Technical Manual

EX12 to EX45-2

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SECTION 1
GENERAL

–CONTENTS–

Group 1 Specification

Specifications. T1-1-1
Working Range·Transportation. T1-1-4
Engine Specification T1-1-6
Interchangeability T1-1-8

Group 2 Component Layout

Main Components T1-2-1
Electrical System (Overall System).....T1-2-3
Electrical System (Relays).....T1-2-5
Electrical System
(Monitor and Switches) T1-2-7

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RECOGNIZE SAFETY INFORMATION

- This is the **SAFETY ALERT SYMBOL**.
  - When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.
  - Follow recommended precautions and safe operating practices.



001-E01A-0001-2 SA-001

UNDERSTAND SIGNAL WORDS

- On machine safety signs, signal words designating the degree or level of hazard – DANGER, WARNING, or CAUTION – are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
  - **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
  - **DANGER or WARNING safety signs** are located near specific hazards. General precautions are listed on **CAUTION safety signs**.
- **CAUTION** also calls attention to safety messages in this manual.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
- ***NOTE*** indicates an additional explanation for an element of information.



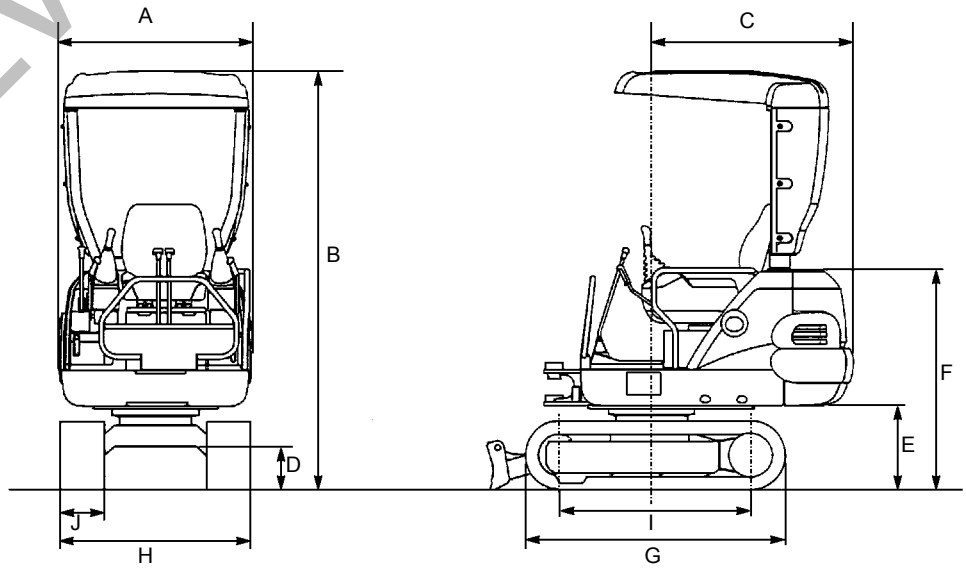
SA-461

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SPECIFICATIONS

	Unit	EX12-2		EX15-2		EX18-2	
		Canopy	Cab	Canopy	Cab	Canopy	Cab
Front Attachment	–	Boom Swing Type		Boom Swing Type		Boom Swing Type	
Bucket Capacity (Heaped)	m^3	PCSA: 0.041 CECE: 0.035		PCSA: 0.046 CECE: 0.04		PCSA: 0.05 CECE: 0.045	
Operating Weight	kg (lb)	1250 (2760)	1350 (2980)	1350 (2980)	1450 (3200)	1700 (3750)	1800 (3970)
Base Machine Weight	kg (lb)	1020 (2250)	1120 (2470)	1080 (2380)	1180 (2600)	1420 (3130)	1520 (3350)
Engine	–	KUBOTA D1105 12.1 kW/2000 min^{-1} (16.5 PS/2000 rpm)		KUBOTA D1105 12.9 kW/2100 min^{-1} (17.5 PS/2100 rpm)		KUBOTA D1105 12.1 kW/2000 min^{-1} (16.5 PS/2000 rpm)	
A: Overall Width	mm (ft in)	1020(3′4″)	1055(3′6″)	1020(3′4″)	1055(3′6″)	1300(4′3″)	1300(4′3″)
B: Cab Height	mm (ft in)	2200(7′3″)	2280(7′6″)	2200(7′3″)	2280(7′6″)	2320(7′7″	2400(7′10″)
C: Rear End Swing Radius	mm (ft in)	1070 (3′6″)		←		←	
D: Minimum Ground Clearance	mm (ft in)	235 (9″)		←		325 (1′1”)	
E: Counterweight Clearance	mm (ft in)	445 (1′5″)		←		565 (1′10”)	
F: Engine Cover Height	mm (ft in)	1170 (3′10″)		←		1275 (4′2”)	
G: Undercarriage Length	mm (ft in)	1375 (4′6″)		←		1775 (5′8”)	
H: Undercarriage Width	mm (ft in)	960 (3′2″)		1000 (3′3″)		1300 (4′3″)	
I: Sprocket Center to Idler Center	mm (ft in)	1025 (3′4″)		←		1350 (4′5″)	
J: Track Shoe Width	mm (ft in)	230 (9″)		←		250 (10″)	
Ground Pressure	kPa (kgf/cm^2, psi)	25 (0.25)	26 (0.26)	26 (0.26)	27 (0.28)	23.5 (0.24)	24.5 (0.25)
Swing Speed	min^{-1} (rpm)	8.5		9.0		10	
Travel Speed (Fast/Slow)	km/h (mph)	2.2 (1.37)		2.3 (1.44)		←	
Gradeability	% (deg.)	58 (30)		←		←	



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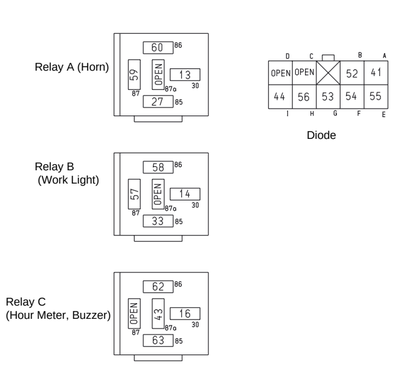
EX12-2 EX15-2 EX18-2 ELECTRICAL CIRCUIT (Type A)

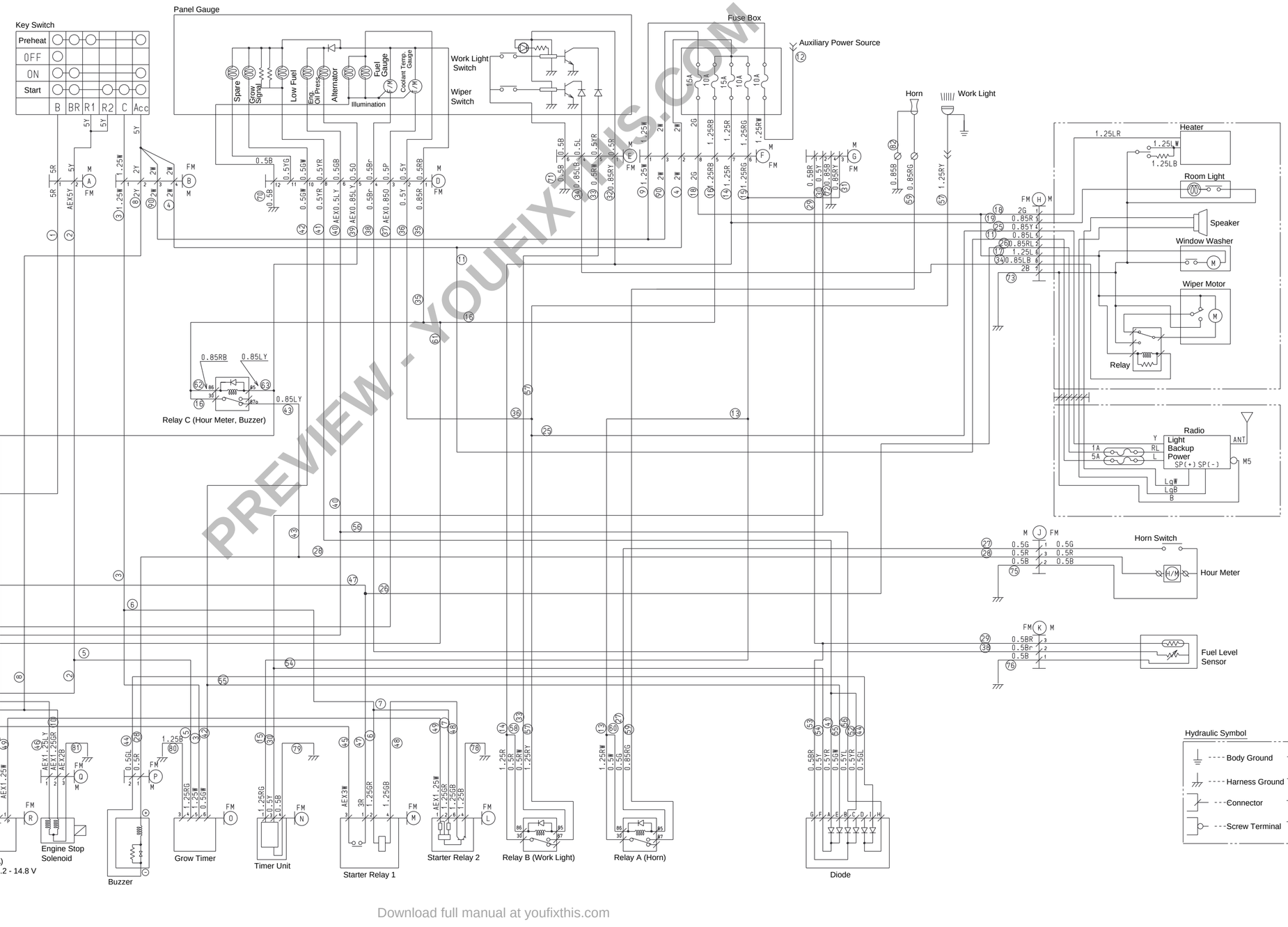
Abbreviations of serial numbers: EX12-2 (Serial Number: 02001 to 02812)
EX15-2 (Serial Number: 01501 to 02175)
EX18-2 (Serial Number: 00101 to 00532)

