Manual No. : KM-187E
Vol. No. : TO187-E-04

Technical Manual

(Operational Principle)

ZAXIS

110
110M
120
130
130LCN
125US
135US
135UR

Excavator

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Service Manual (Manual No. KM-187E) consists of the following three separate volumes;

Technical Manual (Operational Principle)	: Vol. No. TO187E
Technical Manual (Troubleshooting)	: Vol. No. TT187E
Workshop Manual	: Vol. No. W187E

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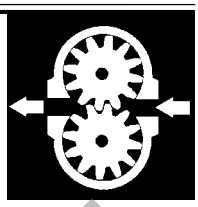
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Technical Manual

(Troubleshooting)

ZAXIS

110
110M
120
130
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INTRODUCTION

Refer to the inspection and troubleshooting procedures after any machine trouble has occurred. The inspection and troubleshooting procedures are presented in an orderly fashion in this section to quickly find the cause of the machine trouble and solution.

The troubleshooting section in this manual consists of 8 groups; General, Component Layout, Troubleshooting A (base machine diagnosis using fault codes), Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status), Troubleshooting C (monitor diagnosis), Troubleshooting D (Auto-Marccino diagnosis), Electrical System Inspection, and ICX.

- General

- Component Layout

- Troubleshooting A (base machine diagnosis using fault codes)
  Refer to these procedures if any fault codes are displayed when the main controller (MC) is diagnosed with Dr. ZX. (or the built-in diagnosing system)
  (MC self-diagnosing function retains a record of the electrical signal system malfunction in the form of fault codes.)

  Example: Fault Code 06: Abnormal EC Sensor

- Troubleshooting B (base machine diagnosis starting with inspection of abnormal operational status)
  Refer to these procedures when no fault codes are displayed after diagnosing the machine with Dr. ZX (or the built-in diagnosing system). Trace the cause of trouble based on the inspected result of the abnormal symptom.

  Example: Even if the engine control dial is operated, engine speed remains unchanged.

- Troubleshooting C (monitor diagnosis)
  Refer to these procedures when gauges and/or indicators are malfunctioning.

  Example: Malfunction of fuel gauge

- Troubleshooting D (troubleshooting of the front attachment operational control using fault codes (ZAXIS135UR).
  Use there charts when the self-diagnosing function of Dr.ZX shows any fault codes in diagnosing the Auto-MARCCINO Control Unit. Some fault codes may be displayed on the standard monitor.

  Example;
  Dr. ZX : Fault Code 11 ---
  Arm Roll-Out Malfunction
  Standard Monitor : Fault Code UE11 ---
  Arm Roll-Out Malfunction

- Electrical System Inspection
  Refer to this group when required to obtain precautions and/or information for the electrical system inspection.

Example: Fuse Inspection

- ICX
  Refer to these procedures after any fault code is displayed after diagnosing ICX (Information Controller) or the satellite terminal (optional) with Dr. ZX. (The controller self-diagnosing function retains a record of the electrical signal system malfunction in the form of fault codes.)

  Example: ICX Fault Code 7: MC Communication Time Out

  In addition, information on the following items is described in this group.
  (1) Trouble shooting and setting procedures of ICX and satellite terminal using Dr. ZX.
  (2) Information on the satellite communication system

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THE ATTACHED DIAGRAM LIST

(The following diagrams are attached to this manual.)

ZAXIS110/120/130/130LCN ELECTRICAL CIRCUIT DIAGRAM

ZAXIS110/120/130/130LCN CONNECTORS

ZAXIS125US/135US ELECTRICAL CIRCUIT DIAGRAM

ZAXIS125US/135US CONNECTORS

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ZAXIS135UR CONNECTORS

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ZAXIS110/120/130/130LCN MONITOR HARNESS

