KIOTI®

DS4110(HS)/4510(HS)

WORKSHOP MANUAL

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DS4110(HS)/4510(HS) SAFETY FIRST CHAPTER 1

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5. SPECIFICATIONS

Model				DS4110/DS4110HS	DS4510/DS4510HS
Engine	Model			4A200LWE	4A220LWE
	Type			4Cyl., In-line Vertical, Water-cooled diesel engine	←
	Max. power		HP (Kw)/rpm	41 (30.5) / 2600	45 (33.6) / 2600
	Number of cylinders			4	←
	Bore x stroke		mm (in.)	83×92.4 (3.3×3.6)	87×92.4 (3.4×3.6)
	Displacement		cc (cu in.)	1,999 (121.98)	2,197 (134.06)
	Rated revolution		(rpm)	2600	←
	Injection timing			BTDC 18°	←
	Injection sequence			1 - 3 - 4 - 2	←
	Compression ratio			22 :1	←
Capacity	Fuel tank		ℓ (U.S.gal)	45 (11.9)	←
	Engine crankcase		ℓ (U.S.gal)	8.0 (2.11)	←
	Engine coolant		ℓ (U.S.gal)	8.9 (2.35)	8.7 (2.30)
	Transmission case		ℓ (U.S.gal)	52 (13.74)	←
	Support of front axle		ℓ (U.S.gal)	7.5 (1.98)	←
Drive train	Clutch			Dry type single stage	←
	Transmission	Main shift		4	←
		Shuttle		Constant mesh / Synchro mesh hyd. clutch	←
		Range shift		2	←
		Speeds		8Fx8R	←
	Brake			Wet disc type	←
	4WD system			Manual	←
	Differential lock			Rear Standard	←
	Tire size	Front (Ag, Turf, Ind)		8-16, 27x8.5-15, 10-16.5	8-16, 29x12.5-15, 12-16.5
		Rear(Ag, Turf, Ind)		13.6-24, 41x14-20, 14.9-24	13.6-24, 21.5L-16.1, 17.5L-24
Hydraulic system	Hydraulic lift control			Position control	←
	Steering type			Hydrostatic Power Steering	←
	Pump capacity	Lifting	ℓ/min (gpm)	31.2 (8.24)	←
		Steering	ℓ/min (gpm)	18.7 (4.94)	←
	3-point hitch			Category I	←
	Lift capacity at lift point		kg (lbs)	1,334 (2,940)	←
	Lift capacity at 24 in. behind lift point		kg (lbs)	1,131 (2,493)	←
	Aux. hydraulic valve			-	-
PTO	Type			Independent	←
	PTO shaft size			SAE 1-3/8, 6 spline	←
	PTO speed (PTO rpm/Engine rpm)			540 / 2,451	←
	PTO power (MAX.)		HP(KW)/rpm	34 (25.3) / 2600	38 (28.3) / 2600
Driving speed		Forward	km/h (MPH)	1.75 ~ 24.14 (1.09 ~ 15.00)	←
		Reverse	km/h (MPH)	1.62 ~ 22.26 (1.01 ~ 20.53)	←
Turing radius (w/brake)			m (ft)	2.91 (9.5)	3.13 (10.2)
Weight (w/ROPS & without tires)			kg (lbs)	1,325 (2,921)	←

NOTE: The specifications are subject to change without notice.

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8. MAINTENANCE

8.1 MAINTENANCE SCHEDULE CHART

No.	Item \ Maintenance interval		Run hour									Run age		Remarks	
			10	50	100	200	400	600	800	1500	3000	1 year	2 years		
1	Engine oil	Change	⦿		●										
2	Engine oil filter	Replace		⦿	●										
3	Transmission oil filter	Change		⦿		●									
4	Transmission fluid	Check	⦿												
		Change					●								
5	Front axle oil	Change		⦿			●								
6	Front axle pivot	Adjust						●							
7	Engine start system	Check		●											
8	Greasing	Apply		●											
9	Wheel bolt torque	Check	⦿	●											
10	Battery condition	Check			●									*3	
11	Air cleaner element	Clean		●										*1	
		Check	●												#
		Replace			●							●		*2	
12	Fuel filter element	Replace				●									#
13	Fan belt	Adjust			●									*3	
14	Clutch pedal free play	Adjust		⦿	●										
15	Brake pedal free play	Adjust		⦿	●										
16	Radiator hose and clamp	Clean	⦿												
		Check				●									
		Replace											●		
17	Power steering hose and oil line	Check				●									
		Replace											●		
18	Fuel line	Check			●										#
		Replace											●		
19	Intake air hose	Check	⦿			●									
		Replace											●	*3	
20	Toe-in	Adjust				●									
21	Engine valve clearance	Adjust							●						
22	Fuel injection nozzle injection pressure	Check								●					#
23	Injection pump	Check									●				#
24	Cooling system	Clean											●		