CONNECTOR TERMINAL LAYOUT
(Drawing are shown in face view of the connector)









Hydraulic Symbol

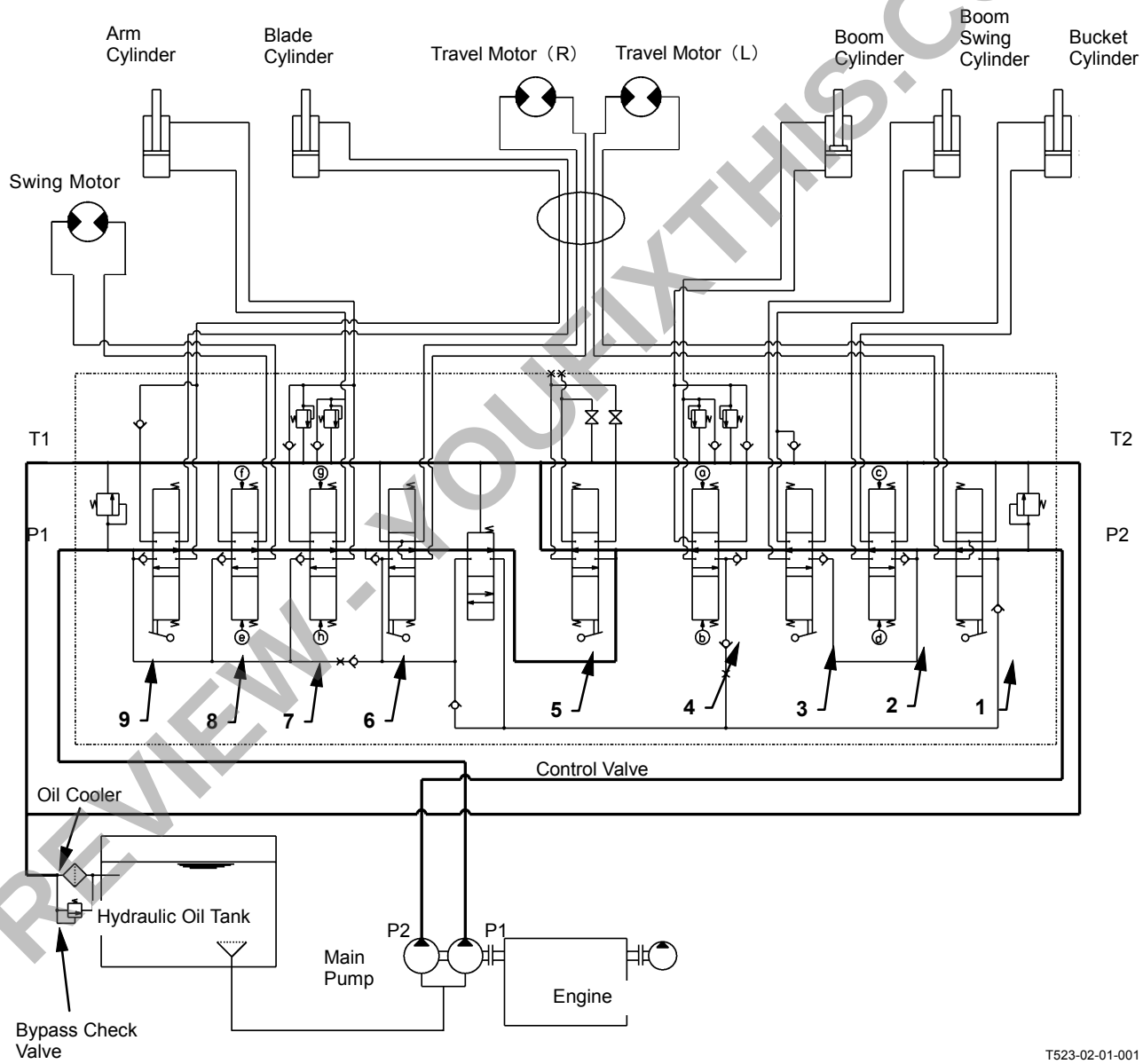
- Body Ground
- Harness Ground
- Connector
- Screw Terminal
- Plug Connector
- Flat Terminal
- Waterproof Plug Connector
- Flat Terminal (With Lock)

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NOTE: The illustration shows the EX12-2 (Serial number 02059 and up) and EX15-2 (Serial number 01542 and up).
Boom section and bucket section are replaced with EX12-2 (Serial number 02001 to 02058) and EX15-2 (Serial number 01501 to 01541).

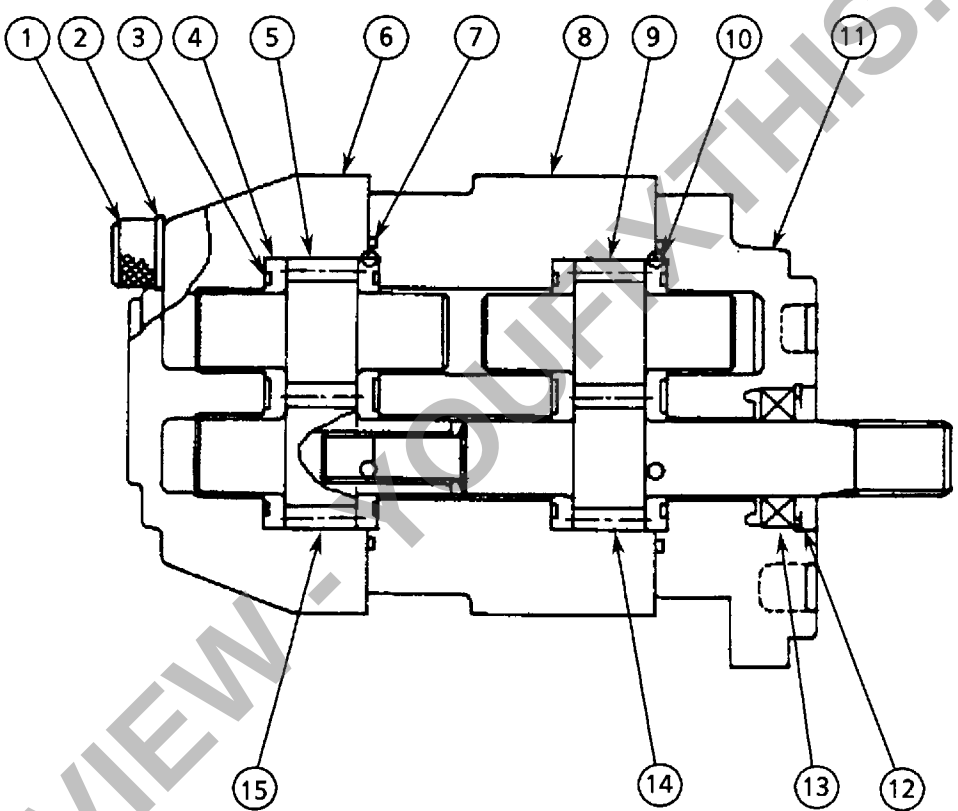


1 - Left Travel
2 - Bucket
3 - Boom Swing
4 - Boom
5 - Auxiliary
6 - Right Travel
7 - Arm
8 - Swing
9 - Blade

