26.3 (35.8)	27.4 (37.3)	28.5 (38.7)	30.7 41.7)	32.9 (44.7)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700	2810	2995	3210
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)								
Power take off		-	Flywheel								
Direction of rotation		-	Counterclockwise (viewed from flywheel)								
Cooling system		-	Radiator								
Lubrication system		-	Forced lubrication with trochoid pump								
Starting system		-	Electric								
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (cetane No.45 min.)								
Applicable lubricant		-	API grade class CD or CF								
Lubricant capacity (oil pan) *	Total	L	7.4								
	Effective	L	2.3								
Coolant water capacity (engine only)		L	2.7								
Engine dimensions ** (with flywheel housing)	Overall length	mm	683	658							
	Overall width	mm	498.5								
	Overall height	mm	617								
Engine mass (dry) ** (with flywheel housing)		kg	183	170							
Cooling fan (std.)		mm	370 mm O/D, 6 blades pusher type								
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	120×90	110×110							

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(6) 4TNV84T

Engine name		Unit	4TNV84T							
Engine specification class		-	CL		VM					
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine							
Combustion chamber		-	Direct injection							
Number of cylinders		-	4							
Cylinder bore×stroke		mm×mm	84×90							
Displacement		L	1.995							
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-					
	Output	KW (hp)	19.1 (26.0)	24.3 (33.0)	-					
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2600	2800	3000
	Output	KW (hp)	21.3 (29.0)	26.9 (36.5)	27.9 (38.0)	30.5 (41.5)	33.5 (45.5)	35.7 (48.5)	38.6 (52.5)	41.2 (56.0)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2810	2995	3210
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)							
Power take off		-	Flywheel							
Direction of rotation		-	Counterclockwise (viewed from flywheel)							
Cooling system		-	Radiator							
Lubrication system		-	Forced lubrication with trochoid pump							
Starting system		-	Electric							
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)							
Applicable lubricant		-	API grade class CD or CF							
Lubricant capacity (oil pan) *	Total	L	7.4							
	Effective	L	3.4							
Coolant water capacity (engine only)		L	2.7							
Engine dimensions **	Overall length	mm	683	649						
	Overall width	mm	498.5							
	Overall height	mm	713							
Engine mass (dry) ** (with flywheel housing)		kg	183	170						
Cooling fan (std.)		mm	370 mm O/D, 6 blades pusher type							
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	120×90	110×110						

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(7) 4TNV88

Engine name		Unit	4TNV88								
Engine specification class		-	CL		VM						
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine								
Combustion chamber		-	Direct injection								
Number of cylinders		-	4								
Cylinder bore×stroke		mm×mm	88×90								
Displacement		L	2.190								
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-						
	Output	kW (hp)	16.4 (22.3)	19.6 (26.7)	-						
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600	2800	3000
	Output	kW (hp)	18.0 (24.5)	21.6 (29.4)	24.1 (32.7)	26.5 (36.0)	28.8 (39.2)	30.1 (40.9)	31.3 (42.5)	33.7 (45.8)	35.4 (48.1)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700	2810	2995	3210
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)								
Power take off		-	Flywheel								
Direction of rotation		-	Counterclockwise (viewed from flywheel)								
Cooling system		-	Radiator								
Lubrication system		-	Forced lubrication with trochoid pump								
Starting system		-	Electric								
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (cetane No.45 min.)								
Applicable lubricant		-	API grade class CD or CF								
Lubricant capacity (oil pan) *	Total	L	5.8								8.6
	Effective	L	2.3								4.2
Coolant water capacity (engine only)		L	2.7								
Engine dimensions ** (with wheel housing)	Overall engthh	mm	683		658						
	Overall width	mm	498.5								
	Overall height	mm	618								
Engine mass (dry) ** (with flywheel housing)		kg	183		170						
Cooling fan (std.)		mm	370 mm O/D, 6 blades pusher type								
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	120×90		110×110						

