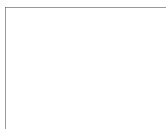




SERVICE MANUAL



TS6000 Sugar Cane Loader
TS6020
TS6030
TS6040

Product: New Holland TS6000/TS6020/TS6030/TS6040 Sugar Cane Loader Service Repair Manual

Full Download: <https://www.arepairmanual.com/downloads/new-holland-ts6000-ts6020-ts6030-ts6040-sugar-cane-loader-service-repair-manual/>

Link Product / Engine

Product	Market Product	Engine
TS6030	Latin America	F4CE0454C*D601
TS6040	Latin America	F4CE0454A*B602

Sample of manual. Download All 1544 pages at:

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INTRODUCTION

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Advice

All repair and maintenance works listed in this manual must be carried out only by qualified dealership personnel, strictly complying with the instructions given; and using, whenever appropriate, the special tools.

Anyone who carries out the above operations without complying with the instructions shall be responsible for the subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional, or local dealers, reject any responsibility for damages due to the anomalous behavior of parts and/or components not approved by the manufacturer himself, including those used for the servicing or repair of the product manufactured or marketed by the manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the manufacturer in case of damages due to an anomalous behavior of parts and/or components not approved by the manufacturer.

The information in this manual is up-to-date at the date of the publication. It is the policy of the manufacturer for continuous improvement. Some information may not be updated due to modifications of a technical or commercial type, as well as to suit the laws and regulations of different countries.

In case of questions, refer to your Sales and Service Networks.

Foreword - Ecology And The Environment

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances which are required by advanced technology, common sense should govern the use and disposal of products of a chemical and petrochemical nature.

NOTE: *The following are recommendations which may be of assistance:*

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use and dispose of these substances.
- Agricultural consultants will, in many cases, be able to help you as well.

HELPFUL HINTS

- Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems which may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances which may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
- Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil but should be collected and disposed of properly.
- Repair any leaks or defects in the engine cooling or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.

International symbols

As a guide to the operation of the machine, various universal symbols have been utilized on the instruments, controls, switches, and fuse box. The symbols are shown below with an indication of their meaning.

 Heater plug for cold start	 Turning signal	 Power Take-Off (PTO)	 Reaction control
 Alternator charging	KAM Activated memory	N Transmission in neutral	 Accessories socket
 Fuel level	 Turn signals	 Creeper selection	 Implement socket
 Automatic fuel shut-off	 Turn signals - one trailer	 Low speed selection	 Percentage slip
 Engine speed (rpm x 100)	 Turn signals - two trailers	 High speed selection	 Raising of the hydraulic lift
 Hour meter	 Wind shield washer	 Road speed	 Rear hitch lower
 Engine oil pressure	 Windscreen wash wipe	 Differential Lock	 Hydraulic lift height threshold
 Engine coolant temperature	 Heating temperature control	 Rear axle oil temperature	 Hydraulic lift disabled
 Coolant level	 Cab recirculation fan	 Transmission oil pressure	 Transmission filters and hydraulic filters
 Machine lights	 Air conditioner	 Auxiliary Front Wheel Drive (AFWD) operated	 Remote control valve extension
 Main beam head	 Air Filter Restriction	 Warning!	 Remote control valve command retraction
 Low beam	(P) Parking brake	 Danger warning lights	 Remote control valve flotation
 Work lamps	 Brake fluid level	 Variable control	 Malfunction! See Operator's
 Stop lamp	 Trailer brake	 Pressurized! Open carefully	 Malfunction! (alternative symbol)
 Klaxon	 Warning! Corrosive substance	 Position control	 Brake fluid level

Safety rules and signal word definitions

Personal safety



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual and on machine decals, you will find the signal words Danger, Warning, and Caution followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.



DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. The color associated with Danger is RED.

M1169A



WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. The color associated with Warning is ORANGE.

M1170A



CAUTION

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. The color associated with Caution is YELLOW.

M1171A

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: Notice indicates a situation which, if not avoided, could result in machine or property damage. The color associated with Notice is BLUE.

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: Note indicates additional information which clarifies steps, procedures, or other information in this manual.

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Torque

Use the torques in this chart when special torques are not given. These torques apply to fasteners with both UNC and UNF threads as received from suppliers dry, or when lubricated with engine oil. Not applicable if special graphite lubricants, Molydisulfide greases, or other extreme pressure lubricants are used.