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DISASSEMBLE AND ASSEMBLE PUMP DEVICE

EX12-2, EX15-2



T503-02-03-002

1— Socket Bolt
2— Washer
3— Gasket
4— Side Plate
5— Driven Gear 2
6— Body 2
7— Gasket
8— Body 1
9— Driven Gear 1
10— Steel Ball
11— Front Cover
12— Retaining Ring
13— Oil Seal
14— Drive Gear 1
15— Drive Gear 2

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- Fast Speed Operation
  When the fast speed travel pedal is in the fast speed position, the pressure oil from the travel speed changeover solenoid valve is supplied to spool (1) left side, moving spool (1) to spring (2) compressing side.
  Motor driving pressure P1 (P2) is applied to control piston (6) chamber, through port M1 (M2) and port Pi1 (Pi2). Swash plate (7) is pushed by control piston (6), the angle of swash plate (7) is "β" and the travel motor rotates at fast speed.

  When the engine stops, no pressure oil from the pilot pump, spool (1) is move to the plug (12) side by the spring (2) force. Accordingly, control piston (6) chamber is connected to the tank port, and swash plate (7) is pushed by a spring (10), the angle of swash plate (7) is "α" (large angle).
  As a result, the travel motor always rotates in slow speed whenever the engine is restarted.

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ENGINE SYSTEM TROUBLESHOOTING

Starter does not rotate

- Check the connection of wiring first.

Check if battery voltage and electrolyte density are normal.
- Voltage: 12 volts or more
- Density: 1.28 or more

YES → With key switch positioned as shown in the table below, check if each terminal voltage on starter is normal.

YES → (When key switch is turned to the START position, if voltage at terminal B is lower than 9 volts, battery may be faulty.)

NO → Measure voltage at terminal B on starter.

0 V → Measure voltage at terminal C on starter.
- Key switch: START

12 V → YES

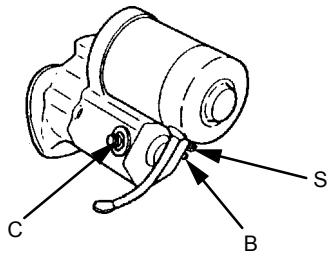
Unit: V

Starter Terminal \ Key Switch	ON	START
B	12	12
C	0	12
S (50)	0	12

NO

Starter voltage check

1. Turn key switch to the ON or START position.
2. Contact minus (−) probe of a circuit tester to the machine (ground to unpainted area like bolt head) and plus (+) probe terminals to the starter terminal respectively, and check voltages.
   (Measure with the harness connected.)



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- EX40-2, 45-2

NOTE: Turn plug 1 (high-side relief pressure) to adjust the travel pressure.
Turn plug 2 (low-side relief pressure) to adjust the front and swing pressure.

- High-Side Relief Pressure Setting Procedure

1. Loosen the lock nut 1. Turn the plug 1 to adjust the relief pressure setting referring to the table below.
   : 22 mm, 24 mm
   : Lock Nut 1: 78^{+10} N·m (8^{+1} kgf·m, 58^{+7} lbf·ft)

- Low-Side Relief Pressure Setting Procedure

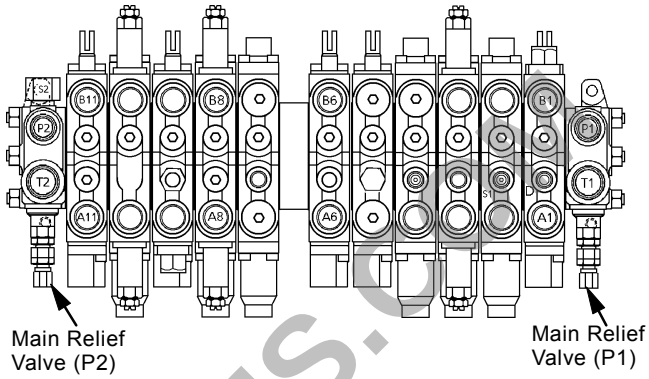
2. Loosen the lock nut 2. Turn the plug 2 counterclockwisely until the specified value is obtained referring to the table below. Retighten the lock nut 2.
   : 19 mm, 22 mm
   : Lock Nut 2: 59^{+3} N·m ($6^{+0.5}$ kgf·m, 43^{+4} lbf·ft)
3. Recheck the set pressure.

NOTE: Standard Change in Pressure (Reference)

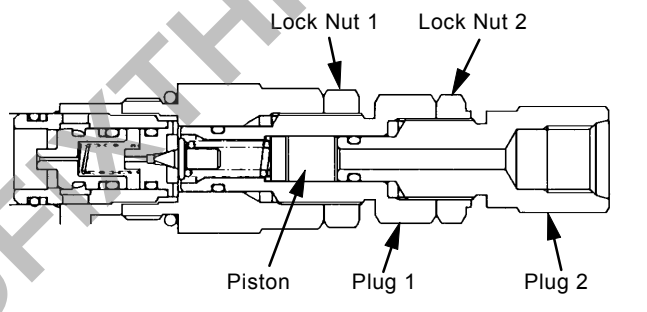
EX40-2, 45-2

Screw Turn		1/4	1/2	3/4	1
Change in Relief Pressure	MPa	3.0	6.1	9.1	12.2
	kgf/cm^2	31	62	93	124
	psi	441	882	1320	1760

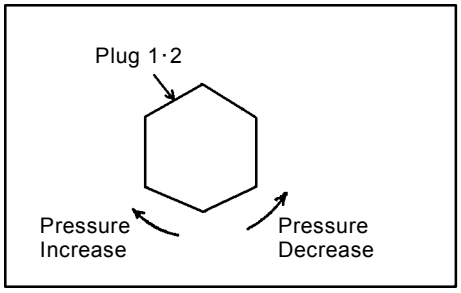
EX40-2, 45-2:



T529-02-04-002



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W107-02-05-127

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[6] MAINTENANCE CHECK LIST

To maintain long-lasting and safe engine performance, make it a rule to carry out regular inspections by following the table below.

Item		Service Interval									
		Every 50 hrs	Every 100 hrs	Every 150 hrs	Every 200 hrs	Every 400 hrs	Every 800 hrs	Every 1000 hrs	Every three months	Every one year	Every two years
Checking fuel pipes and clamps		○									
* Changing engine oil	Oil pan deapth (101 mm)			○							
	Oil pan deapth (125 mm)				○						
Cleaning air filter element			○								
Cleaning fuel filter element			○								
Checking fan belt tension and damage				○							
Checking water pipes and clamps					○						
* Changing oil filter cartridge	Oil pan deapth (101 mm)			○							
	Oil pan deapth (125 mm)				○						
Changing fuel filter element						○					
Cleaning radiator interior						○					
Changing radiator cleaning (L.L.C)											○
Changing air filter element										○	
Checking valve clearance							○				
Checking nozzle injection pressure								○			
Changing water pipes and clamps											○
Changing fuel pipes and clamps											○

* Change engine oil and after the first 50 hours of operation.

⚠ CAUTION

- **When changing or inspecting, be sure to level and stop the engine.**

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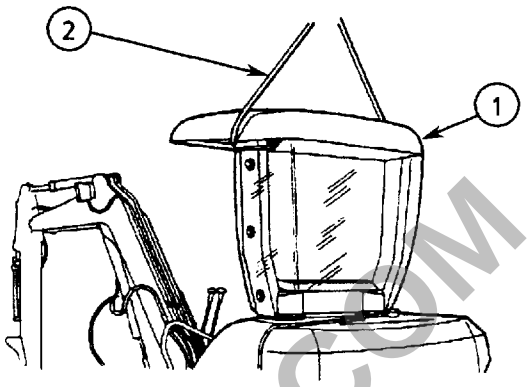
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REMOVE AND INSTALL CANOPY

(The illustration shows the EX30-2.)