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(8) 4TNV94L

Engine name		Unit	4TNV94L					
Engine specification class		-	CL		VM			
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine					
Combustion chamber		-	Direct injection					
Number of cylinders		-	4					
Cylinder bore×stroke		mm×mm	94×110					
Displacement		L	3.053					
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-			
	Output	kW (hp)	26.1 (35.5)	31.3 (42.5)	-			
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500
	Output	kW (hp)	29.1 (39.5)	34.6 (47.0)	35.3 (48.0)	38.2 (52.0)	41.6 (56.5)	43.0 (58.5)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)					
Power take off		-	Flywheel					
Direction of rotation		-	Counterclockwise (viewed from flywheel)					
Cooling system		-	Radiator					
Lubrication system		-	Forced lubrication with trochoid pump					
Starting system		-	Electric					
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Applicable lubricant		-	API grade class CD or CF					
Lubricant capacity (oil pan) *	Total	L	10.2					
	Effective	L	4.5					
Coolant water capacity (engine only)		L	4.2					
Engine dimensions ** (with flywheel housing)	Overall length	mm	719					
	Overall width	mm	498					
	Overall height	mm	717					
Engine mass (dry) ** (with flywheel housing)		kg	245 (equivalent to SAE#3)		235 (equivalent to SAE#4)			
Cooling fan (std.)		mm	410 mm O/D, 6 blades pusher type					
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	130×130					

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(9) 4TNV98

Engine name		Unit	4TNV98					
Engine specification class		-	CL		VM			
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine					
Combustion chamber		-	Direct injection					
Number of cylinders		-	4					
Cylinder bore×stroke		mm×mm	98×110					
Displacement		L	3.318					
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-			
	Output	kW (hp)	30.9 (42.0)	36.8 (50.0)	-			
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500
	Output	kW (hp)	34.6 (47.0	41.2 (56.0)	41.9 (57.0)	45.6 (62.0)	49.3 (67.0)	51.1 (69.5)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)					
Power take off		-	Flywheel					
Direction of rotation		-	Counterclockwise (viewed from flywheel)					
Cooling system		-	Radiator					
Lubrication system		-	Forced lubrication with trochoid pump					
Starting system		-	Electric					
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Applicable lubricant		-	API grade class CD or CF					
Lubricant capacity (oil pan) *	Total	L	10.2					
	Effective	L	4.5					
Coolant water capacity (engine only)		L	4.2					
Engine dimensions ** (with flywheel housing)	Overall length	mm	719					
	Overall width	mm	498					
	Overall height	mm	717					
Engine mass (dry) ** (with flywheel housing)		kg	248 (equivalent to SAE#3)		235 (equivalent to SAE#4)			
Cooling fan (std.)		mm	410 mm O/D, 6 blades pusher type					
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	130×130					

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(10) 4TNV98T

Engine name		Unit	4TNV98T						
Engine specification class		-	CL		VM				
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine						
Combustion chamber		-	Direct injection						
Number of cylinders		-	4						
Cylinder bore×stroke		mm×mm	88×110						
Displacement		L	3.318						
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-				
	Output	kW (hp)	37.9 (51.5)	45.6 (62.0)	-				
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600
	Output	kW (hp)	41.9 (57.0)	50.4 (68.5)	50.7 (69.0)	55.5 (75.5)	60.3 (82.0)	62.5 (85.0)	64.0 (87.0)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700	2810
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)						
Power take off		-	Flywheel						
Direction of rotation		-	Counterclockwise (viewed from flywheel)						
Cooling system		-	Radiator						
Lubrication system		-	Forced lubrication with trochoid pump						
Starting system		-	Electric						
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (cetane No.45 min.)						
Applicable lubricant		-	API grade class CD or CF						
Lubricant capacity (oil pan) *	Total	L	10.2						
	Effective	L	4.5						
Coolant water capacity (engine only)		L	4.2						
Engine dimensions ** (with flywheel housing)	Overall length	mm	715						
	Overall width	mm	575						
	Overall height	mm	779						
Engine mass (dry) ** (with flywheel housing)		kg	258 (equivalent to SAE#3)		245 (equivalent to SAE#4)				
Cooling fan (std.)		mm	430 mm O/D, 8 blades suction type						
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	130×130						