Decimal hardware

Grade 5 bolts, nuts, and studs

Size	Nm	lb in/lb ft
1/4 in	12 - 15 Nm	108 - 132 lb in
5/16 in	23 - 28 Nm	204 - 252 lb in
3/8 in	48 - 57 Nm	420 - 504 lb in
7/16 in	73 - 87 Nm	54 - 64 lb ft
1/2 in	109 - 130 Nm	80 - 96 lb ft
9/16 in	149 - 179 Nm	110 - 132 lb ft
5/8 in	203 - 244 Nm	150 - 180 lb ft
3/4 in	366 - 439 Nm	270 - 324 lb ft
7/8 in	542 - 651 Nm	400 - 480 lb ft
1 in	787 - 944 Nm	580 - 696 lb ft
1-1/8 in	1085 - 1193 Nm	800 - 880 lb ft
1-1/4 in	1519 - 1681 Nm	1120 - 1240 lb ft
1-3/8 in	1980 - 2278 Nm	1460 - 1680 lb ft
1-1/2 in	2631 - 2983 Nm	1940 - 2200 lb ft

Markings for Grade 5 hardware



Grade 8 bolts, nuts, and studs

Size	Nm	lb in/lb ft
1/4 in	16 - 20 Nm	144 - 180 lb in
5/16 in	33 - 39 Nm	288 - 348 lb in
3/8 in	61 - 73 Nm	540 - 648 lb in
7/16 in	95 - 114 Nm	70 - 84 lb ft
1/2 in	149 - 179 Nm	110 - 132 lb ft
9/16 in	217 - 260 Nm	160 - 192 lb ft
5/8 in	298 - 358 Nm	220 - 264 lb ft
3/4 in	515 - 618 Nm	380 - 456 lb ft
7/8 in	814 - 976 Nm	600 - 720 lb ft
1 in	1220 - 1465 Nm	900 - 1080 lb ft
1-1/8 in	1736 - 1953 Nm	1280 - 1440 lb ft
1-1/4 in	2468 - 2712 Nm	1820 - 2000 lb ft
1-3/8 in	3227 - 3688 Nm	2380 - 2720 lb ft
1-1/2 in	4285 - 4827 Nm	3160 - 3560 lb ft

Markings for Grade 8 hardware



NOTE: Use thick nuts with Grade 8 bolts.

Metric hardware

Grade 8.8 bolts, nuts, and studs

Size	Nm	lb in/lb ft
4 mm	3 - 4 Nm	24 - 36 lb in
5 mm	7 - 8 Nm	60 - 72 lb in
6 mm	11 - 12 Nm	96 - 108 lb in
8 mm	26 - 31 Nm	228 - 276 lb in
10 mm	52 - 61 Nm	456 - 540 lb in
12 mm	90 - 107 Nm	66 - 79 lb ft
14 mm	144 - 172 Nm	106 - 127 lb ft
16 mm	217 - 271 Nm	160 - 200 lb ft
20 mm	434 - 515 Nm	320 - 380 lb ft
24 mm	675 - 815 Nm	500 - 600 lb ft
30 mm	1250 - 1500 Nm	920 - 1100 lb ft
36 mm	2175 - 2600 Nm	1600 - 1950 lb ft

Markings for Grade 8.8 hardware



Grade 10.9 bolts, nuts and studs

Size	Nm	lb in/lb ft
4 mm	4 - 5 Nm	36 - 48 lb in
5 mm	9 - 11 Nm	84 - 96 lb in
6 mm	15 - 18 Nm	132 - 156 lb in
8 mm	37 - 43 Nm	324 - 384 lb in
10 mm	73 - 87 Nm	54 - 64 lb ft
12 mm	125 - 150 Nm	93 - 112 lb ft
14 mm	200 - 245 Nm	149 - 179 lb ft
16 mm	310 - 380 Nm	230 - 280 lb ft
20 mm	610 - 730 Nm	450 - 540 lb ft
24 mm	1050 - 1275 Nm	780 - 940 lb ft
30 mm	2000 - 2400 Nm	1470 - 1770 lb ft
36 mm	3500 - 4200 Nm	2580 - 3090 lb ft