Remove Canopy

1. Attach sling belt (2) to canopy (1).

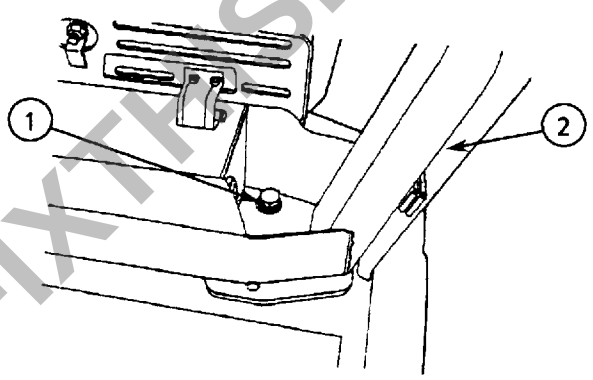


W527-02-01-001

2. Loosen four bolts (1) to remove canopy (2).

: 24 mm

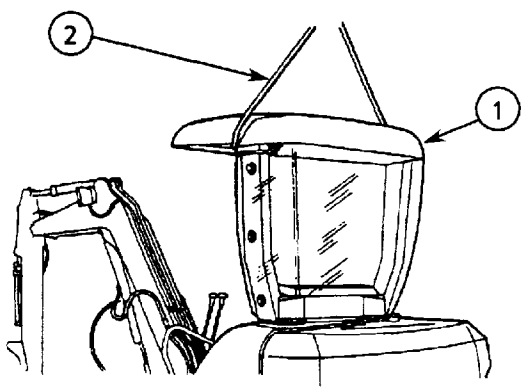
CAUTION: Canopy weight: 41 kg (90 lb)



W527-02-01-002

Install Canopy

1. Attach sling belt (2) to canopy (1). Mount the canopy onto the frame with a crane.

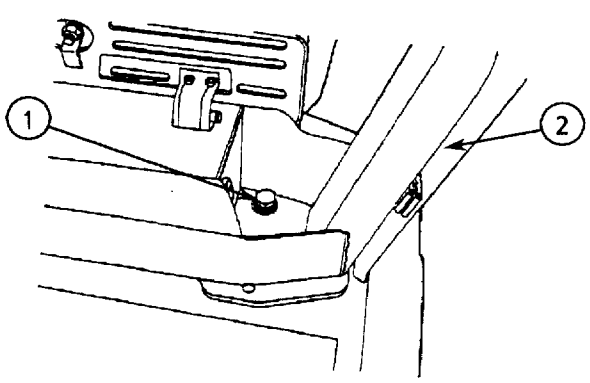


W527-02-01-001

2. Install four canopy mounting bolts (1) to secure the canopy (2).

: 24 mm

: 205 N·m (21 kgf·m, 152 lbf·ft)



W527-02-01-002

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OPERATIONAL PERFORMANCE STANDARD

This Operational Performance Standard values are listed below.
Refer to the correspondence section in T4-2 and after for the details of measurement method.

The value in ( ) is shown for reference only.
* The standard measurement condition is as follows;
  Engine Speed Control Lever: Full Stroke
  Hydraulic Oil Temperature: 50±5 °C

Item	EX12-2	EX15-2	EX18-2	EX22-2	EX25-2	Remarks
ENGINE SPEED (min^{-1})						
Maximum Speed	1070±70	←	1050±70	1130±50	1120±50	
Minimum Speed	2150±50	2250±50	2150±50	2330±50	2530±50	
ENGINE COMPRESSION PRESSURE MPa (kgf/cm^2)	2.8 to 3.2 (29 to 33)	←	←	←	←	
VALVE CLEARANCE (IN, EX) (mm)	0.145 to 0.185	←	←	←	←	
NOZZLE INJECTION PRESSURE MPa (kgf/cm^2)	13.7 to 14.7 (140 to 150)	←	←	←	←	
INJECTION TIMING (Before Top Dead Center) (deg.)	15° to 17°	←	←	←	←	
TRAVEL SPEED (sec/20 m)						
Fast Speed Mode (Rubber Crawler/Steel Crawler)	-	-	-	20.0±1.5/ 21.0±1.5	19.0±1.5/ 19.5±1.5	
Slow Speed Mode (Rubber Crawler/Steel Crawler)	33.5±1.5/ 35.5±1.5	←	31.5±1.5/ 32.5±1.5	32.5±1.5/ 33.5±1.5	30.5±1.5/ 31.5±1.5	
TRACK REVOLUTION SPEED (sec/3 rev)						
Fast Speed Mode (Rubber Crawler/Steel Crawler)	-	-	-	11.5±1.5/12.0±1.5	←	
Slow Speed Mode (Rubber Crawler/Steel Crawler)	15.0±1.5/ 15.5±1.5	←	18.0±1.5/ 18.5±1.5	19.0±1.5/ 19.5±1.5	18.5±1.5/ 19.0±1.5	
MISTRACK (Fast Speed·Slow Speed) (mm/20 m)	200 or less	←	←	←	←	
TRAVEL PARKING FUNCTION (rev)	1/6 or less	←	←	←	←	
TRAVEL MOTOR LEAKAGE (mm/3 min)	30 or less	←	50 or less	30 or less	←	
SWING SPEED (sec/3 rev)	21.0±1.5	20.0±1.5	18.0±1.5	20.7±1.5	19.2±1.5	
SWING FUNCTION DRIFT (mm/90°)	100 or less	←	←	150 or less	←	
SWING MOTOR LEAKAGE (mm/5 min)	0	←	←	←	←	
BOOM SWING CYLINDER LIAKAGE (mm/5 min)	5 or less	←	←	←	←	
MAXIMUM SWINGABLE SLANT ANGLE (angle)	25 or possibly more	←	←	←	←	
SWING BEARING PLAY (mm)	(0.3 to 0.7)	←	←	←	←	Allowable Limit: (2.0)

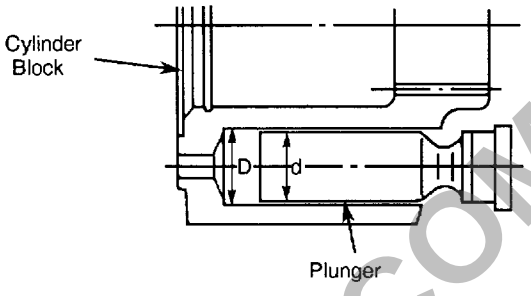
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MAINTENANCE STANDARDS
(EX22-2, EX25-2, EX30-2, EX35-2, EX40-2, EX45-2)

Main Pump

1. Clearance between cylinder block bore and plunger:

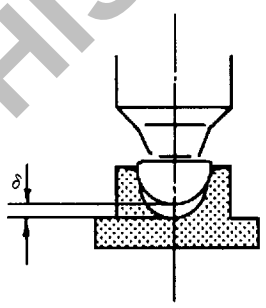
   (D-d) must be 0.05 mm or less.



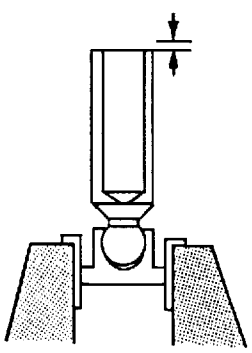
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2. Clearance between plunger tip and shoe bottom:

   Delta must be 0.2 mm or less.



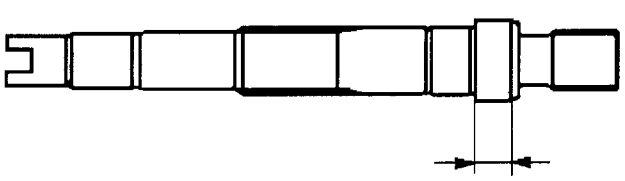
W107-02-06-140



W107-02-06-141

3. Wear amount of the shaft oil seal mount surface:
   The surface must be free from scratches or abnormal wear.

   Wear amount must be 0.025 mm or less.