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4. TROUBLESHOOTING

Symptom	Cause	Solution
Engine does not start	• No fuel	• Add fuel
	• Air in fuel system	• Bleed air
	• Water in fuel system	• Change fuel and repair or flush fuel system
	• Clogged fuel pipe	• Clean
	• Clogged fuel filter	• Clean or replace
	• Excessively high viscosity of fuel or engine oil at low temperature	• Use the specified fuel or engine oil
	• Fuel with low cetane number	• Use the specified fuel
	• Fuel leak due to loose injection pipe mounting nut	• Tighten nut
	• Incorrect injection timing	• Adjust
	• Clogged injection nozzle	• Clean or replace
	• Defective fuel injection pump	• Repair or replace
	• Defective fuel transfer pump	• Repair or replace
	• Defective piston, cylinder bore or bearing	• Repair or replace
	• Compression leak from cylinder	• Replace head gasket, tighten cylinder head screws, glow plug and nozzle holder
	• Improper valve seating, damaged valve spring, valve seized	• Repair or replace
	• Improper valve timing	• Correct or replace timing gear
	• Worn piston ring and bore	• Repair or replace
	• Excessive valve clearance	• Adjust
Start motor does not run	• Discharged battery	• Charge
	• Defective start motor	• Repair or replace
	• Defective key switch	• Repair or replace
	• Disconnected wiring	• Connect
Engine doesn't run smooth	• Clogged or dirty fuel filter	• Clean or replace
	• Clogged air cleaner	• Clean or replace
	• Fuel leak due to loose injection pipe mounting nut	• Tighten nut
	• Defective fuel injection pump	• Repair or replace
	• Incorrect nozzle opening pressure	• Adjust or replace
	• Seized or clogged nozzle	• Repair or replace
	• Clogged fuel overflow pipe	• Clean or replace
	• Defective governor	• Repair or replace
Either white or blue exhaust smoke is produced	• Excessive engine oil	• Reduce to the specified level
	• Worn piston ring and bore or seized piston ring	• Repair or replace
	• Incorrect injection timing	• Adjust
	• Insufficient compression pressure	• Adjust valve clearance

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8.2 LUBRICATION AND REPLENISHMENT

To prevent serious equipment damage, use only genuine DAEDONG oils or equivalents.

No	Item	Capacity		Lubricants
		DS4110(HS)	DS4510(HS)	
1	Fuel	45ℓ (11.9 U.S.gal.)		Diesel fuel
2	Coolant	8.9ℓ (2.35 U.S.gal.)	8.7ℓ (2.30 U.S.gal.)	Fresh clean water with Ethylene glycol (50:50)
3	Engine Oil	8.0ℓ (2.11 U.S.gal.)		Engine oil: API Service Classification CC or CD, SAE 15W-40
4	Transmission Oil	52ℓ (13.74 U.S.gal.)		DAEDONG: UTF55 Shell: DONAX-TD Exxonmobil: Mobilfluid 424 Exxon Hydraul 560 BP: Tractran UTH
5	Front axle Oil	7.5ℓ (1.98 U.S.gal.)		SAE 90 or same as T/M oil
6	Apply grease to: - Front axle bevel gear case - Brake pedal - Control lever - Front+Rear bracket	Apply until grease leaks out from a gap other than grease nipple.		SAE multi-purpose grease.

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10. TIGHTENING TORQUES

10.1 GENERAL USE SCREWS, BOLTS AND NUTS

Screws, bolts and nuts whose tightening torques are not specified in this workshop manual should be tightened according to the table below.

