

**HITACHI**

# **Training Text**

**ZAXIS**

**200-3 class**

**240-3 class**

**270-3 class**

**PERFORMANCE CHECK  
TROUBLESHOOTING**

**Technical Training Center**

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# SECTION 4 OPERATIONAL PERFORMANCE TEST



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# OPERATIONAL PERFORMANCE TEST / Introduction

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## OPERATIONAL PERFORMANCE TESTS

Use operational performance test procedure to quantitatively check all system and functions on the machine.

### **Purpose of Performance Tests**

1. To comprehensively evaluate each operational function by comparing the performance test data with the standard values.
2. According to the evaluation results, repair, adjust, or replace parts or components as necessary to restore the machine's performance to the desired standard.
3. To economically operate the machine under optimal conditions.

### **Kinds of Tests**

1. Base machine performance test is to check the operational performance of each system such as engine, travel, swing, and hydraulic cylinders.
2. Hydraulic component unit test is to check the operational performance of each component such as hydraulic pump, motor, and various kinds of valves.

### **Performance Standards**

"Performance Standard" is shown in tables to evaluate the performance test data.

### **Precautions for Evaluation of Test Data**

1. To evaluate not only that the test data are correct, but also in what range the test data are.
2. Be sure to evaluate the test data based on the machine operation hours, kinds and state of work loads, and machine maintenance conditions.

The machine performance does not always deteriorate as the working hours increase. However, the machine performance is normally considered to reduce in proportion to the increase of the operation hours. Accordingly, restoring the machine performance by repair, adjustment, or replacement shall consider the number of the machine's working hours.

### **Definition of "Performance Standard"**

1. Operation speed values and dimensions of the new machine.
2. Operational performance of new components adjusted to specifications. Allowable errors will be indicated as necessary.

## OPERATIONAL PERFORMANCE TEST / Introduction

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### PREPARATION FOR PERFORMANCE TESTS

Observe the following rules in order to carry out performance tests accurately and safely.

#### THE MACHINE

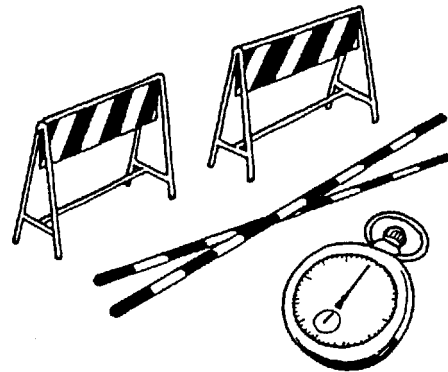
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

#### TEST AREA

1. Select a hard and flat surface.
2. Secure enough space to allow the machine to run straight more than 20 m (65 ft 7 in), and to make a full swing with the front attachment extended.
3. If required, rope off the test area and provide signboards to keep unauthorized personnel away.

#### PRECAUTIONS

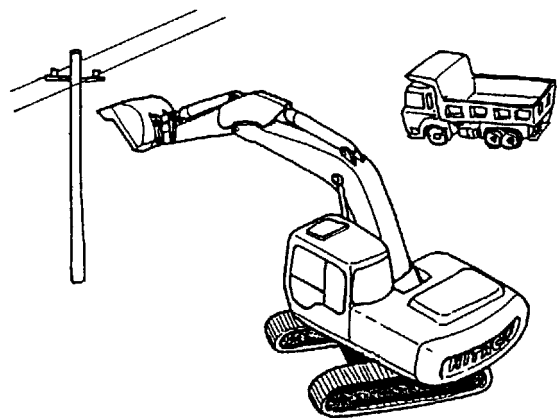
1. Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
2. Operate the machine carefully and always give first priority to safety.
3. While testing, always take care to avoid accidents due to landslides or contact with high-voltage power lines. Always confirm that there is sufficient space for full swings.
4. Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.



T105-06-01-003

#### MAKE PRECISE MEASUREMENT

1. Accurately calibrate test instruments in advance to obtain correct data.
2. Carry out tests under the exact test conditions prescribed for each test item.
3. Repeat the same test and confirm that the test data obtained can be produced repeatedly. Use mean values of measurements if necessary.