Markings for Grade 10.9 hardware



Grade 12.9 bolts, nuts, and studs

Size	Nm	lb in/lb ft
Typically the torque values specified for grade 10.9 hardware can be used satisfactorily on grade 12.9 hardware.		
Markings for Grade 12.9 hardware		

Steel hydraulic fittings

37° flare fitting

Tube outside diameter/Hose inside diameter		Thread size	Nm	lb in/lb ft
mm	inch			
6.4 mm	1/4 in	7/16-20 in	8 - 16 Nm	72 - 144 lb in
7.9 mm	5/16 in	1/2-20 in	11 - 22 Nm	96 - 192 lb in
9.5 mm	3/8 in	9/16-18 in	14 - 34 Nm	120 - 300 lb in
12.7 mm	1/2 in	3/4-16 in	20 - 57 Nm	180 - 504 lb in
15.9 mm	5/6 in	7/8-14 in	34 - 79 Nm	300 - 696 lb in
19.0 mm	3/4 in	1-1/16-12 in	54 - 108 Nm	40 - 80 lb ft
22.2 mm	7/8 in	1-3/16-12 in	81 - 135 Nm	60 - 100 lb ft
25.4 mm	1 in	1-5/16-12 in	102 - 158 Nm	75 - 117 lb ft
31.8 mm	1-1/4 in	1-5/8-12 in	169 - 223 Nm	125 - 165 lb ft
38.1 mm	1-1/2 in	1-7/8-12 in	285 - 338 Nm	210 - 250 lb ft

Straight threads with O-ring

Tube outside diameter/Hose inside diameter		Thread size	Nm	lb in/lb ft
mm	inch			
6.4 mm	1/4 in	7/16-20 in	16 - 26 Nm	144 - 228 lb in
7.9 mm	5/16 in	1/2-20 in	22 - 34 Nm	192 - 300 lb in
9.5 mm	3/8 in	9/16-18 in	34 - 54 Nm	300 - 480 lb in
12.7 mm	1/2 in	3/4-16 in	57 - 91 Nm	540 - 804 lb in
15.9 mm	5/6 in	7/8-14 in	79 - 124 Nm	58 - 92 lb ft
19.0 mm	3/4 in	1-1/16-12 in	108 - 174 Nm	80 - 128 lb ft
22.2 mm	7/8 in	1-3/16-12 in	136 - 216 Nm	100 - 160 lb ft
25.4 mm	1 in	1-5/16-12 in	159 - 253 Nm	117 - 187 lb ft
31.8 mm	1-1/4 in	1-5/8-12 in	224 - 357 Nm	165 - 264 lb ft
38.1 mm	1-1/2 in	1-7/8-12 in	339 - 542 Nm	250 - 400 lb ft

Split flange mounting bolts

Size	Nm	lb in/lb ft
5/16-18 in	20 - 27 Nm	180 - 240 lb in
3/8-16 in	27 - 34 Nm	240 - 300 lb in
7/16-14 in	47 - 61 Nm	420 - 540 lb in
1/2-13 in	74 - 88 Nm	55 - 65 lb ft
5/8-11 in	190 - 203 Nm	140 - 150 lb ft

O-ring face seal end

Nominal SAE dash size	Tube outside diameter		Thread size	Nm	lb in/lb ft
	mm	in			
-4	6.4 mm	1/4 in	9/16-18 in	14 - 16 Nm	120 - 144 lb in
-6	9.5 mm	3/8 in	11/16-16 in	24 - 27 Nm	216 - 240 lb in
-8	12.7 mm	1/2 in	13/16-16 in	43 - 54 Nm	384 - 480 lb in
-10	15.9 mm	5/8 in	1-14 in	62 - 76 Nm	552 - 672 lb in
-12	19.0 mm	3/4 in	1-3/16-12 in	90 - 110 Nm	65 - 80 lb ft
-14	22.2 mm	7/8 in	1-3/16-12 in	90 - 110 Nm	65 - 80 lb ft
-16	25.4 mm	1.0 in	1-7/16-12 in	125 - 140 Nm	92 - 105 lb ft
-20	31.8 mm	1-1/4 in	1-11/16-12 in	170 - 190 Nm	125 - 140 lb ft
-24	38.1 mm	1-1/2 in	2-12 in	200 - 254 Nm	150 - 180 lb ft