ZAXIS135UR CONSOLE HARNESS

ZAXIS110/120/130/130LCN HYDRAULIC CIRCUIT DIAGRAM

ZAXIS125US/135US HYDRAULIC CIRCUIT DIAGRAM

ZAXIS135UR HYDRAULIC CIRCUIT DIAGRAM

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Workshop Manual

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ZAXIS

110
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135US
135UR

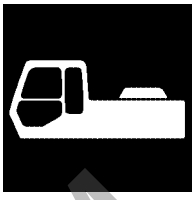
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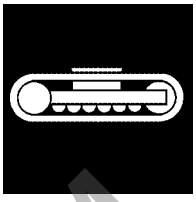
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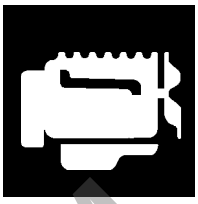
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OPERATIONAL PRINCIPLE

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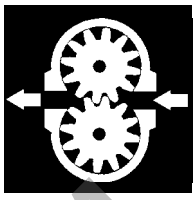
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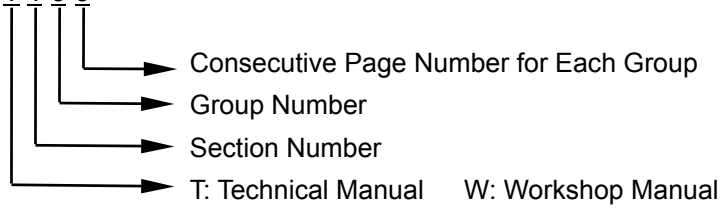
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PAGE NUMBER

- Each page has a number, located on the center lower part of the page, and each number contains the following information:

Example : T 1-3-5



SAFETY ALERT SYMBOL AND HEADLINE NOTATIONS

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury of machine damage.

⚠ This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury.
Never fail to follow the safety instructions prescribed along with the safety alert symbol.
The safety alert symbol is also used to draw attention to component/part weights.
To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

- ⚠ **CAUTION:**
  Indicated potentially hazardous situation which could, if not avoided, result in personal injury or death.

- **IMPORTANT:**
  Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

- *NOTE:*
  Indicates supplementary technical information or know-how.

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ANTI-DRIFT VALVE

The anti-drift valves are located in the boom cylinder bottom and arm cylinder rod side circuits to reduce the cylinder drift.

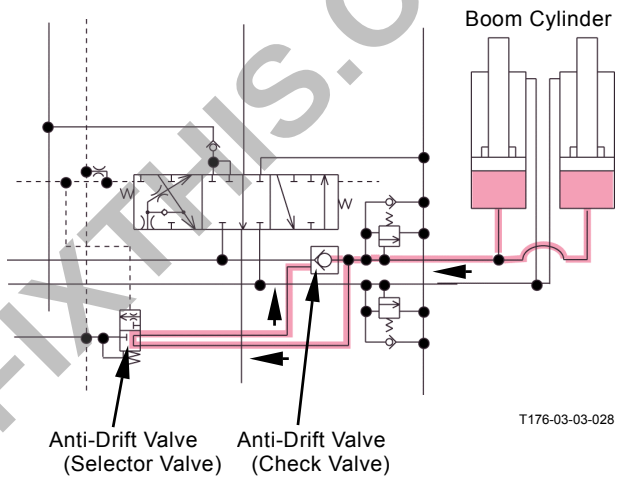
NOTE: The boom and arm anti-drift valves are identical in construction.