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(11) 4TNV106

Engine name		Unit	4TNV106					
Engine specification class		-	CL		VM			
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine					
Combustion chamber		-	Direct injection					
Number of cylinders		-	4					
Cylinder bore×stroke		mm×mm	106×125					
Displacement		L	4.412					
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-			
	Output	kW (hp)	41.2 (56.0)	49.3 (67.0)	-			
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500
	Output	kW (hp)	45.6 (62.0	54.4 (74.0)	56.6 (77.0)	61.4 (83.5)	65.5 (89.0)	67.7 (92.0)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)					
Power take off		-	Flywheel					
Direction of rotation		-	Counterclockwise (viewed from flywheel)					
Cooling system		-	Radiator					
Lubrication system		-	Forced lubrication with trochoid pump					
Starting system		-	Electric					
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)					
Applicable lubricant		-	API grade class CD or CF					
Lubricant capacity (oil pan) *	Total	L	14.0					
	Effective	L	9.0		7.5			
Coolant water capacity (engine only)		L	6.0					
Engine dimensions ** (with flywheel housing)	Overall length	mm	808		776			
	Overall width	mm	629		629			
	Overall height	mm	803		803			
Engine mass (dry) ** (with flywheel housing)		kg	345 (equivalent to SAE#3)		330 (equivalent to SAE#3)			
Cooling fan (std.)		mm	500 mm O/D, 7 blades pusher type		500 mm O/D, 7 blades suction type			
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	150×150					

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

(12) 4TNV106T

Engine name		Unit	4TNV106T			
Engine specification class		-	CL		VM	
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine			
Combustion chamber		-	Direct injection			
Number of cylinders		-	4			
Cylinder bore×stroke		mm×mm	106×125			
Displacement		L	4.412			
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-	
	Output	kW (hp)	51.5 (70.0)	61.8 (84.0)	-	
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200
	Output	kW (hp)	56.8 (77.2	68.0 (92.5)	69.9 (95.0)	72.0 (97.9)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400
Ignition order		-	1-3-4-2-1(No.1 cylinder on flywheel side)			
Power take off		-	Flywheel			
Direction of rotation		-	Counterclockwise (viewed from flywheel)			
Cooling system		-	Radiator			
Lubrication system		-	Forced lubrication with trochoid pump			
Starting system		-	Electric			
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)			
Applicable lubricant		-	API grade class CD or CF			
Lubricant capacity (oil pan) *	Total	L	14.0			
	Effective	L	9.0		7.5	
Coolant water capacity (engine only)		L	6.0			
Engine dimensions ** (with flywheel housing)	Overall length	mm	808		776	
	Overall width	mm	629		628.6	
	Overall height	mm	866		866	
Engine mass (dry) ** (with flywheel housing)		kg	355 (equivalent to SAE#3)		340 (equivalent to SAE#3)	
Cooling fan (std.)		mm	500 mm O/D, 7 blades pusher type		500 mm O/D, 7 blades suction type	
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		mm	150×150			

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

1.3 Fuel Oil, Lubricating Oil and Coolant Water

1.3.1 Fuel oil

IMPORTANT:
Only use the recommended fuel to obtain the best engine performance and prevent damage of parts, also prevent air pollution.

(1) Selection of fuel oil

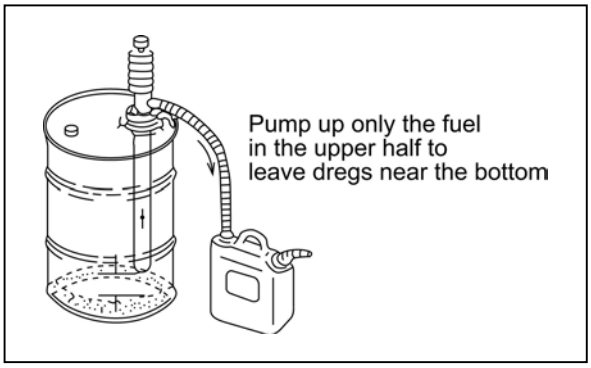
Use the following diesel fuels for best engine performance:
BS 2869 A1 or A2