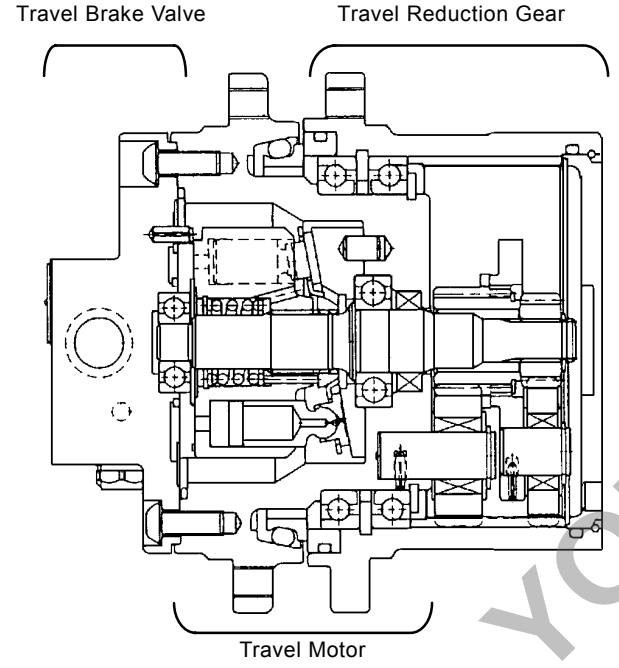
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OUTLINE

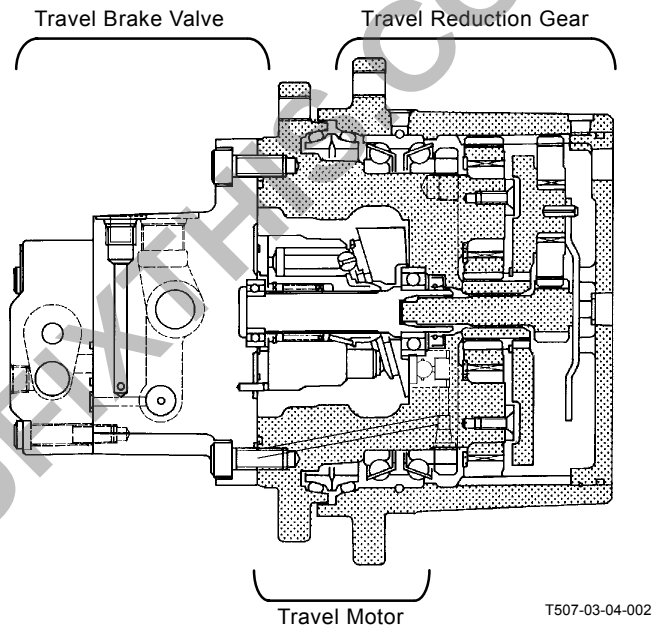
The travel device consists of travel motor, travel reduction gear and travel brake valve.
The travel motor is a variable displacement axial plunger swash plate type. This motor is operated by pressure oil from the pump, and transmits the rotation to the travel reduction gear.
The travel reduction gear is a two-stage planetary-gear reduction type, reducing travel motor speed, increasing travel motor torque, and allowing the sprocket and track to rotate.
The travel brake valve functions to protect the travel circuit.

EX12-2, 15-2, 18-2



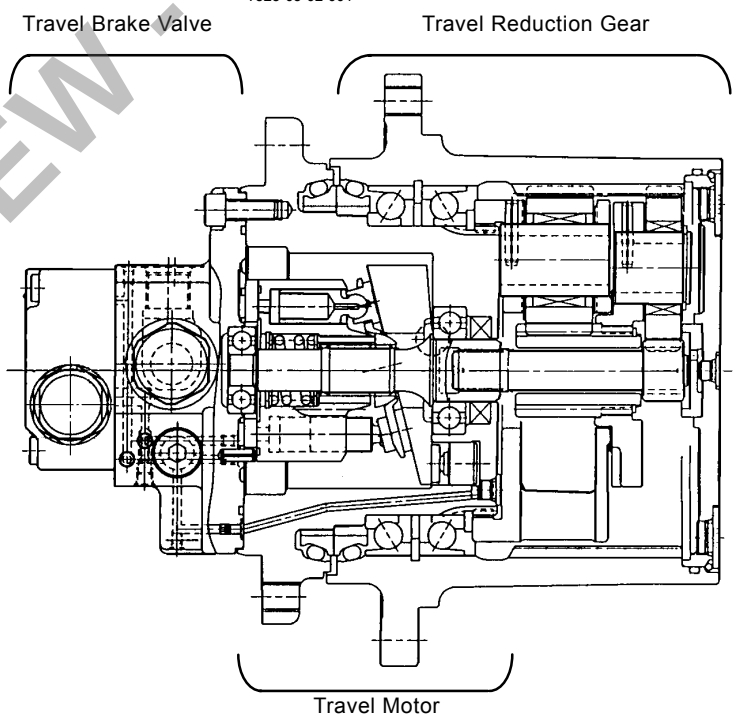
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EX22-2, 25-2, 30-2, 35-2



T507-03-04-002

EX40-2, 45-2



T529-03-02-001

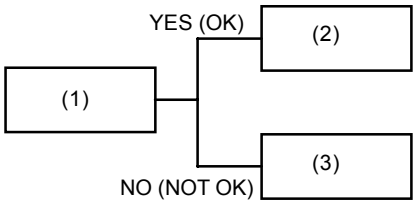
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TROUBLESHOOTING A PROCEDURE (DIAGNOSIS OF MACHINE BY SYMPTOM)

This procedure is used when operating the diagnosis by the symptom.

- How to Read the Troubleshooting Flow Charts



After checking or measuring item (1), select either YES (OK) or NO (NOT OK) and proceed to item (2) or (3) next.

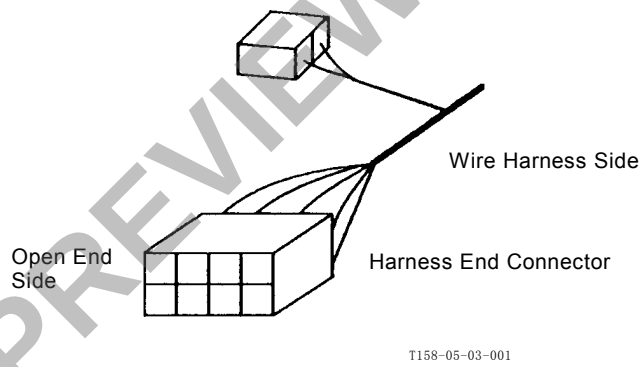


As shown to the left, measuring methods or items to be referred to are indicated in the spaces under the box. Take care to measure or check correctly. Incorrect measuring or checking methods may result in making troubleshooting impossible, and may damage components.



The thick-line box indicates the causes. Scanning through thick-line boxes, possible causes can be focused.

NOTE: The connector drawings show the harness end connectors seen from the open end side.



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EX30-2, EX35-2

No.	Descriptions	Bolt Dia mm	Qty	Wrench Size mm	Torque		
					N·m	kgf·m	lbf·ft
1	Engine cushion rubber mounting nut	8	4	13	20	2	15
		10 (Fine thread)	8	17	49	5	36
2	Engine bracket mounting bolt (Front)	10 (Fine thread)	8	17	49	5	36
	Engine bracket mounting bolt (Rear)	10	6	17	49	5	36
3	Tank mounting bolt	10	5	17	49	5	36
4	Hydraulic hoses and Union Joints	UNF7/16-20		19	29	3	22
		UNF9/16-18		22	39	4	29
		UNF3/4-16		27	64	6.5	47
5	Pump mounting bolt	12	2	19	88	9	65
6	Pump cover mounting bolt	10 (Fine thread)	6	17	49	5	36
7	Control valve mounting bolt	10	4	17	49	5	36
	Control valve bracket mounting bolt	10	4	17	49	5	36
		12	3	19	88	9	65
8	Swing device mounting bolt	12	6	19	88	9	65
9	Battery mounting bolt	8	2	13	9.8	1	7
		10	2	17	49	5	36
10	Canopy mounting bolt	16	4	24	205	21	152
11	Cab mounting bolt	16	4	24	137	14	101
12	Swing bearing mounting bolt to upperstructure	12	20	19	108	11	80
	Swing bearing mounting bolt to undercarriage	12	20	19	108	11	80
13	Travel device mounting bolt	12	22	19	108	11	80
14	Sprocket mounting socket bolt	12	22	19	108	11	80
15	Guide mounting bolt	12	12	19	88	9	65
16	Upper roller mounting bolt	14	2	22	137	14	101
17	Lower roller mounting bolt	14	16	22	245	25	181
18	Cover mounting bolt	10		17	49	5	36
		12		19	88	9	65
19	Protector mounting bolt	10	4	17	49	5	36
20	Counterweight mounting bolt	22	2	32	539	55	398

NOTE: (1) Apply lubricant (i.e. white zinc B dissolved into spindle oil) to bolts and nuts to stabilize their friction coefficients.

(2) Make sure bolt and nut threads are clean before installing.