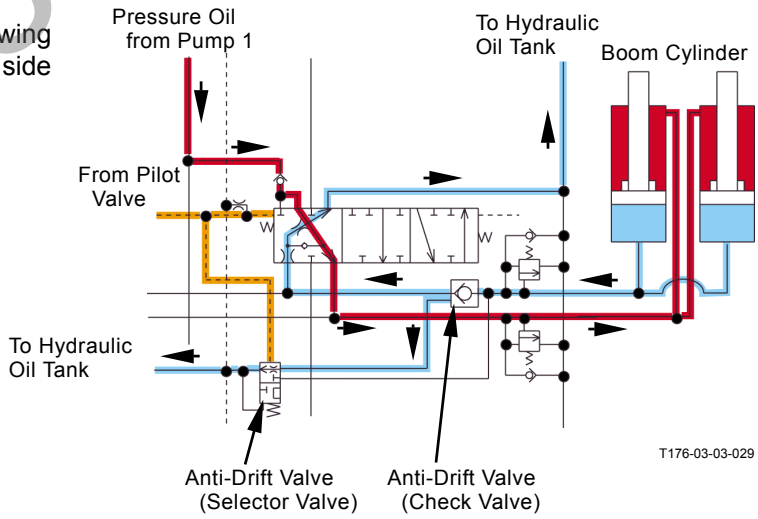
Blocking Operation

1. When the control lever (the spool) is in neutral, the anti-drift valve (selector valve) is not shifted.
2. Therefore, the pressure oil in the boom cylinder bottom (arm cylinder rod side) is applied to the anti-drift valve check valve via the control valve.
3. Consequently, the check valve is seated, blocking the return oil circuit from the cylinder so that the cylinder drift is reduced.

Releasing Operation

1. When rolling the arm in or lowering the boom, the pressure oil from the pilot valve shifts the anti-drift valve (selector valve).
2. The hydraulic oil in the check valve spring chamber is returned to the hydraulic oil tank via the orifice in the Selector valve.
3. Accordingly, the check valve is unseated, allowing the return oil from the boom cylinder bottom side (arm cylinder rod side) to flow to the spool.





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Evaluation:
Performance of the overload relief valves are normal if the measured main relief pressures (in main circuit or blade circuit) are within the specified value range.

Refer to T4-2 Operational Performance Standard.

Overload Relief Valve Set Pressure Adjusting Procedure

NOTE: In principle, adjust the overload relief valve set pressure on a test stand.

Adjustment:

1. Loosen the lock nut.
   Main Circuit :
   : 17 mm
   : 31.5 N·m (3.2 kgf·m, 23.1 lbf·ft)

   Blade Circuit :
   : 17 mm
   : 19.6 N·m (2 kgf·m, 14.4 lbf·ft)
   : 6 mm

2. Turn adjustiing screw (2) to adjust the overload relief pressure setting referring to the table below.

3. Retighten lock nut (1).

4. Recheck the set pressures.

NOTE: Standard Change in Pressure (Reference)

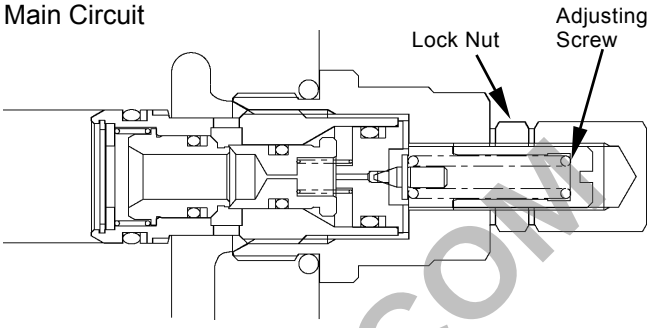
•Main Circuit

Screw Turns		1/4	1/2	3/4	1
Change in Relief Pressure	MPa	2.79	5.59	8.36	11.2
	(kgf/cm^2)	(28.5)	(57)	(85.2)	(114)
	(psi)	(405)	(811)	(1212)	(1620)

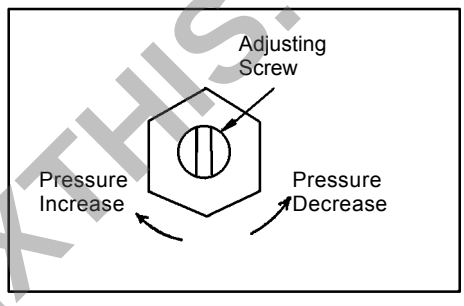
•Blade Circuit

Screw Turns		1/4	1/2	3/4	1
Change in Relief Pressure	MPa	4.9	9.9	14.9	19.8
	(kgf/cm^2)	(50.5)	(101.0)	(151.4)	(201.9)
	(psi)	(718)	(1436)	(2153)	(2811)