Fuels equivalent to Japanese Industrial Standard, JIS. No. K2204-2

Fuel cetane number should be 45 or greater

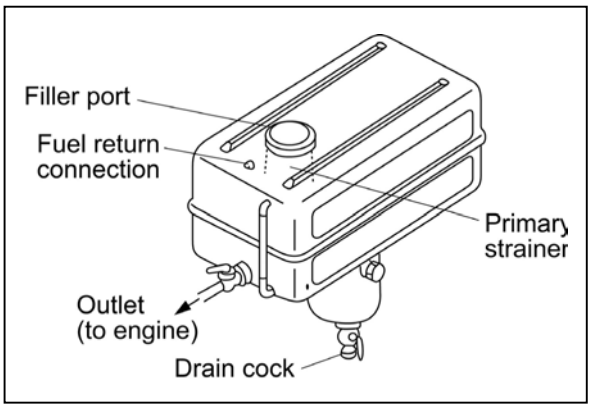
(2) Fuel handling

- Water and dust in the fuel oil can cause operation failure. Use containers which are clean inside to store fuel oil. Store the containers away from rain water and dust.
- Before supplying fuel, let the fuel container rest for several hours so that water and dust in the fuel are deposited on the bottom. Pump up only the clean fuel.



(3) Fuel tank

Be sure to attach a drain cock, precipitation trap and primary strainer to the fuel tank as shown illustration right.



1.3.2 Lubricating oil

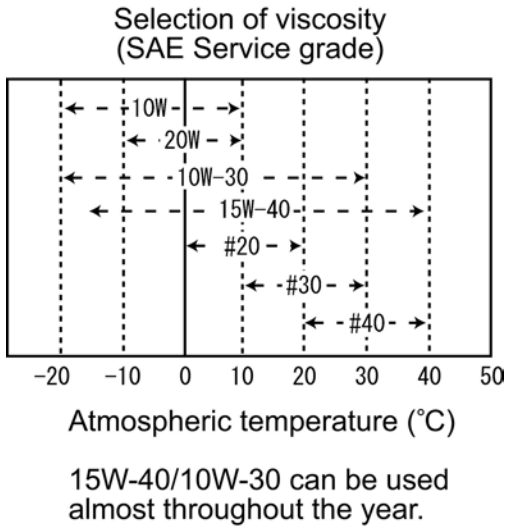
IMPORTANT:
Use of other than the specified engine oil may cause inner parts seizure or early wear, leading to shorten the engine service life.

(1) Selection of engine lube oil

Use the following engine oil

- API classification ..... CD or CF
  (Standards of America Petroleum Institute)
- SAE viscosity ..... 10W-30 or 15W-40
  (Standard of Society of Automotive Engineering)

Engine oil with 10W30 or 15W40 can be used throughout the year.
(Refer to the right figure.)



(2) Handling of engine oil

- Carefully store and handle the oil so as to prevent dust or dirt entrance. When supplying the oil, pay attention and clean around the filler port.
- Do not mix different types of oil as it may adversely affect the lubricating performance.

⚠ CAUTION

When touching engine oil by hand, the skin of the hand may become rough. Be careful not to touch oil with your hands without protective gloves. If touch, wash your hands with soap and water thoroughly.

1.3.3 Coolant water

Use clean soft water and be sure to add the Long Life Coolant Antifreeze (LLC) in order to prevent rust built up and freezing. If there is any doubt over the water guality, distilled water or pre-mixed coolant should be used.
The coolants / antifreezes, which are good performance for example, are shown below.