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O-ring boss end fitting or lock nut

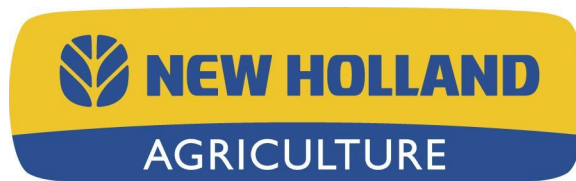
Nominal SAE dash size	Tube outside diameter		Thread size	Nm	lb in/lb ft
	mm	in			
-4	6.4 mm	1/4 in	7/16-20 in	23 - 27 Nm	204 - 240 lb in
-6	9.5 mm	3/8 in	9/16-18 in	34 - 41 Nm	300 - 360 lb in
-8	12.7 mm	1/2 in	3/4-16 in	61 - 68 Nm	540 - 600 lb in
-10	15.9 mm	5/8 in	7/8-14 in	81 - 88 Nm	60 - 65 lb ft
-12	19.0 mm	3/4 in	1-1/16-12 in	115 - 122 Nm	85 - 90 lb ft
-14	22.2 mm	7/8 in	1-13/16-12 in	129 - 136 Nm	95 - 100 lb ft
-16	25.41 mm	1.0 in	1-5/16-12 in	156 - 169 Nm	115 - 125 lb ft
-20	31.8 mm	1-1/4 in	1-5/6-12 in	201 - 217 Nm	150 - 160 lb ft
-24	38.1 mm	1-1/2 in	1-7/8-12 in	258 - 271 Nm	190 - 200 lb ft

Abbreviation Measurements

Typical applications	Metric unit		Imperial unit	
	Name	Symbol	Name	Symbol
Area (Land area)				
	hectare	ha	acre	ac
	square meter	m²	square foot	ft²
			square inch	in²
	square millimeter	mm²	square inch	in²
Electricity				
	ampere	A	ampere	A
	volt	V	volt	V
	microfarad	µF	microfarad	µF
	ohm	Ω	ohm	Ω
Force				
	kilonewton	kN	pound	lb
	newton	N	pound	lb
Force per length				
	newton per meter	N/m	pound per foot	lb/ft
			pound per inch	lb/in
Frequency				
	megahertz	MHz	megahertz	MHz
	kilohertz	kHz	kilohertz	kHz
	hertz	Hz	hertz	Hz
Frequency – Rotational				
	revolution per minute	r/min	revolution per minute	r/min ^a
		rpm		rpm
Length				
	kilometer	km	mile	mi
	meter	m	foot	ft
	centimeter	cm	inch	in
	millimeter	mm	inch	in
	micrometer	µm		
Mass				
	kilogram	kg	pound	lb
	gram	g	ounce	oz
	milligram	mg		
Power				
	kilowatt	kW	horsepower	Hp
	watt	W	Btu per hour	Btu/hr
			Btu per minute	Btu/min
Pressure or stress (Force per area)				
	kilopascal	kPa	pound per square inch	psi
			inch of mercury	inHg
	pascal	Pa	inch of water	inH2O
	megapascal	MPa	pound per square inch	psi

INTRODUCTION

Typical applications	Metric unit		Imperial unit	
	Name	Symbol	Name	Symbol
Temperature (other than Thermodynamic)				
	degrees Celsius	°C	degrees Fahrenheit	°F
Time				
	hour	h	hour	h
	minute	min	minute	min
	second	s	second	s
Torque (includes Bending moment, Moment of force, and Moment of a couple)				
	newton meter	N m	pound foot	lb ft
			pound foot	lb in
Velocity				
	kilometer per hour	km/h	mile per hour	mph
	meter per second	m/s	foot per second	ft/s
	millimeter per second	mm/s	inch per second	in/s
	meter per minute	m/min	foot per minute	ft/min
Volume (includes Capacity)				
	cubic meter	mm³	cubic yard	yd³
				cu yd
	liter	l	cubic inch	in³
	liter	l	US gallon	US gal
			UK gallon	UK gal
			US quart	US qt
			UK quart	UK qt
	milliliter	ml	fluid ounce	fl oz
Volume per time (includes Discharge and Flow rate)				
	cubic meter per minute	m³/min	cubic foot per minute	ft³/min
	liter per minute	l/min	US gallon per minute	US gal/min
	milliliter per minute	ml/min	UK gallon per minute	UK gal/min
Sound power level and Sound pressure level				
	decibel	dB	decibel	dB