Main Circuit

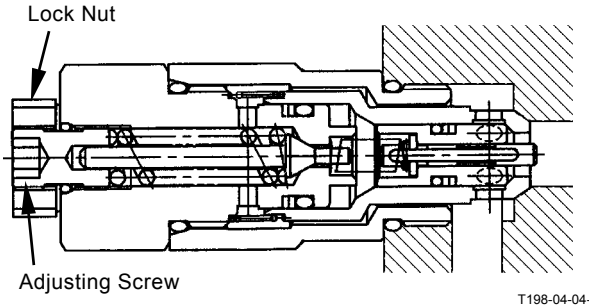


T176-04-04-003

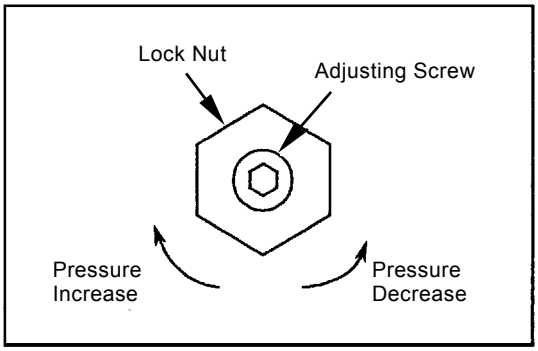


T105-06-05-002

Blade Circuit



T198-04-04-008



T505-06-04-007

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- Faulty engine oil pressure switch.
- YES
  - Broken harness between monitor and engine oil pressure switch.
  - NO
    - Faulty monitor.

Engine Oil Pressure Switch

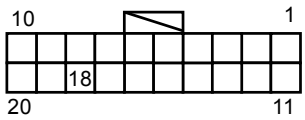
Pressure	Operation
Approx. 39 kPa (0.4 kgf/cm^2, 5.7 psi) or less	ON
Approx. 39 kPa (0.4 kgf/cm^2, 5.7 psi) or higher	OFF

- Burnt indicator light.
- Faulty engine oil pressure switch or faulty engine oil pressure system, or clogged oil filter.
- Short-circuited harness between monitor and engine oil pressure switch.
- Faulty monitor.

Connector (Harness end connector terminals seen from the open end side)

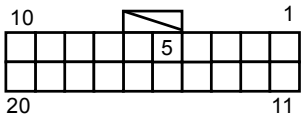
ZAXIS110, 110M, 120, 130, 130LCN, 125US, 135US

Monitor Connector C



ZAXIS135UR

Monitor Connector A



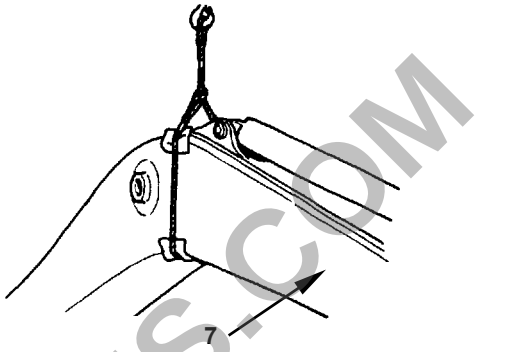
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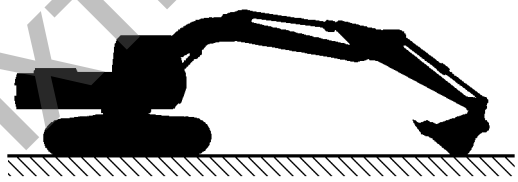
CAUTION: Front attachment assembly weight:
1800 kg (3970 lb) (ZAXIS110, 110M, 125US)
2000 kg (4400 lb) (ZAXIS120, 130, 130LCN, 135US)
3300 kg (7275 lb) (ZAXIS135UR)