Mark on bolt head	4 No-grade or 4T						7 7T						9 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of steel or gray iron part	Steel or gray iron			Aluminum			Steel or gray iron			Aluminum			Steel or gray iron		
Unit / Code	Nm	kgf-m	lb-ft	Nm	kgf-m	lb-ft	Nm	kgf-m	lb-ft	Nm	kgf-m	lb-ft	Nm	kgf-m	lb-ft
M6 (6 mm, 0.24 in.)	7.85 ~ 9.31	0.80 ~ 0.95	5.79 ~ 6.87	7.85 ~ 8.82	0.80 ~ 0.90	5.79 ~ 6.50	9.81 ~ 11.2	1.00 ~ 1.15	7.24 ~ 8.31	7.85 ~ 8.82	0.80 ~ 0.90	5.79 ~ 6.50	12.3 ~ 14.2	1.25 ~ 1.45	9.05 ~ 10.4
M8 (8 mm, 0.31 in.)	17.7 ~ 20.5	1.8 ~ 2.1	13.1 ~ 15.1	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.4	23.6 ~ 27.4	2.4 ~ 2.8	17.4 ~ 20.2	17.7 ~ 20.5	1.8 ~ 2.1	13.1 ~ 15.1	29.5 ~ 34.3	3.0 ~ 3.5	21.7 ~ 25.3
M10 (10 mm, 0.39 in.)	39.3 ~ 45.1	4.0 ~ 4.6	29.0 ~ 33.2	31.4 ~ 34.3	3.2 ~ 3.5	23.2 ~ 25.3	48.1 ~ 55.8	4.9 ~ 5.7	35.5 ~ 41.2	39.3 ~ 44.1	4.0 ~ 4.5	29.0 ~ 32.5	60.9 ~ 70.6	6.2 ~ 7.2	44.9 ~ 52.0
M12 (12 mm, 0.47 in.)	62.8 ~ 72.5	6.4 ~ 7.4	46.3 ~ 53.5				77.5 ~ 90.2	7.9 ~ 9.2	57.2 ~ 66.5	62.8 ~ 72.5	6.4 ~ 7.4	46.3 ~ 53.5	103 ~ 117	10.5 ~ 12.0	76.0 ~ 86.7
M14 (14 mm, 0.55 in.)	108 ~ 125	11.0 ~ 12.8	79.6 ~ 92.5				124 ~ 147	12.6 ~ 15.0	91.2 ~ 108				167 ~ 704	17.0 ~ 20.0	123 ~ 144
M16 (16 mm, 0.63 in.)	167 ~ 191	17.0 ~ 19.5	123 ~ 141				197 ~ 225	20.0 ~ 23.0	145 ~ 166				260 ~ 304	26.5 ~ 31.0	192 ~ 224
M18 (18 mm, 0.71 in.)	246 ~ 284	25.0 ~ 29.0	181 ~ 209				275 ~ 318	28.0 ~ 32.5	203 ~ 235				344 ~ 402	35.0 ~ 41.0	254 ~ 296
M20 (20 mm, 0.79 in.)	334 ~ 392	34.0 ~ 40.0	246 ~ 289				368 ~ 431	37.5 ~ 44.0	272 ~ 318				491 ~ 568	50.0 ~ 58.0	362 ~ 419

10.2 STUD

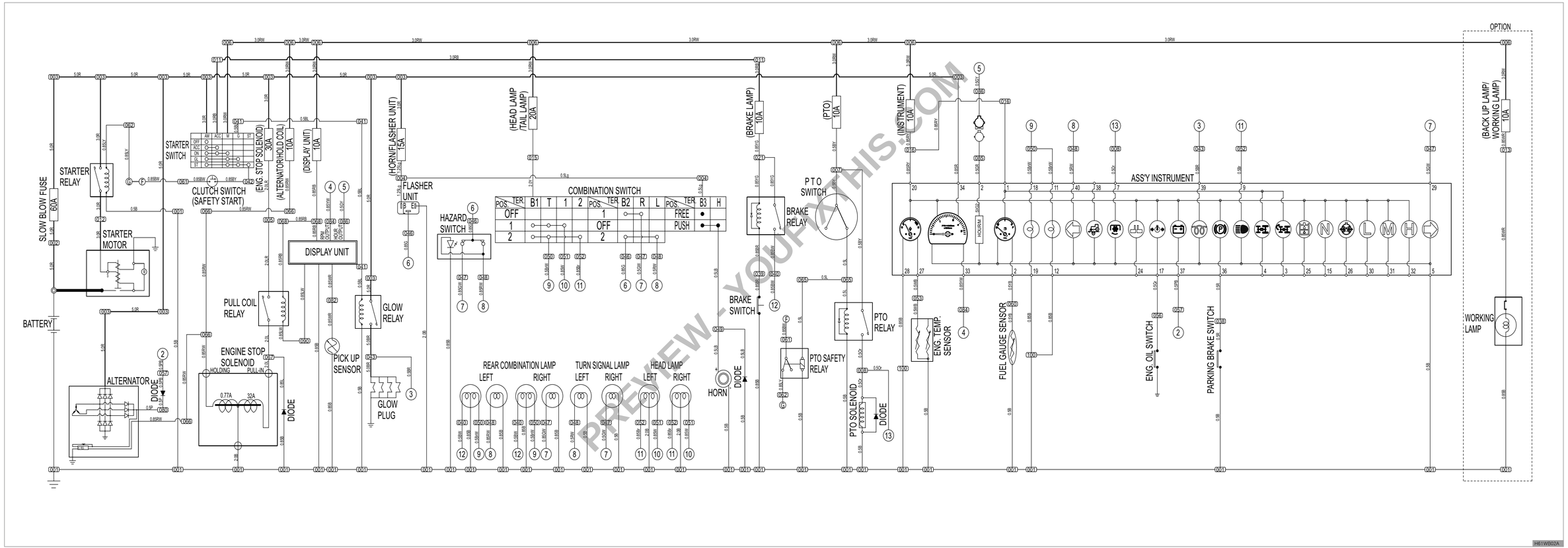
Material of component part	Steel or gray iron			Aluminum		
Unit / Diameter	Nm	kgf-m	lb-ft	Nm	kgf-m	lb-ft
M8 (8 mm, 0.31 in.)	11.6 ~ 15.6	1.2 ~ 1.6	8.68 ~ 11.5	8.82 ~ 11.6	0.90 ~ 1.2	6.51 ~ 8.67
M10 (10 mm, 0.39 in.)	24.6 ~ 31.3	2.5 ~ 3.2	18.1 ~ 23.1	19.7 ~ 25.4	2.0 ~ 2.6	14.5 ~ 18.8
M12 (12 mm, 0.47 in.)	29.5 ~ 49.0	3.0 ~ 5.0	21.7 ~ 36.1	31.4	3.2	23.1