T105-06-01-004

## OPERATIONAL PERFORMANCE TEST / Standard

### ZX200-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.


Engine Control Dial : Fast Idle  
 Power Mode Switch : P Mode  
 Auto-Idle Switch: OFF  
 Work Mode: Digging Mode  
 Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

 NOTE: 1 mm=0.03937 in


PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
<b>ENGINE SPEED</b> <span style="float: right;">min<sup>-1</sup></span>			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (w/irh ECO deactivated)	1800±50	↑	
Fast Idle Speed (Heater control: OFF)	1700±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	1800±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1650±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2000±50	Relief operation of boom raise and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
<b>ENGINE COMPRESSION PRESSURE</b> <span style="float: right;">MPa (kgf/cm<sup>2</sup>, psi)</span>	3.04±0.2 (31±2, 442±29)	Engine speed: 200min <sup>-1</sup>	T4-3-3
<b>VALVE CLEARANCE (IN, EX)</b>	0.4	With the engine cold	T4-3-4
<b>LUBRICANT CONSUMPTION</b> (Rated output) <span style="float: right;">mL/h</span>	30 or less	Hour meter: 2000 hours or less	T4-3-10

## OPERATIONAL PERFORMANCE TEST / Standard

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
<b>TRAVEL SPEED</b> <span style="float: right;">sec/10 m</span>			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(10.2±1.0)		
<b>TRACK REVOLUTION SPEED</b> <span style="float: right;">sec/3 rev</span>			T4-4-2
Fast Speed	17.2±1.0	LC: 18.3±1.0	
Slow Speed	26.7±2.0	LC: 28.4±2.0	
<b>MISTRACK</b> <span style="float: right;">mm/20 m</span> (With fast and slow travel speed modes)	200 or less		T4-4-3
<b>TRAVEL MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0		T4-4-4
<b>SWING SPEED</b> <span style="float: right;">sec/3 rev</span>	13.5±1.0	Bucket: empty	T4-4-5
<b>SWING FUNCTION DRIFT CHECK</b> <span style="float: right;">mm /180°</span>	1254 or less	Bucket: empty ZAXIS210H-3: 1368 or less	T4-4-6
<b>SWING MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0	Bucket: loaded	T4-4-8
<b>MAXIMUM SWINGABLE SLANT ANGLE</b> <span style="float: right;">deg.</span>	25° or more	Bucket: loaded	T4-4-10
<b>SWING BEARING PLAY</b> <span style="float: right;">mm</span>	0.2 to 1.0	Allowable limit: 2.0 to 3.0	T4-4-11
<b>HYDRAULIC CYLINDER CYCLE TIME</b> <span style="float: right;">sec</span>		2.91 m arm 0.8 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	3.1±0.3	ZAXIS210H-3: 3.2±0.3	
Boom Lower	2.2±0.3		
Arm Roll-In	3.2±0.3		
Arm Roll-Out	2.5±0.3	ZAXIS210H-3: 2.6±0.3	
Bucket Roll-In	3.0±0.3		
Bucket Roll-Out	2.0±0.3	ZAXIS210H-3: 2.1±0.3	
<b>DIG FUNCTION DRIFT CHECK</b> <span style="float: right;">mm/5 min</span>		2.91 m arm 0.8 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	5 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	10 or less 10 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	15 or less 7 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	100 or less 80 or less	Bucket: loaded Bucket: empty	


## OPERATIONAL PERFORMANCE TEST / Standard

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
<b>CONTROL LEVER OPERATING FORCE</b> N (kgf, lbf)		HITACHI lever pattern	T4-4-16
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
<b>CONTROL LEVER STROKE</b> mm		HITACHI lever pattern	T4-4-17
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
<b>BOOM RAISE/SWING</b> sec	3.6±0.4	2.91 m arm 0.8 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-18
(Bucket Teeth Height: H) mm	6600 or more		
<b>BOOM RAISE/ARM ROLL-IN/SWING</b> sec	(4.3±0.5)	2.91 m arm 0.8 m <sup>3</sup> (PCSA heaped) bucket	T4-4-19
<b>HYDRAULIC SYSTEM</b>			
<b>PRIMARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-1
Engine: Fast Idle	4.0 <sup>+1.0</sup> <sub>-0.5</sub> (40 <sup>+10</sup> <sub>-5</sub> , 580 <sup>+142</sup> <sub>-71</sub> )		
Engine: Slow Idle	3.8 <sup>+1.0</sup> <sub>-0.5</sub> (35 <sup>+10</sup> <sub>-5</sub> , 500 <sup>+142</sup> <sub>-5</sub> )		
<b>SECONDARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-3
(Engine: Fast Idle (noraml) and Slow Idle)	3.4 to 4.0 (34 to 40, 483 to 570)	Value indicated on Dr. ZX (Lever: Full stroke)	
<b>SOLENOID VALVE SET PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	Value Indicated On Dr. ZX±0.2 (2, 28)		T4-5-4
<b>MAIN PUMP DELIVERY PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	0.7 <sup>+1.0</sup> <sub>-0.5</sub> (7 <sup>+10</sup> <sub>-5</sub> , 100 <sup>+142</sup> <sub>-71</sub> )	In neutral, Value indicated on Dr. ZX	T4-5-6