7. Install front attachment assembly (7). Then, fill with hydraulic oil.
   (Refer to “Remove and Install Front Attachment” in this section.)
   : 5 mm
   : 9.8 N·m (1.0 kgf·m, 7.2 lbf·ft)
   (ZAXIS135UR Angle sensor for boom foot)
   : 17 mm
   : 50 N·m (5.1 kgf·m, 37 lbf·ft)
   : 19 mm
   : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)
   : 24 mm
   : 270 N·m (27.5 kgf·m, 190 lbf·ft)
   : 27 mm
   : 400 N·m (41 kgf·m, 295 lbf·ft)
   (Stopper bolt for boom foot pin)
   : 27 mm
   : 93 N·m (7.5 kgf·m, 54 lbf·ft)
   (Hydraulic line fitting for boom foot)
   : 36 mm
   : 175 N·m (18 kgf·m, 130 lbf·ft)
   (Hydraulic line fitting for boom foot)

8. Start the engine and set the front attachment in posture for checking hydraulic oil level in its tank. Inspect the hydraulic oil level and check if there is any oil leakage.



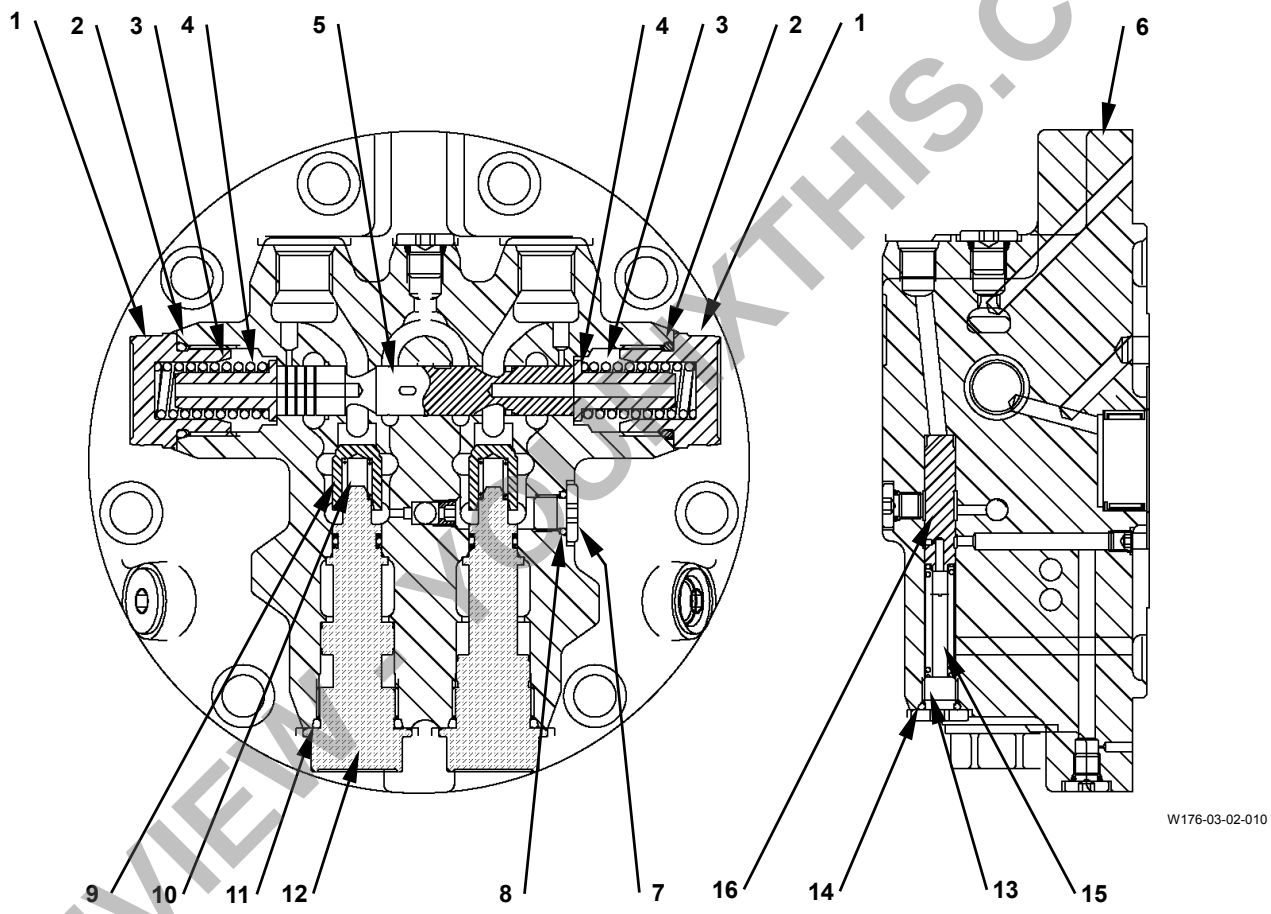
W105-02-03-002


M104-07-021

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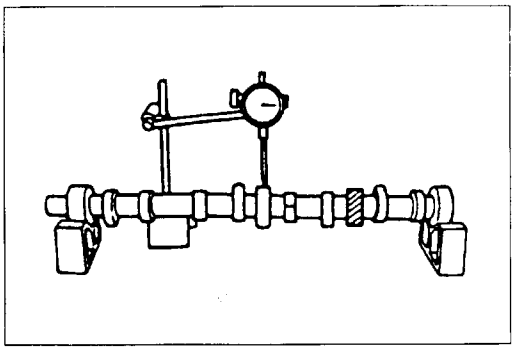
ASSEMBLE TRAVEL BRAKE VALVE (ZAXIS110, 120, 130, 130LCN, 125US, 135US, 135UR)



1 - Plug (2 Used)
2 - O-Ring (2 Used)
3 - Spring (2 Used)
4 - Stopper (2 Used)
5 - Spool