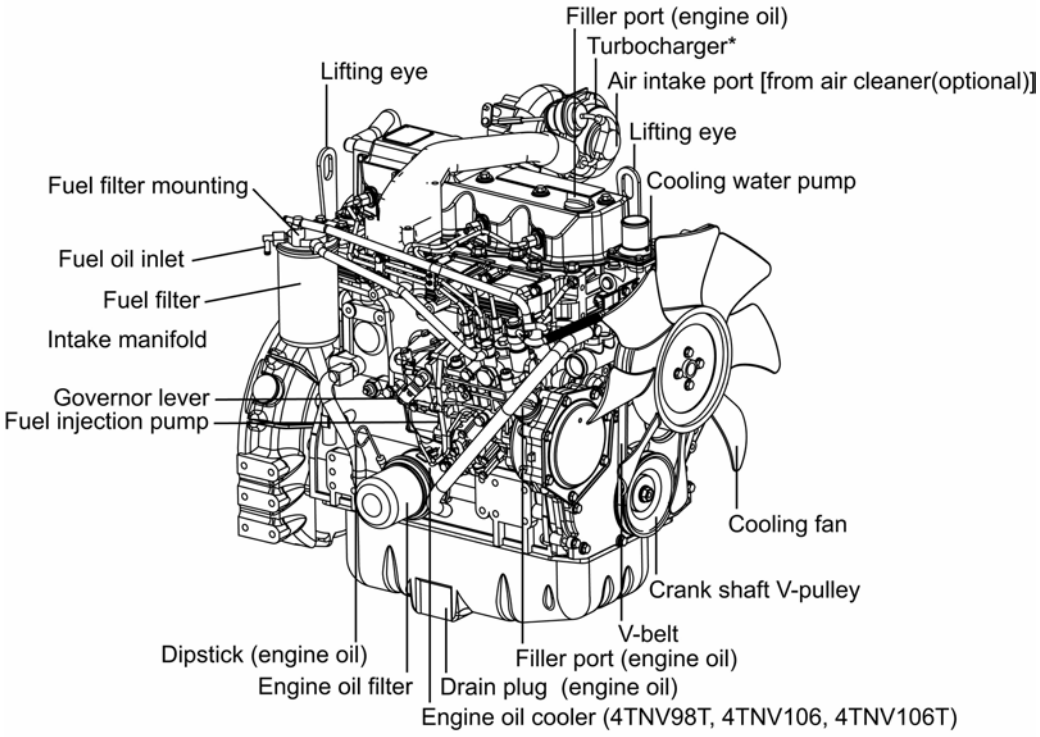
- TEXACO LONG LIFE COOLANT ANTIFREEZE, both standard and pre-mixed.
  Product codes 7997 and 7998
- HAVOLINE EXTENDED LIFE ANTIFREEZE / COOLANT
  Product code 7994

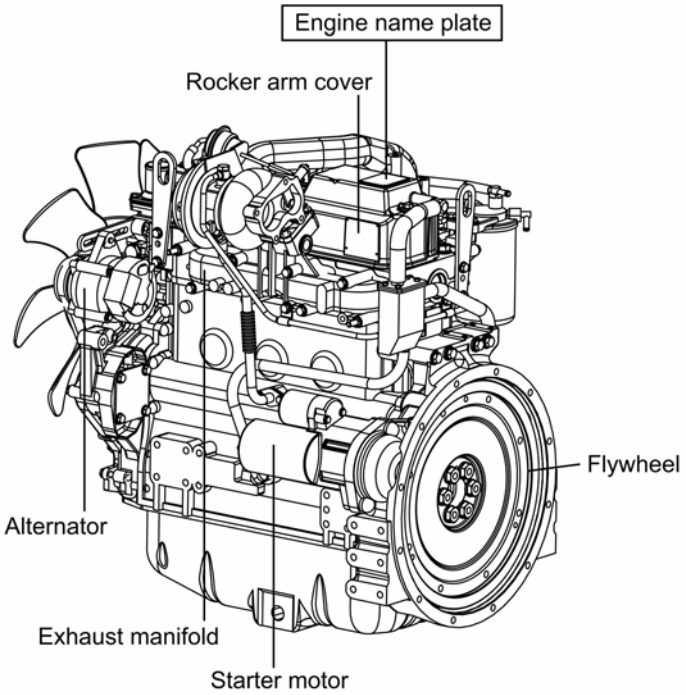
IMPORTANT:
- Be sure to add Long Life Coolant Antifreeze(LLC) to soft water. In cold season, the LLC is especially important. Without LLC, cooling performance will decrease due to scale and rust in the coolant water line. Without LLC, coolant water will freeze and expand to break the cooling line.
- Be sure to use the mixing ratios specified by the LLC manufacturer for your temperature range.
- Do not mix different types (brand) of LLC, chemical reactions may make the LLC useless and engine trouble could result.
- Replace the coolant water every once a year.