## OPERATIONAL PERFORMANCE TEST / Standard

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX200-3 class (Performance Standard)	Remarks	Reference Page
<b>MAIN RELIEF VALVE PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-8
Boom, Arm, Bucket (Relief operation for each)	34.3 <sup>+2.0</sup> <sub>-0.5</sub> (350 <sup>+20</sup> <sub>-5</sub> , 4980 <sup>+284</sup> <sub>-71</sub> )	Value indicated on Dr. ZX	
Power Digging	36.3 <sup>+2.0</sup> <sub>-1.0</sub> (370 <sup>+20</sup> <sub>-10</sub> , 5260 <sup>+284</sup> <sub>-142</sub> )	Value indicated on Dr. ZX	
<b>RELIEF PRESSURE</b> (Relief operation for Swing) MPa (kgf/cm <sup>2</sup> , psi)	32.9 <sup>+2.3</sup> <sub>-0</sub> (335 <sup>+25</sup> <sub>-0</sub> , 4780 <sup>+356</sup> <sub>-0</sub> )	Value indicated on Dr. ZX	T4-5-10
<b>OVERLOAD RELIEF PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)		(Reference values at 50 L/min)	T4-5-12
Boom Lower, Arm Roll-In, Bucket Roll-In	37.2 <sup>+1.0</sup> <sub>-0</sub> (380 <sup>+10</sup> <sub>-0</sub> , 5400 <sup>+142</sup> <sub>-0</sub> )		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	39.2 <sup>+1.0</sup> <sub>-0</sub> (400 <sup>+10</sup> <sub>-0</sub> , 5690 <sup>+142</sup> <sub>-0</sub> )		
<b>MAIN PUMP FLOW RATE</b> (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-14
<b>SWING MOTOR DRAINAGE</b> (L/min)			T4-5-20
With constant speed	0.2 to 0.3		
With the motor relieved	(2 to 5)		
<b>TRAVEL MOTOR DRAINAGE</b> (L/min)			T4-5-22
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

## OPERATIONAL PERFORMANCE TEST / Standard

### ZX240-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.


Engine Control Dial : Fast Idle  
 Power Mode Switch : P Mode  
 Auto-Idle Switch: OFF  
 Work Mode: Digging Mode  
 Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
<b>ENGINE SPEED</b> <span style="float: right;">min<sup>-1</sup></span>			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (w/irh ECO deactivated)	1900±50	↑	
Fast Idle Speed (Heater control: OFF)	1800±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	1900±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1750±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2000±50	Relief operation of boom raise and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
<b>ENGINE COMPRESSION PRESSURE</b> <span style="float: right;">MPa (kgf/cm<sup>2</sup>, psi)</span>	3.04±0.2 (31±2, 442±29)	Engine speed: 200min <sup>-1</sup>	T4-3-3
<b>VALVE CLEARANCE (IN, EX)</b>	0.4	With the engine cold	T4-3-4
<b>LUBRICANT CONSUMPTION</b> (Rated output) <span style="float: right;">mL/h</span>	30 or less	Hour meter: 2000 hours or less	T4-3-10