SERVICE MANUAL

Engine



TS6000 Sugar Cane Loader

TS6020

TS6030

TS6040

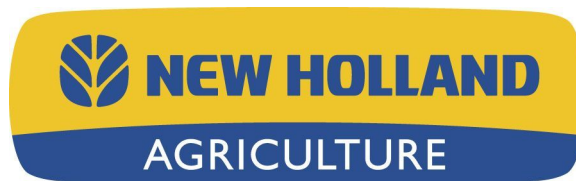
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Engine - General specification

General specifications		
Engine type	4 Cylinders	6 Cylinders
Cycle	Four-Stroke diesel engine	
Power	Turbocharged with intercooler	
Injection	Direct	
Number of cylinders	4	6
Bore	104 mm (4 in)	
Stroke	132 mm (5 in)	
Total displacement	4485 cm³	6728 cm³
Timing		
Start before T.D.C.	18.5 °	
End after B.D.C.	29.5 °	
Start before B.D.C.	67 °	
End after T.D.C.	35 °	
Valve clearance		
Intake	0.20 - 0.30 mm (0.008 - 0.012 in)	
Exhaust	0.45 - 0.55 mm (0.018 - 0.022 in)	
Fuel feed		
Injection type	Bosch high pressure common rail	
Control	EDC7 UC31	
Injector	CRIN 2	
Nozzle type	DLLA	
Injection sequence	1-3-4-2	1-5-3-6-2-4
Injection pressure	250 - 1600 bar (3625 - 23200 psi)	
Aspiration		
Turbocharging	Intercooled	
Turbocharger type	Honeywell GT25	Holset HX35
Lubrication		
Oil pressure @ low idle	0.7 bar (10 psi)	
Oil pressure @ fast idle	3.5 bar (51 psi)	
Oil pan capacity	15 l (15.85 US qt)	
Oil filter capacity	1 l (1.06 US qt)	
Cooling		
Water pump	Belt driven	
Thermostat	79 - 83 °C (174 - 181 °F)	

Clearance data	
Cylinder block and crankshaft components	
Cylinder barrels	104.000 - 104.024 mm (4.094 - 4.095 in)
Oversize	0.4 mm (0.016 in)
Pistons	103.739 - 103.757 mm (4.084 - 4.085 in) (*)
Skirt height	49.5 mm (1.949 in) (*)
Pin housing	38.010 - 38.016 mm (1.496 - 1.497 in)
Piston (oversize)	0.4 mm (0.016 in)
Protrusion	0.28 - 0.52 mm (0.011 - 0.020 in)
Pin	37.994 - 38.000 mm (1.496 - 1.496 in)
Piston pin - Pin housing	0.01 - 0.022 mm (0.0004 - 0.001 in)
Piston ring landings	
Combustion	2.705 - 2.735 mm (0.106 - 0.108 in)
Intermediate	2.420 - 2.440 mm (0.095 - 0.096 in) (*)
Oil control	4.030 - 4.050 mm (0.159 - 0.159 in)
Piston rings	
Combustion	2.560 - 2.605 mm (0.101 - 0.103 in)
Intermediate	2.350 - 2.380 mm (0.093 - 0.094 in)
Oil control	3.970 - 3.990 mm (0.156 - 0.157 in)
Piston ring and ring landing clearance	
Combustion	0.100 - 0.175 mm (0.004 - 0.007 in)
Intermediate	0.060 - 0.110 mm (0.002 - 0.004 in) / 0.040 - 0.090 mm (0.002 - 0.004 in) (*)
Oil control	0.040 - 0.080 mm (0.002 - 0.003 in)
Piston ring end gap	
Combustion	0.30 - 0.40 mm (0.012 - 0.016 in)
Intermediate	0.60 - 0.80 mm (0.024 - 0.031 in)
Oil control	0.30 - 0.55 mm (0.012 - 0.022 in)
Connecting rod	
Small end housing	40.987 - 41.013 mm (1.614 - 1.615 in)
Big end housing	72.987 - 73.013 mm (2.874 - 2.875 in)
Small end bushing inside diameter	38.019 - 38.033 mm (1.497 - 1.497 in)
Big end bearing shell thickness	1.955 - 1.968 mm (0.077 - 0.077 in)
Piston pin and bushing clearance	0.019 - 0.039 mm (0.001 - 0.002 in)
Oversize big end bearing shells	0.250 mm (0.010 in) ; 0.500 mm (0.020 in)
Crankshaft	
Main journals	82.99 - 83.01 mm (3.267 - 3.268 in)
Crankpins	68.987 - 69.013 mm (2.716 - 2.717 in)
Main bearing shell thickness	2.456 - 2.464 mm (0.097 - 0.098 in)
Big end bearing shell thickness	1.955 - 1.968 mm (0.077 - 0.078 in)
Main bearing bore	
No. 1,5 / 1,7	87.982 - 88.008 mm (3.464 - 3.465 in)
No. 2,3,4 / 2,3,4,5,6	87.977 - 88.013 mm (3.464 - 3.465 in)
Bearing shell and journal clearance	
No. 1,5 / 1,7	0.041 - 0.119 mm (0.002 - 0.005 in)
No. 2,3,4 / 2,3,4,5,6	0.041 - 0.103 mm (0.002 - 0.004 in)
Bearing shell and crankpin clearance	0.033 - 0.041 mm (0.001 - 0.002 in)
Thrust journal	37.475 - 37.545 mm (1.475 - 1.478 in)
Thrust bearing bore	32.180 - 32.280 mm (1.267 - 1.271 in)
Thrust bearing	37.28 - 37.38 mm (1.468 - 1.472 in)
Crankshaft end play	0.095 - 0.265 mm (0.004 - 0.010 in)