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3.4 OVERALL CIRCUIT DIAGRAM

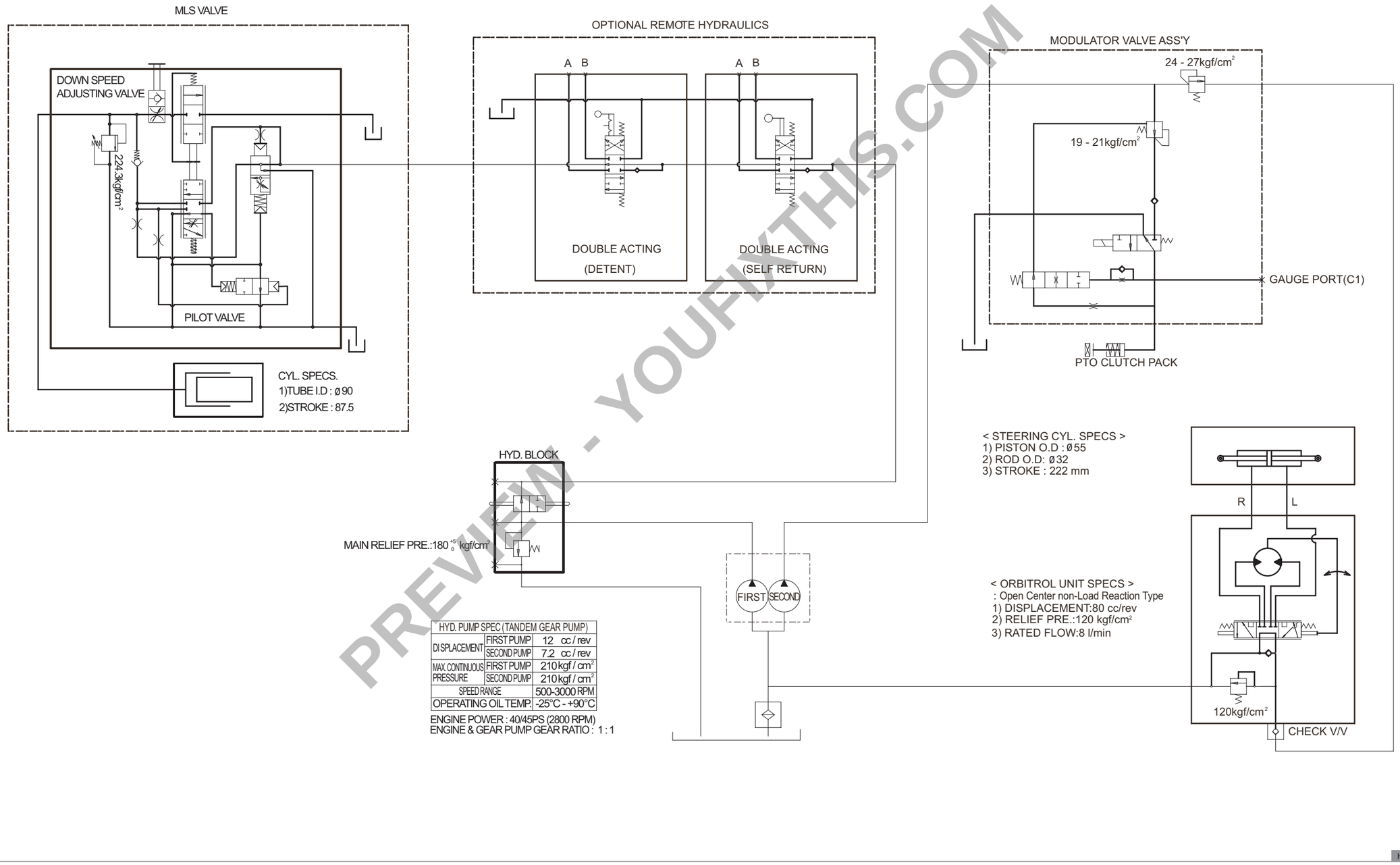


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• HYDRAULIC CIRUIT (MANUAL)



HYD. PUMP SPEC (TANDEM GEAR PUMP)		
DISPLACEMENT	FIRST PUMP	12 cc / rev
	SECOND PUMP	7.2 cc / rev
MAX. CONTINUOUS PRESSURE	FIRST PUMP	210 kgf / cm²
	SECOND PUMP	210 kgf / cm²
SPEED RANGE		500-3000 RPM
OPERATING OIL TEMP.		-25°C - +90°C