⚠ CAUTION

When handling Long Life Coolant Antifreeze, wear protective rubber gloves not to touch it. If LLC gets eyes or skin, wash with clean water at once.

1.4 Engine External Views

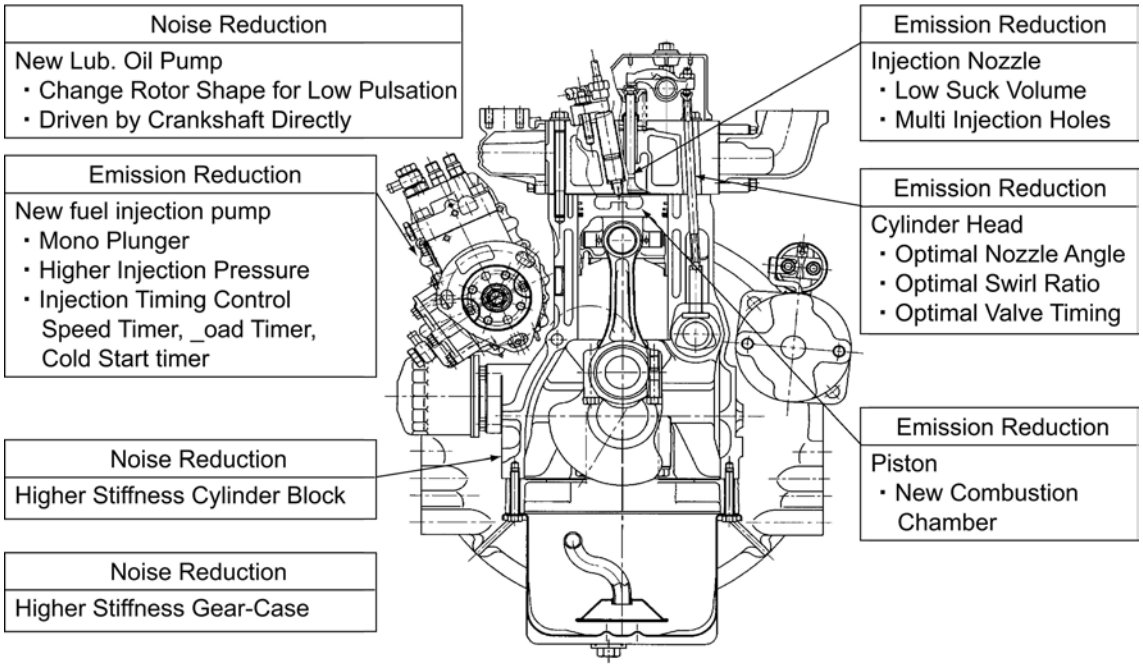




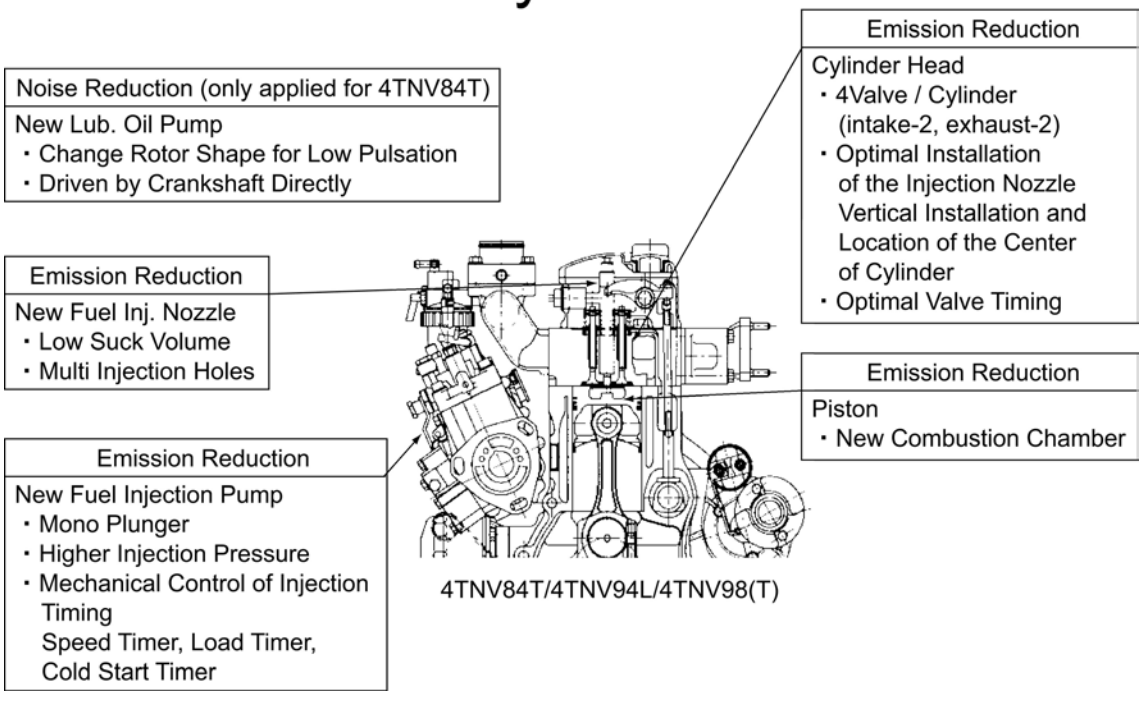
Note) ・This illustration shows the 4TNV98T engine (with turbocharger).
・The drain plug (engine oil) location depends on the engine installed on the machine unit to be on the fuel injection pump side (above illustration) or starter motor side.

1.5 Structural Description

2-valve cylinder head



4-valve cylinder head



4TNV84T/4TNV94L/4TNV98(T)

1.6 Exhaust gas emission regulation

The engines in this manual have been certified by the US EPA, California ARB and/or the 97/68/EC Directive.

California
Proposition 65 Warning
Diesel engine exhaust and some of its constitutions are known to the State of California to cause cancer, birth defects, and other reproductive harm.

California
Proposition 65 Warning
Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.

1.6.1 The Emission Standard in USA

(1) EPA Nonroad Diesel Engine Emission Standards

g/kW·hr(g/bhp·hr)