Clearance data	
Cylinder head and components	
Valve guide bore	7.042 - 7.062 mm (0.277 - 0.278 in)
Intake valves	
Stem diameter	6.970 - 6.990 mm (0.274 - 0.275 in)
Face angle	59.75 - 60.25 °
Exhaust valves	
Stem diameter	6.970 - 6.990 mm (0.274 - 0.275 in)
Face angle	44.75 - 44.25 °
Valve stem and guide clearance	0.052 - 0.092 mm (0.002 - 0.004 in)
Valve seat bore	
Intake	34.837 - 34.863 mm (1.372 - 1.373 in)
Exhaust	34.837 - 34.863 mm (1.372 - 1.373 in)
Valve seat outside diameter:	
Intake	34.917 - 34.931 mm (1.375 - 1.375 in)
Exhaust	34.917 - 34.931 mm (1.375 - 1.375 in)
Valve seat angle	
Intake	60 °
Exhaust	45 °
Valve sink	
Intake	0.59 - 1.11 mm (0.023 - 0.044 in)
Exhaust	0.96 - 1.48 mm (0.038 - 0.058 in)
Interference between valve seat and cylinder head	
Intake	0.054 - 0.094 mm (0.002 - 0.004 in)
Exhaust	0.054 - 0.094 mm (0.002 - 0.004 in)
Valve spring height	
Free	47.75 mm (1.880 in)
Under a load equal to: 330.8 - 348.8 N (74.4 - 78.4 lb)	35.33 mm (1.391 in)
Under a load equal to: 702 - 780 N (157.8 - 175.4 lb)	25.2 mm (0.992 in)
Camshaft bore	
No.1 (flywheel side)	59.222 - 59.248 mm (2.332 - 2.333 in)
No. 2,3,4,5 / 2,3,4,5,6,7	54.089 - 54.139 mm (2.129 - 2.131 in)
Camshaft journals	
1-5 / 1-7	53.995 - 54.045 mm (2.126 - 2.128 in)
Bushing inside diameter	54.083 - 54.147 mm (2.129 - 2.132 in)
Bushing and journal clearance	0.038 - 0.162 mm (0.001 - 0.006 in)
Cam lift	
Intake	7.582 mm (0.299 in)
Exhaust	6.045 mm (0.238 in)
Tappet bore	16.000 - 16.030 mm (0.630 - 0.631 in)
Tappet outside diameter	
Top	15.924 - 15.954 mm (0.627 - 0.628 in)
Middle	15.960 - 15.975 mm (0.628 - 0.629 in)
Bottom	15.924 - 15.954 mm (0.627 - 0.628 in)
Tappets and bore clearance	0.025 - 0.070 mm (0.001 - 0.003 in)
Rocker shaft	21.965 - 21.977 mm (0.865 - 0.865 in)
Rockers	22.001 - 22.027 mm (0.866 - 0.867 in)
Rockers and shaft clearance	0.024 - 0.162 mm (0.001 - 0.006 in)