(3) Apply Loctite to threads of engine cushion rubber mounting bolts, lower roller mounting bolts, and swing-post vertical-pin mounting bolts before installing them.

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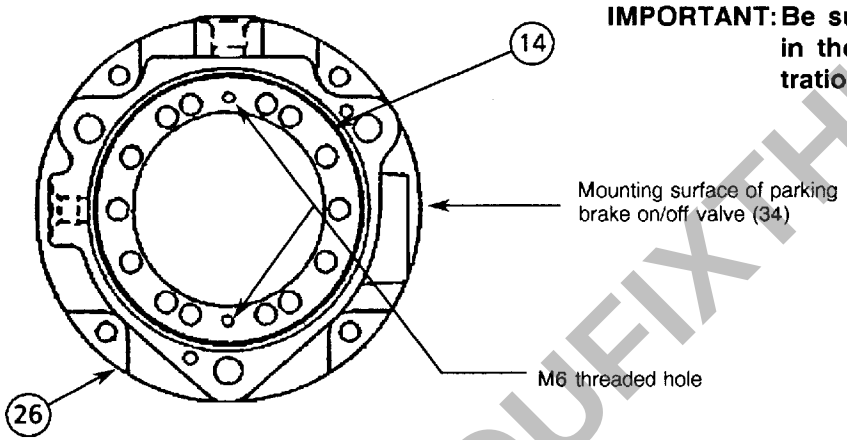
9. Install O-rings (13) and (31) onto collar (14), and install them into case (26) using a press.

IMPORTANT: Do not use a plastic hammer or similar instrument to install collar (14). Collar (14) and/or case (26) may be damaged. Be sure to use a press to install collar (14) into case (26).

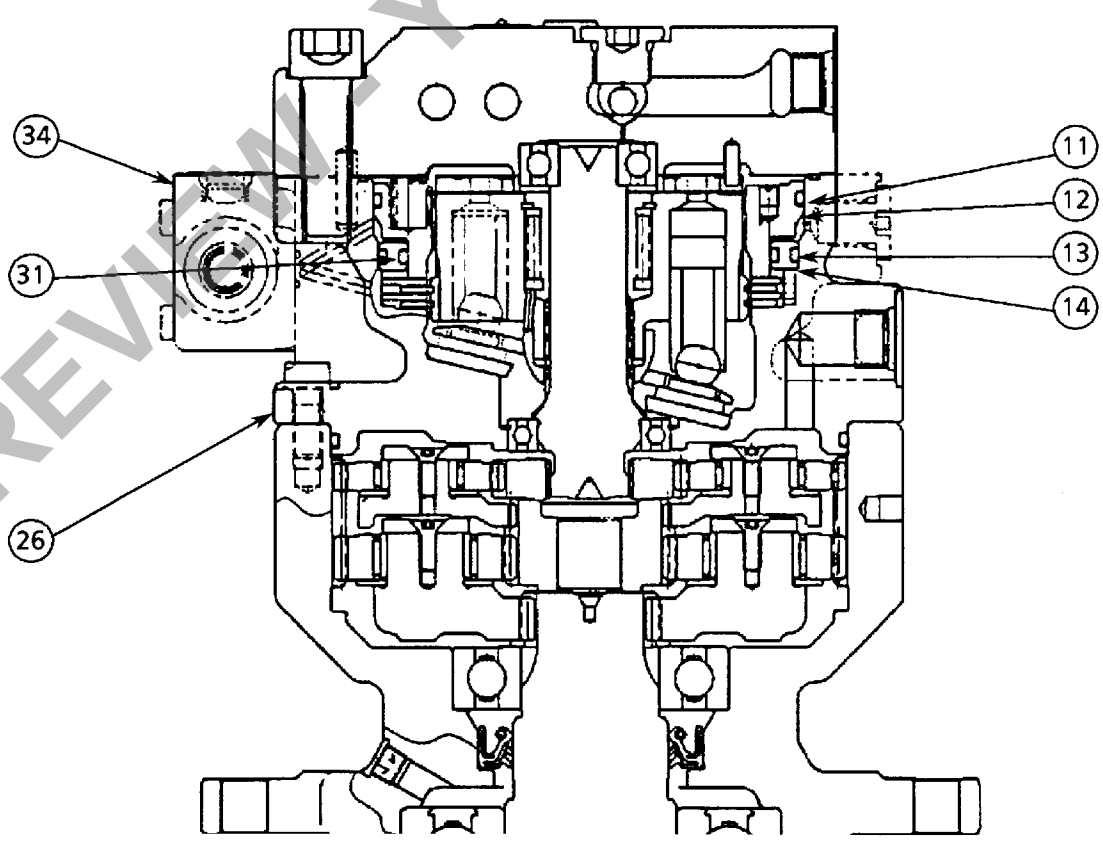
10. Install O-ring (11) onto brake piston (12), and install them into case (26) using a press, referring to the illustration below for brake piston positioning.

IMPORTANT: Do not use a plastic hammer or similar instrument to install brake piston (12). Brake piston (12) and/or case (26) may be damaged. Be sure to use a press to install brake piston (12) into case (26).

IMPORTANT: Be sure to install the brake piston in the position shown in the illustration below.



W527-02-05-003



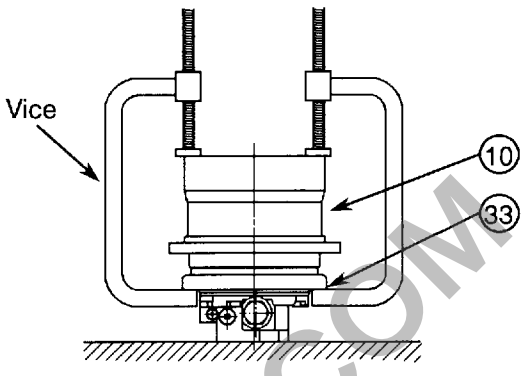
T525-02-03-001

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20. Install one side of floating seal (35) into ring gear (10).

IMPORTANT: Be sure to apply grease to the seal mounting surface of the ring gear beforehand.

NOTE: If the O-ring on the floating seal is difficult to in place, use a round-enged wooden spatula between the O-ring and the drum in a clockwise direction along the periphery to insert the floating seal.



W508-03-02-006

21. Install the other side of floating seal (35) into housing (33).

22. Install ring gear (10) onto housing (33).

23. Install retaining ring (9) into housing (33) while holding down ring gear (10) and housing (33) using a vice.

24. Install needle ring (5), needles (6) (24 used), and needle ring (5) into second stage planetary gear (4), in that order.

25. Install thrust washers (2) (4 used), second stage planetary gear (7) assemblies (4 used), thrust washers (2) (4 used), and spring pins (8) (4 used) into second stage carrier (45), in that order.

26. Install sun gear (46) and retaining ring (49) onto first stage carrier (48).

27. Install thrust washers (2) (3 used), first stage planetary gears (1) (3 used), needles (72 used), thrust washers (2) (3 used), and retaining rings (49) (3 used) onto first stage carrier (48), in that order.

28. Install second stage carrier (45) assembly, thrust washer (47), and first stage carrier (48) assembly onto ring gear (10).

29. Install drive gear (52) onto first stage carrier (48) assembly.

30. Install O-ring (50) onto ring gear (10).

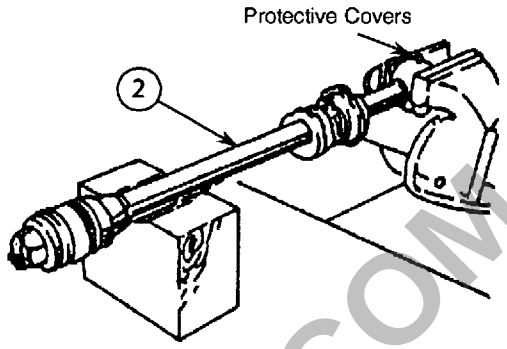
31. Add 0.8 liters of gear oil.

32. Install ring (55) into cover (56).

33. Install cover (56) onto ring gear (10). Install stopper ring (51) into ring gear (10).

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4. Secure piston rod (2) horizontally as illustrated.



W506-04-02-005

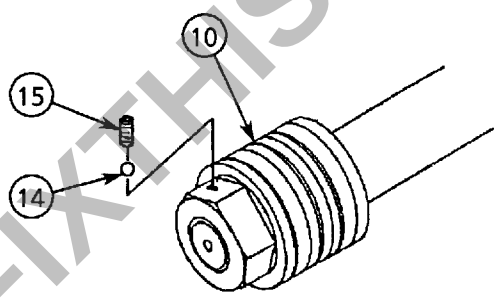
5. Remove set screw (15) and steel ball (14).