## OPERATIONAL PERFORMANCE TEST / Standard


 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
<b>TRAVEL SPEED</b> <span style="float: right;">sec/10 m</span>			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(10.2±1.0)		
<b>TRACK REVOLUTION SPEED</b> <span style="float: right;">sec/3 rev</span>			T4-4-2
Fast Speed	17.6±2.0	LC: 19.1±2.0	
Slow Speed	28.6±2.0	LC: 31.0±2.0	
<b>MISTRACK</b> <span style="float: right;">mm/20 m</span> (With fast and slow travel speed modes)	200 or less		T4-4-3
<b>TRAVEL MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0		T4-4-4
<b>SWING SPEED</b> <span style="float: right;">sec/3 rev</span>	13.7±1.0	Bucket: empty	T4-4-5
<b>SWING FUNCTION DRIFT CHECK</b> <span style="float: right;">mm /180°</span>	1565 or less	Bucket: empty	T4-4-6
<b>SWING MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0	Bucket: loaded	T4-4-8
<b>MAXIMUM SWINGABLE SLANT ANGLE</b> <span style="float: right;">deg.</span>	21.5° or more	Bucket: loaded	T4-4-10
<b>SWING BEARING PLAY</b> <span style="float: right;">mm</span>	0.2 to 1.25	Allowable limit: 2.0 to 3.05	T4-4-11
<b>HYDRAULIC CYLINDER CYCLE TIME (Mono Boom)</b> <span style="float: right;">sec</span>		2.96 m arm 1.0 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	3.5±0.3		
Boom Lower	2.3±0.3		
Arm Roll-In	3.5±0.3		
Arm Roll-Out	2.7±0.3		
Bucket Roll-In	3.4±0.3		
Bucket Roll-Out	2.4±0.3		
<b>HYDRAULIC CYLINDER CYCLE TIME (2-Piece Boom)</b> <span style="float: right;">sec</span>		2.96 m arm 1.0 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	4.6±0.3		
Boom Lower	3.7±0.3		
Arm Roll-In	3.7±0.3		
Arm Roll-Out	2.7±0.3		
Bucket Roll-In	3.4±0.3		
Bucket Roll-Out	2.4±0.3		
Positioning Lower (without HRV)	5.9±0.3	HRV: Hose Rupture Valve	
(with HRV)	6.3±0.3		
Positioning Raise	4.1±0.3		

## OPERATIONAL PERFORMANCE TEST / Standard


PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
<b>DIG FUNCTION DRIFT CHECK (Mono Boom)</b> <span style="float: right;">mm/5 min</span>		2.96 m arm 1.0 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 10 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	150 or less 110 or less	Bucket: loaded Bucket: empty	
<b>DIG FUNCTION DRIFT CHECK (2-Piece Boom)</b> <span style="float: right;">mm/5 min</span>		2.96 m arm 1.0 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 10 or less	Bucket: loaded Bucket: empty	
Positioning Cylinder (Maximum Reach Position) (Arm Roll-In position)	40 or less 30 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	200 or less 150 or less	Bucket: loaded Bucket: empty	

## OPERATIONAL PERFORMANCE TEST / Standard

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
<b>CONTROL LEVER OPERATING FORCE</b> N (kgf, lbf)		HITACHI lever pattern	T4-4-16
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
<b>CONTROL LEVER STROKE</b> mm		HITACHI lever pattern	T4-4-17
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
<b>BOOM RAISE/SWING</b> sec	3.8±0.4	2.96 m arm 1.0 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-18
(Bucket Teeth Height: H) mm	6700 or more		
<b>BOOM RAISE/ARM ROLL-IN/SWING</b> sec	(4.0±0.5)	2.96 m arm 1.0 m <sup>3</sup> (PCSA heaped) bucket	T4-4-19
<b>HYDRAULIC SYSTEM</b>			
<b>PRIMARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-1
Engine: Fast Idle	4.0 <sup>+1.0</sup> <sub>-0.5</sub> (40 <sup>+10</sup> <sub>-5</sub> , 580 <sup>+142</sup> <sub>-71</sub> )		
Engine: Slow Idle	3.8 <sup>+1.0</sup> <sub>-0</sub> (38 <sup>+10</sup> <sub>-0</sub> , 550 <sup>+145</sup> <sub>-0</sub> )		
<b>SECONDARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-3
(Engine: Fast Idle (noraml) and Slow Idle)	3.4 to 4.0 (34 to 40, 483 to 570)	Value indicated on Dr. ZX (Lever: Full stroke)	
<b>SOLENOID VALVE SET PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	Value Indicated On Dr. ZX±0.2 (2, 29)		T4-5-4
<b>MAIN PUMP DELIVERY PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	0.8 <sup>+1.2</sup> <sub>-0.5</sub> (8 <sup>+12</sup> <sub>-5</sub> , 115 <sup>+175</sup> <sub>-71</sub> )	In neutral, Value indicated on Dr. ZX	T4-5-6