Engine - Dimension

Assembly dimensions

Description	
Pistão e biela	
Cylinder sleeves	104.0 - 104.024 mm
Oversize	0.4 mm
Pistons supplied as spare part:	
Distance between the lower face of the piston and the centre of the pin holeX	12 mm
OD	101.883 - 101.897 mm
Oversize piston diameter	0.5 mm
Pin seat	40.008 - 40.014 mm
Piston - cylinder sleeves	0.252 - 0.294 mm
Piston projection above the cylinder block	0.28 - 0.52 mm
Piston pin diameter	37.994 - 38.000 mm
Piston pin - pin seat oversize	0.010 - 0.022 mm
Height of piston ring slots	
Top ring	2.705 - 2.735 mm
Middle ring	2.440 - 2.460 mm
Lower ring	4.030 - 4.050 mm
Ring thickness	
Top ring	2.560 - 2.605 mm
Middle ring	2.350 - 2.380 mm
Lower ring	3.970 - 3.990 mm
Tolerance between slots and rings	
Top ring	0.100 - 0.175 mm
Middle ring	0.060 - 0.110 mm
Lower ring	0.040 - 0.080 mm
Ring end opening in cylinder sleeve	
Top ring	0.30 - 0.40 mm
Middle ring	0.60 - 0.80 mm
Lower ring	0.30 - 0.80 mm
Diameter of smaller conrod seat	40.987 - 41.013 mm
Diameter of larger conrod seat	72.987 - 73.013 mm
Internal diameter of conrod bushing	38.019 - 38.033 mm
Thickness of bushings	1.955 - 1.968 mm
Virabrequim	
Diameter of trunnions	82.990 - 83.010 mm
Diameter of crankpins	68.987 - 69.013 mm
Trunnion bushing thickness	2.456 - 2.464 mm
Conrod bushing thickness	1.955 - 1.968 mm
Diameter of end bearings	87.982 - 88.008 mm
Diameter of intermediate bearings	87.977 - 88.013 mm
Trunnion bushing oversize	
End bushings	0.064 - 0.095 mm
Intermediate bushings	0.059 - 0.100 mm
Crankpin bushings oversize	0.033 - 0.041 mm
Width of side support trunnions	37.475 - 37.550 mm
Width of side support bearings	31.730 - 32.280 mm
Width of crankshaft half-rings	37.28 - 37.38 mm
Válvulas	
Diameter of valve guide seat in head	8.019 - 8.039 mm
Angle of valve faces:	
Intake	60 °

Description	
Exhaust	45 °
Valve stem diameter	
Intake and exhaust	7.960 - 7.980 mm
Clearance between valve rod and the respective guide	0.039 - 0.079 mm
Diameter of seat in head for valve seat	
Intake	46.987 - 47.013 mm
Exhaust	43.637 - 43.663 mm
External diameter of valve seat	
Intake	47.063 - 47.089 mm
Exhaust	43.713 - 43.739 mm
Valve seat angle in head	
Intake	60 °
Exhaust	45 °
Valve recess	
Intake	0.336 - 1.072 mm
Exhaust	0.104 - 0.840 mm
Clearance between valve seat and head	
Intake and exhaust	0.050 - 0.102 mm
Eixo de comando de válvulas	
Diameter of rear bushing seat	59.222 - 59.248 mm
Diameter of other shaft seats	54.089 - 54.139 mm
Diameter of bearings	53.995 - 54.045 mm
Internal diameter of bushings	54.083 - 54.147 mm
Clearance between bushings and bearings	0.038 - 0.152 mm
Clearance between seats and bearings	0.044 - 0.144 mm
Cam eccentricity	
Intake	10.74 mm
Exhaust	11.02 mm