ENGINE POWER : 40/45PS (2800 RPM)
ENGINE & GEAR PUMP GEAR RATIO : 1 : 1

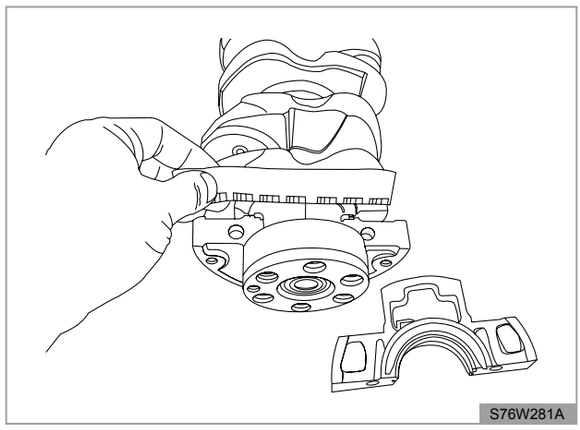
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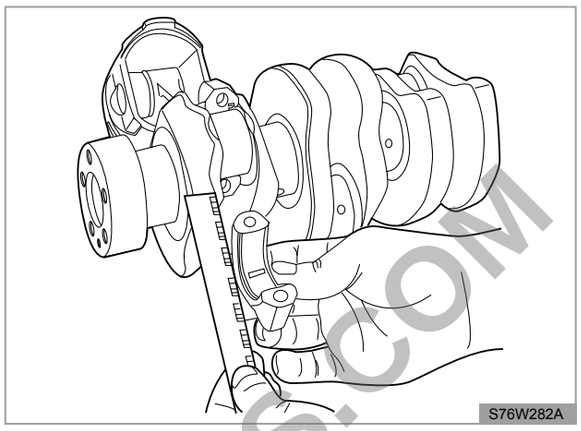
5.11.3 OIL CLEARANCE BETWEEN CRANK-SHAFT JOURNAL AND BEARING 2



1. Place a plastigauge in lengthwise on the center of the journal.
2. Install the bearing cap, tighten the bolts to the specified torque once and remove the cap again.
3. Measure the amount of the flatness with a scale and get the oil clearance.
4. If the clearance exceeds the allowable limit, replace the bearing.

Oil clear-ance	Specified value	0.05 ~ 0.114 mm (0.00197 ~ 0.00449 in.)
	Allowable limit	0.20 mm (0.0079 in.)
Journal O.D.	Specified value	59.911 ~ 59.930 mm (2.3587 ~ 2.3594 in.)
Metal 2 I.D.	Specified value	59.99 ~ 60.043 mm (2.3618 ~ 2.3639 in.)

5.11.4 OIL CLEARANCE BETWEEN CRANK PIN AND CONNECTING ROD BIG END BEARING



1. Place a plastic gauge in lengthwise on the center of the crank pin.
2. Install the connecting rod, tighten the bolts to the specified torque once and remove the cap again.
3. Measure the amount of the flatness with the scale and get the oil clearance.
4. If the clearance exceeds the allowable limit, replace the big end bearing.

Oil clear-ance	Specified value	0.025 ~ 0.087 mm (0.00098 ~ 0.00343 in.)
	Allowable limit	0.20 mm (0.0079 in.)
Crank pin O.D.	Specified value	46.959 ~ 46.975 mm (1.8488 ~ 1.8494 in.)
Big end bearing	Specified value	47.0 ~ 47.046 mm (1.8504 ~ 1.8522 in.)

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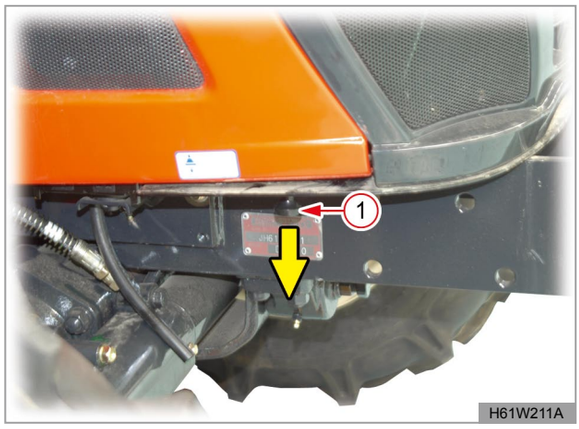
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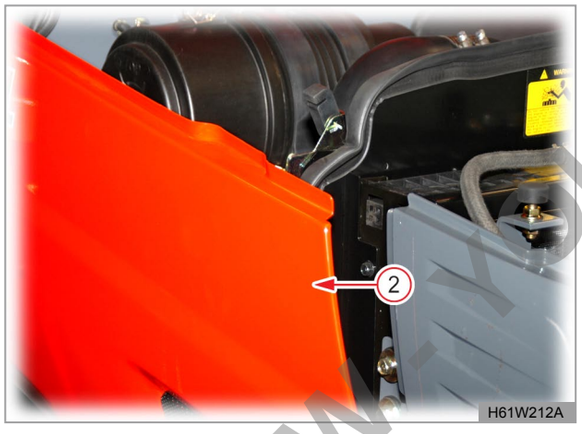
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6. DISASSEMBLY, SERVICE AND ASSEMBLY