NOTE: As the set screw head is mushroomed when installed, cut the mushroomed part with a hand drill before loosening set screw (15).

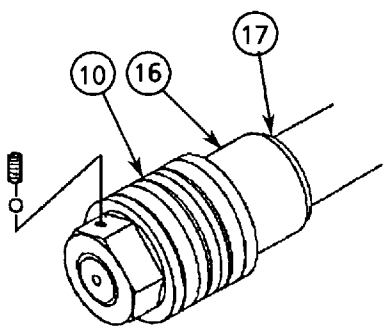
: 3 mm, 4 mm

Loosen piston (10) to remove it.
For cushion-type cylinders, remove cushion bearing (16) and spacer (17) too.

: 36 mm, 41 mm, 50 mm, 55 mm



W554-04-02-021

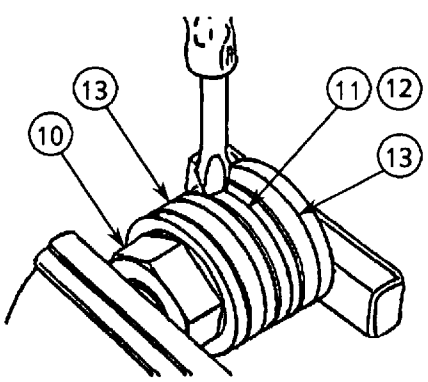


Cushion-Type Cylinder

W551-04-02-005

6. Remove slide rings (13) (2 used), seal ring (11), and O-ring (12) from piston (10).

NOTE: In order to remove seal ring (11), clamp piston (10) in a vise, and drive out the seal ring using a screwdriver and a hammer.



W506-04-02-007

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Connecting Rod

Item	Factory Specification	Allowable Limit
Connecting rod alignment	–	0.05 mm 0.0020 in.
Clearance between piston pin and small end bushing	0.014 to 0.038 mm 0.0006 to 0.0015 in.	0.15 mm 0.0059 in.
Piston pin O.D.	22.002 to 22.011 mm 0.8662 to 0.8666 in.	–
Small end bushing I.D.	22.025 to 22.040 mm 0.8671 to 0.8677 in.	–

Crankshaft

Crankshaft alignment	–	0.02 mm 0.00079 in.
Oil clearance between crankshaft and crankshaft bearing 1	0.034 to 0.114 mm 0.0013 to 0.0045 in.	0.2 mm 0.0079 in.
Crankshaft O.D.	47.934 to 47.950 mm 1.8872 to 1.8878 in.	–
Crankshaft bearing 1 I.D.	47.984 to 48.048 mm 1.8891 to 1.8917 in.	–
Oil clearance between crankshaft and crankshaft bearing 2	0.034 to 0.095 mm 0.0013 to 0.0037 in.	0.2 mm 0.0079 in.
Crankshaft O.D.	47.934 to 47.950 mm 1.8872 to 1.8878 in.	–
Crankshaft bearing 2 I.D.	47.984 to 48.029 mm 1.8891 to 1.8909 in.	–
Oil clearance between crankshaft and crank shaft bearing 3	0.034 to 0.098 mm 0.0013 to 0.0039 in.	0.20 mm 0.0079 in.
Crankshaft O.D.	51.921 to 51.940 mm 2.0441 to 2.0449 in.	–
Crank bearing 3 I.D.	51.974 to 52.019 mm 2.0462 to 2.0480 in.	–
Oil clearance between crank pin and crank pin bearing	0.029 to 0.091 mm 0.0011 to 0.0036 in.	0.2 mm 0.0079 in.
Crank pin O.D.	39.959 to 39.975 mm 1.5732 to 1.5738 in.	–
Crank pin bearing I.D.	40.004 to 40.050 mm 1.5750 to 1.5768 in.	–
Crankshaft side clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.5 mm 0.0197 in.

Cylinder Liner

Cylinder liner I.D.	78.000 to 78.019 mm 3.0709 to 3.0716 in.	+ 0,15 mm
Oversized cylinder liner I.D.	+ 0.5 mm 0.0197 in.	

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Remplacement du coussinet 1 du vilebrequin

(Au retrait)

1. Chasser le coussinet 1 de vilebrequin au moyen de l'outil de remplacement de coussinet 1 de vilebrequin.

(Lors de la repose)

1. Nettoyer un coussinet 1 neuf et alésage et les enduire d'huile moteur.
2. Monter à la presse un coussinet 1 neuf en utilisant un outil de mise en place, en veillant à ce que la jointure du coussinet 1 soit en regard du côté du collecteur d'échappement.

(1) Jointure

Jeu de marche entre le tourillon de vilebrequin et coussinet 2, 3 de vilebrequin

1. Nettoyer le tourillon de vilebrequin et coussinet de vilebrequin.
2. Disposer une jauge plastique (Référence: 07909-30241) au centre de tourillon de vilebrequin.

■ **IMPORTANT**

- **Ne pas introduire la jauge plastique dans le trou de lubrification de tourillon.**

3. Poser le palier principal et serrer les vis au couple spécifié puis retirer le palier principal.
4. Mesurer l'aplatissement à l'aid d'une échelle et en déduire le jeu de marche.
5. Si le jeu excède la limite de service, remplace le coussinet.

Austausch des Kurbelwellenlager 1

(Beim Ausbau)

1. Das lager 1 mit den werkzeug für den Austausch des Kurbelwellenlager herausdrücken.

(Beim Einbau)

1. Das neue Lager 1 und die Bohrung reinigen und Öl auf sie auftragen.
2. Ein neues Lager 1 mit Hilfe eines Einsatzwerkzeuges einpassen. Hierbei darauf achten, daß die Naht des Lagers 1 der Auspuffkrümmerseite gegenüberliegt.

(1) Naht

Ölspiel zwischen Kurebelwelle und Kurebelwellenlager 2, 3

1. Den Kurebelwelle und das Kurebelwellenlager reinigen.
2. Einen Streifen der Preßmeßgerät (CodeNr. 07909-30241) auf die Mitte des Kurebelwelle legen.

■ **WICHTIG**

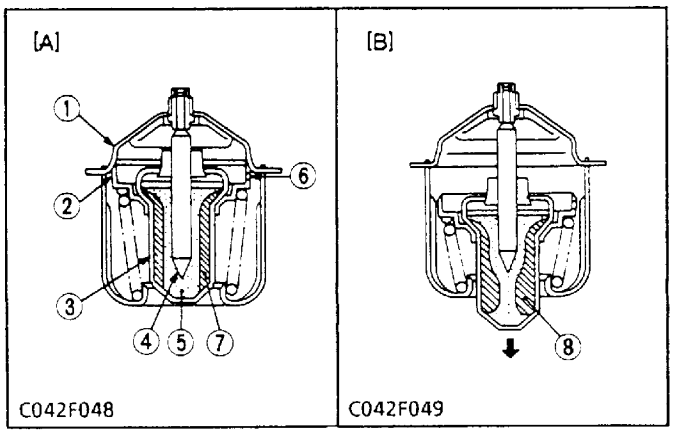
- **Das Preßmeßgerät nicht in die Ölöffnung des Kurebedwelle einsetzen.**

3. Die Hauptlagerschale anbringen und die Schrauben mit dem vorgeschriebenen Drehmoment anziehn und dann den Hauptlagerschale abschrauben.
4. Die Stärke der Preßmeßgerätmessen und den Ölspiel errechnen.
5. Überschreitet der Ölspiel den zulässigen Grenzwert, die Kurebelwellenlager austauschen.

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[3] THERMOSTAT



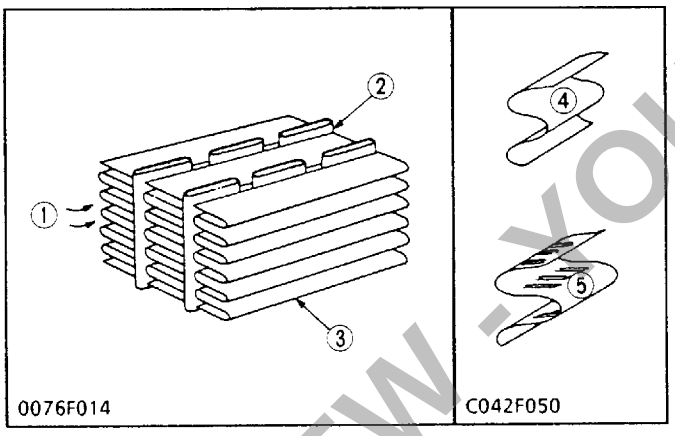
(1) Seat
(2) Valve
(3) Pellet
(4) Spindle
(5) Synthetic Rubber
(6) Leak Hole
(7) Wax (solid)
(8) Wax (liquid)

The thermostat maintains the cooling water at correct temperature. KUBOTA's engine uses a wax pellet type thermostat. Wax is enclosed in the pellet. The wax is solid at low temperatures, but turns liquid at high temperatures, expands and opens the valve.