Engine - Torque

Torques

Component	Bolt and thread	N.m
Oil spray nozzles in piston	M8 x 1.25 x 10	12 - 18 N·m
Crankshaft main bearing housings:		47 - 53 N·m
1 st step	—	47 - 53 N·m
2 nd step		75 - 85 N·m
3 rd step		85 - 95 °
Rear gearbox	M8 x 1.25 x 40	20 - 28 N·m
	M8 x 1.25 x 25	20 - 28 N·m
	M10 x 1.5	44 - 54 N·m
Oil pump		
1 st step	M8 x 1.25 x 45	20 - 28 N·m
2 nd step	M8 x 1.25 x 30	
Conrod cover bolts		
1 st step	M11 x 1.25	27 - 33 N·m
2 nd step		55 - 65 N·m
3 rd step		55 - 65 °
Oil sump fastening bolts (see Engine oil pan - Assemble (10.102))		
Bolts No. 23 and 26	M10 x 1.5 x 45	45 - 55 N·m
Bolts No. 3 - 10; 13 - 20; 24 - 25	M10 x 1.5 x 90	65 - 75 N·m
Bolts No. 1 - 2 and 21 - 22	M10 x 1.5 x 125	65 - 75 N·m
Bolts No. 11 and 12	M10 x 1.5 x 190	65 - 75 N·m
Fuel pump installation		

Component	Bolt and thread	N.m
Bolts	M8	20 - 28 N·m
Bolts	M6	9 - 11 N·m
Nuts	M6	9 - 11 N·m
Injector pump fastening nuts		
Pre-adjustments	M10 x 1.5	10 - 15 N·m
Final torque		50 - 55 N·m
Rocker arm fastening	M8	20 - 28 N·m
Adjustment nut tightening	3/4 in	20 - 28 N·m
Cylinder head fastening bolts (see Cylinder head - Install (10.101)).		
Valve cover.	(M8 x 1.25 x 25)	20 - 28 N·m
Water pump fastening	(M8 x 1.25 x 25)	20 - 28 N·m
Fan pulley fastening	(M6)	8 - 12 N·m
	(M10)	37 - 49 N·m
Fan hub fastening	(M10)	28 - 38 N·m
Lifting support fastening	(M12 x 1.75 x 25)	5 - 19 N·m
	(M10)	34 - 48 N·m
Crankshaft pulley	(M12 x 1.75 - 10.9)	105 - 115 N·m
Flywheel fastening to crankshaft		
1 st step	(M10 x 40)	26 - 34 N·m
2 nd step		55 - 65 °
	(M12 x 120)	75 - 95 N·m
Flywheel cover engine fastening	(M12 x 80)	75 - 95 N·m
	(M10 x 80)	44 - 54 N·m
	(M10 x 40)	44 - 54 N·m
Breather pump gear cover	(M8 x 1.25 x 16)	20 - 28 N·m
Injector nozzle cylinder head fastening	—	55 - 65 N·m
Fuel bleed pump fastening		20 - 28 N·m
Turbocharger exhaust manifold fastening	(M10)	37 - 49 N·m
Turbocharger lubrication tubing fastening	(M12 x 1.5)	30 - 40 N·m
Turbocharger discharge tubing fastening	(M8 x 1.25 x 16)	20 - 28 N·m
Alternator support fastening	(M8 x 1.25 x 30)	20 - 28 N·m
Alternator support thermostat cover installation	(M8 x 1.25 x 30)	20 - 28 N·m
Lower support installation	(M10 x 1.25 x 25)	20 - 28 N·m
Alternator upper part support fastening	(M10)	44 - 54 N·m
Alternator support fastening	(M120 x 1.75 x 120)	37 - 49 N·m
Alternator electrical connections	(Porca M6 x 1.0)	8 - 12 N·m
Starter motor flywheel casing fastening	(M10)	44 - 54 N·m
Crankshaft bearing cap fastening bolts		
1 st phase	(M12)	44 - 56 N·m
2 nd phase		74 - 86 N·m
3 rd phase		85 - 95 °
Camshaft longitudinal fastening bolt	(M8)	20 - 28 N·m
Camshaft gear fastening bolt	(M8)	32 - 40 N·m
Conrod cover fastening bolt		
1 st phase	(M10)	55 - 65 N·m
2 nd phase		55 - 65 °

Engine - Special tools

Special tools

Tool code	Description
291182	Injection pump gear extractor
380000988	Tool for turning and locking the engine

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