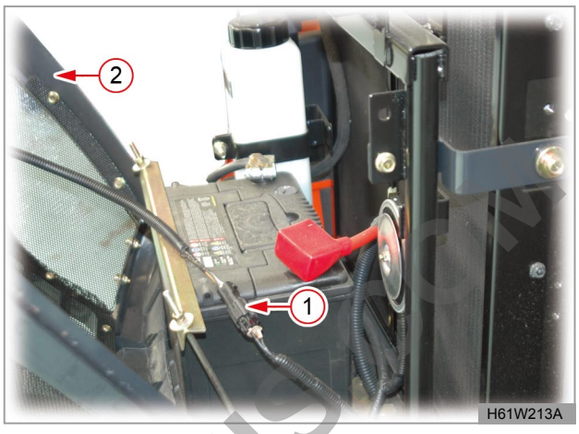
6.1 ENGINE REMOVAL

1. Park the tractor on level ground, stop the engine, and then apply the parking brake. Drain coolant, engine oil, hydraulic oil and fuel if necessary.

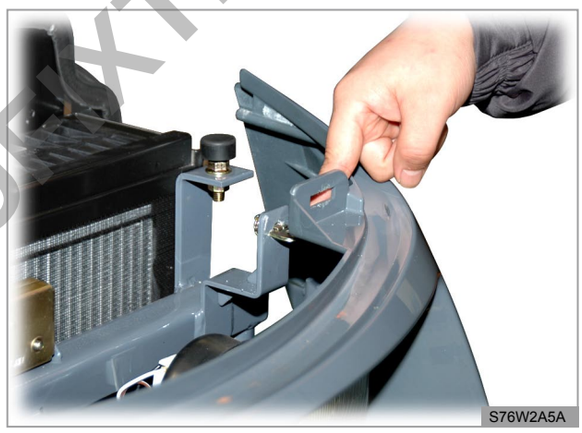


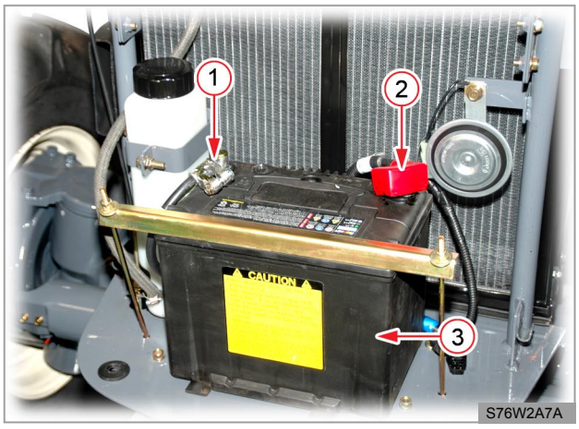


2. Open the hood by pulling its hook (1), and remove the side covers (2) on both sides.



3. Disconnect the headlamp wiring (1), and remove the front grille (2).





4. Disconnect the negative ground cable (1) first and then the positive cable (2). Then, remove the battery (3) from the vehicle.

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2.3 SERVICE AND MAINTENANCE STANDARD

Engine body

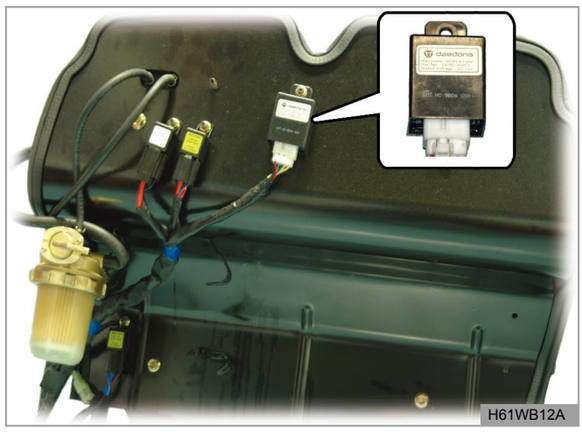
Item			Standard	Allowable limit
A. Cylinder Head	Cylinder head surface flatness		-	0.05 mm / 100 mm (0.002 in. / 3.94 in.)
	T.D.C clearance		0.750 ~ 0.9 mm (0.0294 ~ 0.0354 in.)	-
	Gasket thickness		Tightened 1.21 mm (0.0476 in.)	-
	Compression pressure (When cranking with starter motor) ※ Variance of compression pressure among cylinders should be 10% or less.		3.24 ~ 3.73 MPa 33 ~ 38 kgf/cm² 469 ~ 540 psi	2.55 MPa 26 kgf/cm² 370 psi
B. Valves	Valve clearance (cold)	Intake	0.25 mm (0.0098 in.)	± 0.05 mm (0.002 in.)
		Exhaust	0.3 mm (0.012 in.)	± 0.05 mm (0.002 in.)
	Valve seat angle	Intake	60° (1.047 rad.)	-
		Exhaust	45° (0.785 rad.)	-
	Valve face angle	Intake	60° (1.047 rad.)	-
		Exhaust	45° (0.785 rad.)	-
	Valve recess		0.2 ~ 0.5 mm (0.0079 ~ 0.0197 in.)	0.8 mm (0.0315 in.)
	Clearance between valve stem and valve guide		0.040 ~ 0.070 mm (0.0016 ~ 0.0028 in.)	0.10 mm (0.039 in.)
	Valve stem O.D.		7.960 ~ 7.975 mm (0.31339 ~ 0.31398 in.)	-
	Valve guide I.D.		8.015 ~ 8.030 mm (0.3156 ~ 0.3161 in.)	-
C. Valve Timing	Intake valve	Open	0.14 rad. (8°) before T.D.C	-
		Close	0.611 rad. (35°) after B.D.C	
	Exhaust valve	Open	0.785 rad (45°) before B.D.C	-
		Close	0.14 rad. (8°) after T.D.C	
D. Cylinder Bore I.D.			87.000 ~ 87.022 mm (3.425 ~ 3.426 in.)	0.15 mm (0.0059 in.)