## OPERATIONAL PERFORMANCE TEST / Standard

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX240-3 class (Performance Standard)	Remarks	Reference Page
<b>MAIN RELIEF VALVE PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-8
Boom, Arm, Bucket (Relief operation for each)	34.3 <sup>+2.0</sup> <sub>-0.5</sub> (350 <sup>+20</sup> <sub>-5</sub> , 4980 <sup>+284</sup> <sub>-71</sub> )	Value indicated on Dr. ZX	
Relief operation of Positioning (2-piece boom only)	35.5 <sup>+2.0</sup> <sub>-0.5</sub> (362 <sup>+20</sup> <sub>-5</sub> , 5161 <sup>+284</sup> <sub>-71</sub> )	Value indicated on Dr. ZX	
Power Digging	36.3 <sup>+2.0</sup> <sub>-1.0</sub> (370 <sup>+20</sup> <sub>-10</sub> , 5260 <sup>+284</sup> <sub>-142</sub> )	Value indicated on Dr. ZX	
<b>RELIEF PRESSURE</b> (Relief operation for Swing) MPa (kgf/cm <sup>2</sup> , psi)	33.3 <sup>+2.3</sup> <sub>-0.5</sub> (340 <sup>+23</sup> <sub>-5</sub> , 4840 <sup>+330</sup> <sub>-73</sub> )	Value indicated on Dr. ZX	T4-5-10
<b>OVERLOAD RELIEF PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)		(Reference values at 50 L/min)	T4-5-12
Boom Lower, Arm Roll-In, Bucket Roll-In	37.2 <sup>+1.0</sup> <sub>-0</sub> (380 <sup>+10</sup> <sub>-0</sub> , 5400 <sup>+142</sup> <sub>-0</sub> )		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	39.2 <sup>+1.0</sup> <sub>-0</sub> (400 <sup>+10</sup> <sub>-0</sub> , 5690 <sup>+142</sup> <sub>-0</sub> )		
<b>MAIN PUMP FLOW RATE</b> (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-14
<b>SWING MOTOR DRAINAGE</b> (L/min)			T4-5-20
With constant speed	0.2 to 0.5		
With the motor relieved	(2 to 5)		
<b>TRAVEL MOTOR DRAINAGE</b> (L/min)			T4-5-22
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	


## OPERATIONAL PERFORMANCE TEST / Standard

### ZX270-3 CLASS OPERATIONAL PERFORMANCE STANDARD TABLE

The standard Performance values are listed in the table below. Refer to the Group T4-3 to T4-5 for performance test procedures. Values indicated in parentheses are reference values.


Engine Control Dial : Fast Idle  
 Power Mode Switch : P Mode  
 Auto-Idle Switch: OFF  
 Work Mode: Digging Mode  
 Hydraulic Oil Temperature : 50±5 °C (122±41 °F)

The following switch positions shall be selected and the hydraulic oil temperature shall be maintained as indicated below as the preconditions of performance tests unless otherwise instructed in each performance test procedure:

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
<b>ENGINE SPEED</b> <span style="float: right;">min<sup>-1</sup></span>			T4-3-1
Slow Idle Speed	800±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (w/irh ECO deactivated)	2000±50	↑	
Fast Idle Speed (Heater control: OFF)	1900±50	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on Dr. ZX	
Fast Idle Speed (Heater control: ON)	2000±50	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on Dr. ZX	
Fast Idle Speed (Relief operation)	2000±50	Boom raise relief operation, Value indicated on Dr. ZX	
Fast Idle Speed (E mode)	1850±50	Lever in neutral, Value indicated on Dr. ZX	
Fast Idle Speed (HP mode)	2100±50	Relief operation of boom raise and arm roll-in, Value indicated on Dr. ZX.	
Auto-Idle Speed	1200±50	Value indicated on Dr. ZX.	
Warming-Up Speed	1400±100	↑	
<b>ENGINE COMPRESSION PRESSURE</b> <span style="float: right;">MPa (kgf/cm<sup>2</sup>, psi)</span>	3.04±0.2 (31±2, 442±29)	Engine speed: 200min <sup>-1</sup>	T4-3-3
<b>VALVE CLEARANCE (IN, EX)</b>	0.4	With the engine cold	T4-3-4
<b>LUBRICANT CONSUMPTION</b> (Rated output) <span style="float: right;">mL/h</span>	25 or less	Hour meter: 2000 hours or less	T4-3-10