6 - Valve Housing
7 - Plug
8 - O-Ring
9 - Poppet (2 Used)
10 - Spring (2 Used)
11 - O-Ring (2 Used)
12 - Relief Valve (2 Used)
13 - Plug
14 - O-Ring
15 - Spring
16 - Spool

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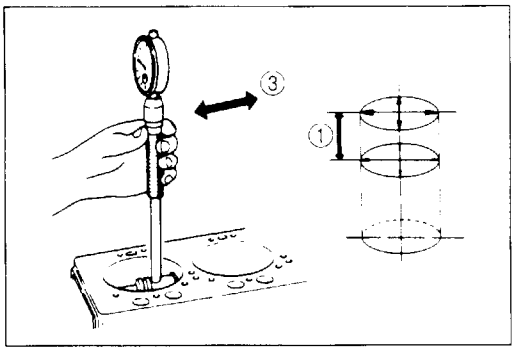
5. Place the camshaft on a measuring stand.
   Use a dial indicator to measure the camshaft runout.
   Note the total indicator reading (TIR).
   If the measured run-out exceeds the specified limit, the camshaft must be replaced.

mm (in)

	Limit
Camshaft Run-Out TIR	less than 0.12 (0.005)

CYLINDER BODY AND LINER

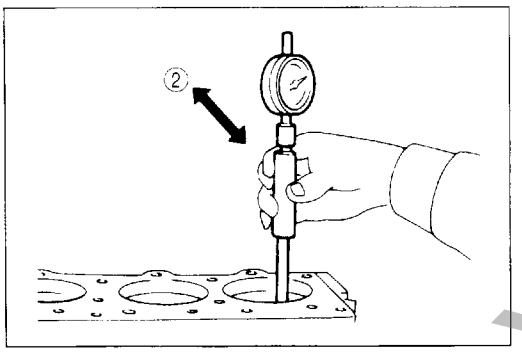
Cylinder Liner Bore Measurement



Use a cylinder indicator to measure the cylinder liner bore at measuring position ① in line with the crankshaft ② and across the crankshaft ③.

Measuring Point ① mm (in): 20.0 (0.79) (Maximum Wear Portion)

If the measured value exceeds the specified limit, the cylinder liner must be replaced.



mm (in)

	Standard	Limit
Cylinder Liner Bore Total Indicator Reading	105.021–105.060 (4.1347–4.1362)	105.20 (4.1417)

Note:

The inside of the dry type cylinder liner is chrome plated. It cannot be rebored or honed.