(A) At low temperatures (lower than 71°C (159.8°F)). As the thermostat is closed, cooling water circulates in the engine through the water return pipe without running to the radiator. Air in the water jacket escapes to the radiator side through leak hole (6) of the thermostat.

(B) At high temperatures (higher than 71°C (159.8°F). When the temperature of cooling water exceeds 71°C (159.8°F), wax in the pellet turns liquid and expands. Because the spindle (4) is fixed, the pellet (3) is lowered, the valve (2) is separated from the seat (1), and then cooling water is sent to the radiator.

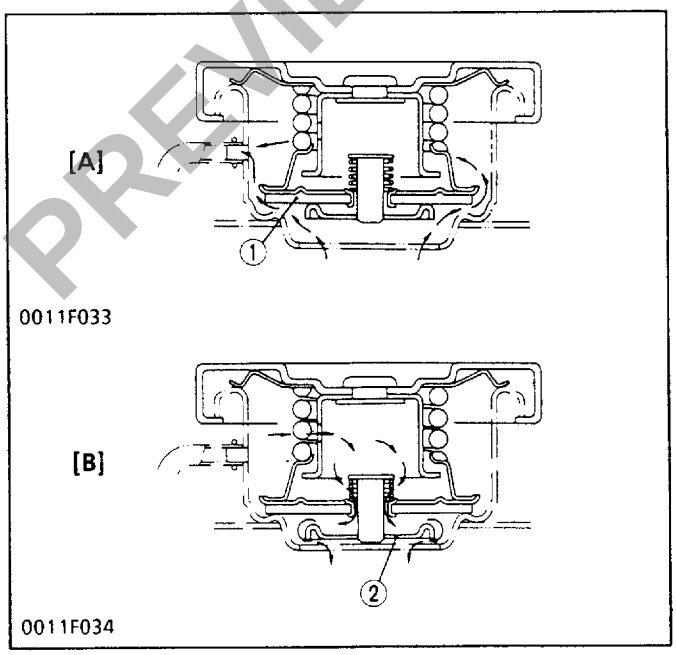
[4] RADIATOR (not included in the basic engine)



The radiator core consists of water carrying tubes and fins (3) at a right angle to the tubes (2). Heat of hot water in the tubes is radiated from the tube walls and fins. KUBOTA's engine uses corrugated fin type core which has a light weight and high heat transfer rate. Clogging is minimized by the louverless corrugated fins.

(1) Cooling Air
(2) Tube
(3) Fin
(4) Louverless Corrugated Fin
(5) Louvered Corrugated Fin

[5] RADIATOR CAP



The radiator cap is for sustaining the internal pressure of the cooling system at the specified level 88 kPa (0.9 kgf/cm^2, 13 psi) when the engine is in operation. The cap consists of a pressure valve (1) a vacuum valve (2), valve springs, gasket, etc.

Cooling water is pressurized by thermal expansion of steam, and as its boiling temperature rises, generation of air bubbles will be suppressed. (Air bubbles in cooling water lowers the cooling effect.)

[A] When radiator internal pressure is high
[B] When radiator internal pressure is negative

(1) Pressure Valve
(2) Vacuum Valve

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[3] CULASSE ET SOUPAPES

Couvercle de culasse et porte-injecteur

1. Détacher les conduits d'injection et le tuyau de trop-plein.
2. Détacher le cordon de bougie de préchauffage et la bougie de préchauffage.
3. Détacher le porte-injecteur et le joint en cuivre.
4. Enlever le joint thermique.
5. Déposer le couvercle de culasse.

(Au remontage)

- Vérifier que le joint de couvercle de culasse n'est pas d'efectueux.
- S'assurer de bien mettre en place le joint thermique (3) et huile de bouclier (4) (Voir figure).

(1) Porte-injecteur
(2) Joint en cuivre
(3) Joint thermique
(4) Huile de bouclier
(5) Côte engrenage
(6) Plaque court
(7) Plaque long

Procédure d'enlèvement du joint thermique de l'injecteur

■ **IMPORTANT**

- **Utiliser un tournevis pour vis cruciforme (phillips) ayant un diamètre supérieur à celui du trou de joint thermique de 1/4 pouce (6 mm environ).**

1. Introduire le tournevis légèrement dans le trou de joint thermique.
2. Tourner le tournevis trois ou quatre fois dans chaque sens.
3. Tout en tournant le tournevis, retirer lentement le joint thermique avec le joint d'injecteur.

   Si le joint thermique tombe, répéter la procédure décrite ci-dessuss. Le joint therjmique et le joint d'injecteur doivent être remplacés lorsque l'injecteur est détaché en vue du nettoyage ou de l'entretien.

(1) Tournevis cruciforme
(2) Injectur
(3) Joint d'injecteur
(4) Joint thermique

Culbuteurs, tiges de poussoirs et collecteurs

1. Déposer le culbuteur comme une seule pièce.
2. Déposer les poussoirs.
3. Détacher les collecteurs d'admission et d'échappement.

(Au remontage)

- En plaçant les tiges de poussoirs sur les poussoirs, vérifier que les extrémités sont bien engagées dans les rainures.

■ **IMPORTANT**

- **Après le remontage du culbuteur, veiller à régler le jeu des soupapes.**

(1) Culbuteur
(2) Tige de poussoir
(3) Poussoir

[3] ZYLINDERKOPF UND VENTILE

Zylinderkopfdeckel und Düsenhalter

1. Die Einspritzrohre und das Überlaufsrohr ausbauen.
2. Das Glühkerzenkabel und die Glühkerze ausbauen.
3. Den Düsenhalter und die Kupferscheibe ausbauen.
4. Die Wärmedichtung ausbauen.
5. Den Kopfdeckel ausbeuen.

(Beim Wiedereinbau)

- Die Dichtung der Zylinderkopfdeckel auf evtl ßeschädiqungen prüfen.
- Sehen Sie nach, ob Sie die Wärmedichtung eingesetzt haben (3) und Entluefter Oelschild (4) (Siehe Zeichung).

(1) Düsenhalter
(2) Kupferscheibe
(3) Wärmedichtung
(4) Entluefter Oelschild
(5) Getriebegehäuse
(6) Kurz platte
(7) Lang platte

Ausbauanweisungen für den Einspritzdüsen-Isoletordichtring

■ **WICHTIG**

- **Einen Kreuzschlitzschraubendreher verwenden, dessen Durchmesser größer als die Montageöffnung des Isolatordichtrings ist. (ca. 6 mm).**

1. Den Schraubendreher vorsichtig in die Montageöffnung des Isolatordichtrings einführen.
2. Den Schraubendreher etwa drei bis viermal in beiden Richtungen drehen.
3. Während der Schraubendreher gedreht wird, den Isolatordichtring zusammen mit der Einspritzdüsen-Dichtung vorsichtig herausziehen.

   Wenn der Isolatordichtring herunterfällt, muß der obige Vorgang wiederholt werden. Der Isolatordichtring und die Einspritzdüsen-Dichtung müssen ersetzt werden, wenn die Einspritzdüse zu Reinigungs und Wartungszwecken ausgebaut wird.

(1) Kreuzshlitzshraubendreher
(2) Düsenhalter
(3) Kupferscheibe
(4) Wärmedichtung

Kipphebel Stößelstange und Krümmer

1. Den Kipphebel als Einheit entfernen.
2. Die Stößelstangen entfernen.
3. Den Ausaug-und Auspuffkrümmer ausbauen.

(Beim Wiedereinbau)

- Bei Anbringung der Stößelstangen auf den Ventilstößeln ist darauf zu achten, daß ihre Enden richtig in die Nuten eingreifen.

■ **WICHTIG**

- **Nach erfolgtem Wiedereinbau des Kipphebels muß das Ventilspiel eingestellt werden.**

(1) Kipphebel
(2) Stößelstange
(3) Stößel

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