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 NOTE: 1 mm=0.03937 in


PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
<b>TRAVEL SPEED</b> <span style="float: right;">sec/10 m</span>			T4-4-1
Fast Speed	6.6±0.6		
Slow Speed	(11.0±1.0)		
<b>TRACK REVOLUTION SPEED</b> <span style="float: right;">sec/3 rev</span>			T4-4-2
Fast Speed	32.1±2.0	LC: 34.2±2.0	
Slow Speed	32.1±2.0	LC: 34.2±2.0	
<b>MISTRACK</b> <span style="float: right;">mm/20 m</span> (With fast and slow travel speed modes)	200 or less		T4-4-3
<b>TRAVEL MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0		T4-4-4
<b>SWING SPEED</b> <span style="float: right;">sec/3 rev</span>	14.3±1.0	Bucket: empty	T4-4-5
<b>SWING FUNCTION DRIFT CHECK</b> <span style="float: right;">mm /180°</span>	1610 or less	Bucket: empty	T4-4-6
<b>SWING MOTOR LEAKAGE</b> <span style="float: right;">mm/5 min</span>	0	Bucket: loaded	T4-4-8
<b>MAXIMUM SWINGABLE SLANT ANGLE</b> <span style="float: right;">deg.</span>	20° or more	Bucket: loaded	T4-4-10
<b>SWING BEARING PLAY</b> <span style="float: right;">mm</span>	0.2 to 1.25	Allowable limit: 2.0 to 3.05	T4-4-11
<b>HYDRAULIC CYLINDER CYCLE TIME (Mono Boom)</b> <span style="float: right;">sec</span>		3.11 m arm 1.1 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	3.5±0.3		
Boom Lower (without HRV) (with HRV)	2.3±0.3 2.5±0.3	HRV: Hose Rupture Valve	
Arm Roll-In	3.6±0.3		
Arm Roll-Out	2.9±0.3		
Bucket Roll-In	3.1±0.3		
Bucket Roll-Out	2.5±0.3		
<b>HYDRAULIC CYLINDER CYCLE TIME (2-Piece Boom)</b> <span style="float: right;">sec</span>		3.11 m arm 1.1 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-12
Boom Raise	4.3±0.3		
Boom Lower (without HRV) (with HRV)	3.4±0.3 3.7±0.3	HRV: Hose Rupture Valve	
Arm Roll-In	3.8±0.3		
Arm Roll-Out	2.9±0.3		
Bucket Roll-In	3.1±0.3		
Bucket Roll-Out	2.5±0.3		
Positioning Lower (without HRV) (with HRV)	5.3±0.3 5.7±0.3	HRV: Hose Rupture Valve	
Positioning Raise	4.0±0.3		



## OPERATIONAL PERFORMANCE TEST / Standard


PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
<b>DIG FUNCTION DRIFT CHECK (Mono Boom)</b> <span style="float: right;">mm/5 min</span>		3.11 m arm 1.1 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	30 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 10 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	150 or less 110 or less	Bucket: loaded Bucket: empty	
<b>DIG FUNCTION DRIFT CHECK (2-Piece Boom)</b> <span style="float: right;">mm/5 min</span>		3.11 m arm 1.1 m <sup>3</sup> (PCSA heaped) bucket	T4-4-14
Boom Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 5 or less	Bucket: loaded Bucket: empty	
Arm Cylinder (Maximum Reach Position) (Arm Roll-In position)	30 or less 15 or less	Bucket: loaded Bucket: empty	
Bucket Cylinder (Maximum Reach Position) (Arm Roll-In position)	20 or less 10 or less	Bucket: loaded Bucket: empty	
Positioning Cylinder (Maximum Reach Position) (Arm Roll-In position)	40 or less 30 or less	Bucket: loaded Bucket: empty	
Bucket Bottom (Maximum Reach Position) (Arm Roll-In position)	200 or less 150 or less	Bucket: loaded Bucket: empty	