If the inside of the cylinder liner is scored or scorched, the cylinder liner must be replaced.

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Auxiliary Flow Rate Control (Only on the machines equipped with the auxiliary pressure sensor and auxiliary flow rate control solenoid valve)

Function: Restricts the oil flow to the auxiliary spool when the combined operation of the swing, boom raise, and arm roll-in is made while operating a front attachment using the auxiliary spool to maintain controllability of the combined operation.

Operation: The MC activates the auxiliary flow rate control solenoid valve (optional) so that the oil flow to the auxiliary spool is restricted under the following conditions.

Operating Conditions:
Auxiliary Pressure Sensor: ON
Swing, Boom Raise, Arm Roll-In Pressure Sensors: ON

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PERFORMANCE TEST DESIGNATION	ZAXIS135US (Performance Standard)	Remarks
BOOM RAISE/SWING (Bucket Empty) sec	3.3±0.3	2.52 m Arm 0.50 m3(PCSA heaped) bucket
(Bucket Teeth Height: H) mm	5600 or more	
BOOM RAISE/ARM ROLL-IN (Bucket Empty) sec	5.0±0.5	2.52 m Arm 0.50 m^3(PCSA heaped) bucket
PRIMARY PILOT PRESSURE MPa (kgf/cm^2, psi)		
Engine: Fast Idle	$4.0^{+1.0}_{-0.5}$ (40^{+10}_{-5}, 570^{+142}_{-71})	
Engine: Slow Idle	$3.5^{+1.0}_{-0.5}$ (35^{+10}_{-5}, 500^{+142}_{-71})	
SECONDARY PILOT PRESSURE) (Engine: Fast Idle and Slow Idel) MPa (kgf/cm^2, psi)	3.4 to 4.0 (34 to 40, 483 to 570)	Value indicated on Dr.EX (Lever: Full Stroke)
SOLENOID VALVE SET PRESSURE MPa (kgf/cm^2, psi)	Value Indicated On Dr. EX±0.2 (2, 28)	
MAIN PUMP DELIVERY PRESSURE MPa (kgf/cm^2, psi)	$0.7^{+1.0}_{-0.5}$ (7^{+10}_{-5}, 100^{+142}_{-71})	Value indicated on Dr.EX
MAIN RELIEF VALVE SET PRESSURE MPa (kgf/cm^2, psi)		
Boom, Arm, and Bucket	$34.3^{+2.0}_{-0.5}$ (350^{+20}_{-5}, 4980^{+284}_{-71})	Value indicated on Dr.EX
Swing	$33.3^{+2.0}_{-0.5}$ (340^{+20}_{-5}, 4835^{+356}_{-71})	Value indicated on Dr.EX
Travel	$34.3^{+2.0}_{-0.5}$ (350^{+20}_{-5}, 4980^{+427}_{-284})	Value indicated on Dr.EX
OVERLOAD RELIEF VALVE SET PRESSURE MPa (kgf/cm^2, psi)	(Reference values at 50 L/min)	
Boom (Raise/Lower), Arm Roll-In, and Bucket Roll-In	$37.3^{+1.0}_{-0}$ (380^{+10}_{-0}, 5400^{+142}_{-0})	
Arm Roll-Out, Bucket Roll-Out	$39.2^{+1.0}_{-0}$ (400^{+10}_{-0}, 5690^{+142}_{-0})	
MAIN PUMP FLOW TEST (L/min)	—	Refer to page T4-5-13, 14
SWING MOTOR DRAINAGE (L/min)		
With constant maximum speed	0.4 or less	Allowable Limit: 0.6
With the motor relieved	1.6 or less	Allowable Limit: 2.0
TRAVEL MOTOR DRAINAGE (L/min)		
With the track jacked up	0.3 to 1.2	Allowable Limit: 1.8
With the motor relieved	0.3 to 1.9	Allowable Limit: 2.5

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