Engine Power	Tier	Model Year	NOx	HC	NMHC+NOx	CO	PM
kW < 8 (hp < 11)	Tier 1	2000	-	-	10.5 (7.8)	8.0 (6.0)	1.0 (0.75)
	Tier 2	2005	-	-	7.5 (5.6)	8.0 (6.0)	0.80 (0.60)
8 <= kW < 19 (11 <= hp < 25)	Tier 1	2000	-	-	9.5 (7.1)	6.6 (4.9)	0.80 (0.60)
	Tier 2	2005	-	-	7.5 (5.6)	6.6 (4.9)	0.80 (0.60)
19<= kW < 37 (25 <= hp < 50)	Tier 1	1999	-	-	9.5 (7.1)	5.5 (4.1)	0.80 (0.60)
	Tier 2	2004	-	-	7.5 (5.6)	5.5 (4.1)	0.60 (0.45)
37 <= kW < 75 (50 <= hp < 100)	Tier 1	1998	9.2 (6.9)	-	-	-	-
	Tier 2	2004	-	-	7.5 (5.6)	5.0 (3.7)	0.40 (0.30)
	Tier 3	2008	-	-	4.7 (3.5)	5.0 (3.7)	
75 <= kW < 130 (100 <= hp < 175)	Tier 1	1997	9.2 (6.9)	-	-	-	-
	Tier 2	2003	-	-	6.6 (4.9)	5.0 (3.7)	0.30 (0.22)
	Tier 3	2007	-	-	4.0 (3.0)	5.0 (3.7)	

Note1) The EPA emission regulation under 130kW is mentioned below.
Note2) As for Model year, the year which a regulation is applicable to is shown.

Engine classification	Transient smoke standards % opacity (acceleration/lug/peak modes)
Constant speed engine	Not regulated
Variable speed engine	20/15/50 or less

(2) California ARB Emission Regulation

The ARB emission standard is based on that of the EPA.

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