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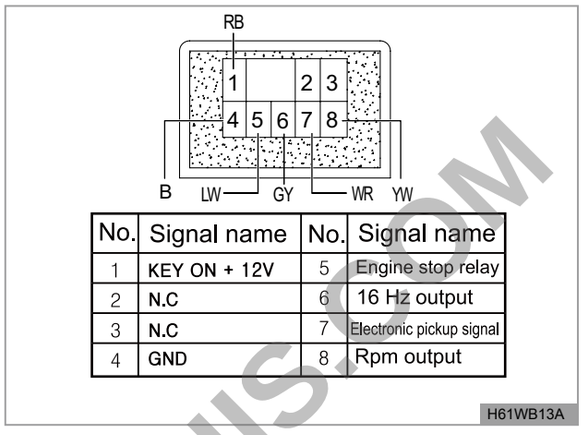
5.5 DISPLAY UNIT



The display unit is installed in the middle of the engine fire wall.

● Function

1. Activating hour meter on instrument panel. When the charge voltage (over 13.5V) is supplied from the alternator after starting the engine.
2. 1 sec. timer relay function for pull coil of engine stop solenoid.
3. Supplying tachometer operating signal using pick up sensor signal.



No.	Signal name	No.	Signal name
1	KEY ON + 12V	5	Engine stop relay
2	N.C	6	16 Hz output
3	N.C	7	Electronic pickup signal
4	GND	8	Rpm output

● Connector Description

▶ TEST

● To test dispaly unit remove the mounting bolt for easy access to unit. Do not disconnect the wire connector.

Purpose	Tester selection	Red lead	Black lead	Result	Remarks
Key ON signal input	VDC	1, RB	Ground or 4, B	DC 12V	key ON
Output signal to Tachometer	VDC	8, YW	4, B	Variable DC 6 ~ 8V	engine run
Output signal to Hour meter	VDC	6, GY	4, B	Variable DC 6 ~ 8V	engine run
Output signal to Pull coil	VDC	5, LW	4, B	DC 12V	1 sec, when key is turn to ON
Input signal from Pick up sensor	VDC	7, RW	4, B	Variable DC 3.5 ~ 6V	engine run

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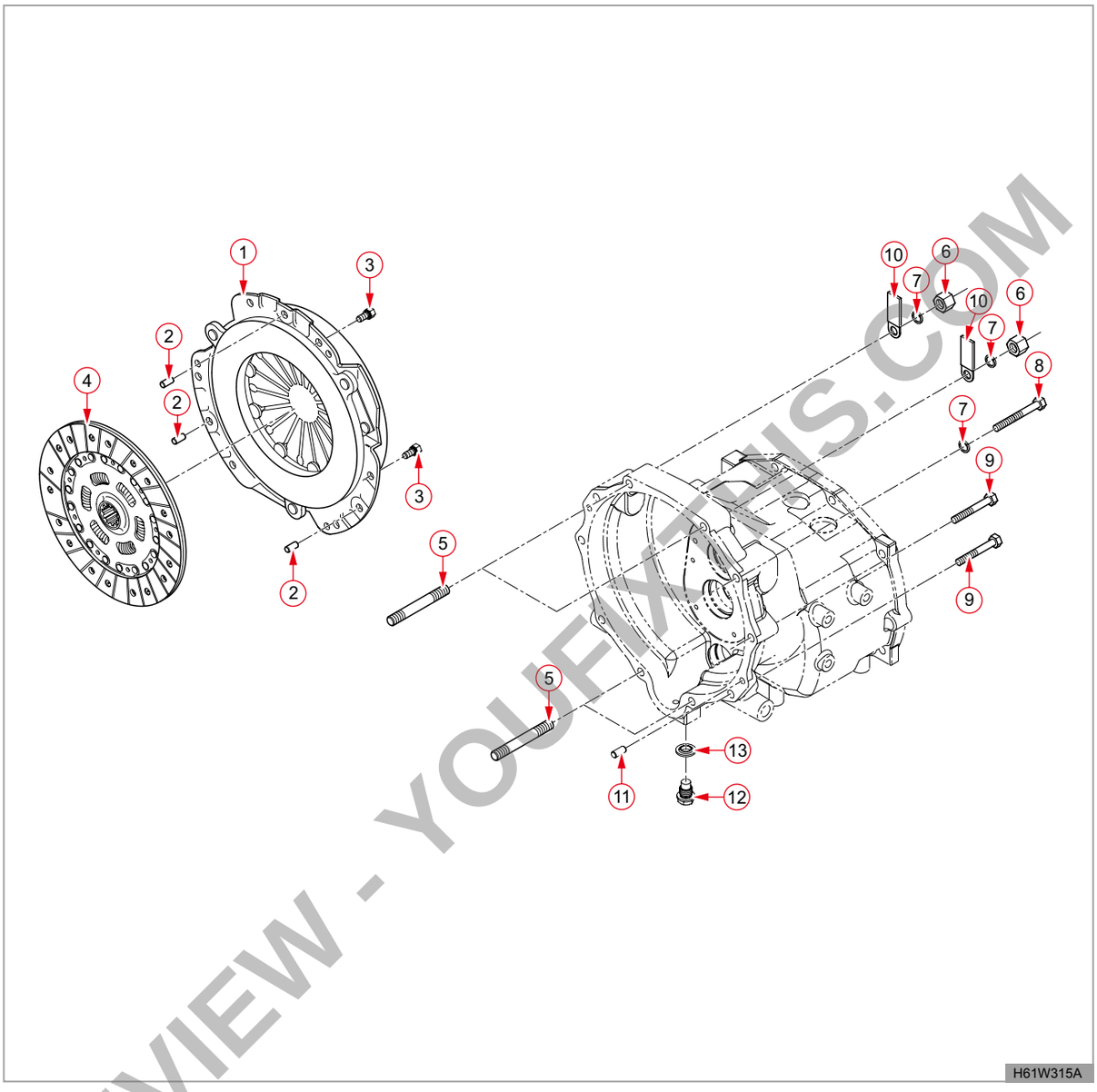
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6.2 T100A CLUTCH



COMPONENTS

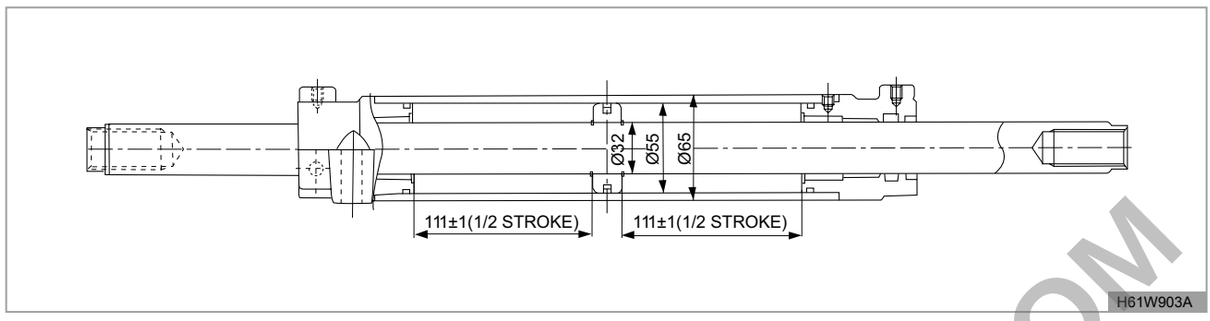
(1) ASS`Y, CLUTCH COVER
(2) PIN, STRAIGHT
(3) BOLT
(4) COMP, CLUTCH DISC
(5) STUD
(6) NUT
(7) WASHER, SPRING
(8) BOLT
(9) BOLT
(10) CLAMP, CORD
(11) PIN, STRAIGHT
(12) PLUG
(13) WASHER, SEAL

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2.3 STEERING CYLINDER INTERNAL STRUCTURE



COMPONENTS

The steering cylinder is a double acting type cylinder which has a piston in center and two hydraulic chambers on sides of the piston.

As the both hydraulic chambers are the same in volume and a rod passes through the cylinder and is connected to the wheels on both sides, there is no need for a separate tie rod, resulting in more stable steering and accurate steering performance of the steering wheel in both directions.

Rod O.D.	Tube I.D.	Tube O.D.	Stroke
Ø 32 mm(1.260 in.)	Ø 55 mm(2.165 in.)	Ø 65 mm(2.559 in.)	220±2.0mm (8.74±0.078 in.)

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