## OPERATIONAL PERFORMANCE TEST / Standard

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
<b>CONTROL LEVER OPERATING FORCE</b> N (kgf, lbf)		HITACHI lever pattern	T4-4-16
Boom Lever	16 (1.6, 3.6) or less		
Arm Lever (ISO Lever Pattern: Swing Lever)	13 (1.3, 2.9) or less		
Bucket Lever	13 (1.3, 2.9) or less		
Swing Lever (ISO Lever Pattern: Arm Lever)	16 (1.6, 3.6) or less		
Travel Lever	28 (2.8, 6.3) or less		
<b>CONTROL LEVER STROKE</b> mm		HITACHI lever pattern	T4-4-17
Boom Lever	97±10		
Arm Lever (ISO Lever Pattern: Swing Lever)	82±10		
Bucket Lever	82±10		
Swing Lever (ISO Lever Pattern: Arm Lever)	97±10		
Travel Lever	120±10		
<b>BOOM RAISE/SWING</b> sec	3.9±0.4	3.11 m arm 1.1 m <sup>3</sup> (PCSA heaped) bucket, bucket: empty	T4-4-18
Bucket Teeth Height: H (Mono Boom) (2-Piece Boom) mm	6700 or more 5800 or more		
<b>BOOM RAISE/ARM ROLL-IN/SWING</b> sec	(5.0±0.5)	3.11 m arm 1.1 m <sup>3</sup> (PCSA heaped) bucket	T4-4-19
<b>HYDRAULIC SYSTEM</b>			
<b>PRIMARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-1
Engine: Fast Idle	4.0 <sup>+1.0</sup> <sub>-0.5</sub> (40 <sup>+10</sup> <sub>-5</sub> , 580 <sup>+142</sup> <sub>-71</sub> )		
Engine: Slow Idle	3.8 <sup>+1.0</sup> <sub>-0</sub> (39 <sup>+10</sup> <sub>-0</sub> , 550 <sup>+142</sup> <sub>-0</sub> )		
<b>SECONDARY PILOT PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-3
(Engine: Fast Idle (noraml) and Slow Idle)	3.4 to 4.0 (34 to 40, 483 to 570)	Value indicated on Dr. ZX (Lever: Full stroke)	
<b>SOLENOID VALVE SET PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	Value Indicated On Dr. ZX±0.2 (2, 28)		T4-5-4
<b>MAIN PUMP DELIVERY PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)	0.8 <sup>+1.2</sup> <sub>-0.5</sub> (8 <sup>+12</sup> <sub>-5</sub> , 115 <sup>+175</sup> <sub>-71</sub> )	In neutral, Value indicated on Dr. ZX	T4-5-6

## OPERATIONAL PERFORMANCE TEST / Standard

 NOTE: 1 mm=0.03937 in

PERFORMANCE TEST DESIGNATION	ZX270-3 class (Performance Standard)	Remarks	Reference Page
<b>MAIN RELIEF VALVE PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)			T4-5-8
Boom, Arm, Bucket (Relief operation for each)	34.3 <sup>+2.0</sup> <sub>-0.5</sub> (350 <sup>+20</sup> <sub>-5</sub> , 4980 <sup>+284</sup> <sub>-71</sub> )	Value indicated on Dr. ZX	
Relief operation of Positioning (2-piece boom only)	35.5 <sup>+2.0</sup> <sub>-0.5</sub> (362 <sup>+20</sup> <sub>-5</sub> , 5160 <sup>+284</sup> <sub>-71</sub> )	Value indicated on Dr. ZX	
Power Digging	36.3 <sup>+2.0</sup> <sub>-1.0</sub> (370 <sup>+20</sup> <sub>-10</sub> , 5260 <sup>+284</sup> <sub>-142</sub> )	Value indicated on Dr. ZX	
<b>RELIEF PRESSURE</b> (Relief operation for Swing) MPa (kgf/cm <sup>2</sup> , psi)	33.3 <sup>+2.3</sup> <sub>-0.5</sub> (340 <sup>+23</sup> <sub>-5</sub> , 4840 <sup>+334</sup> <sub>-73</sub> )	Value indicated on Dr. ZX	T4-5-10
<b>OVERLOAD RELIEF PRESSURE</b> MPa (kgf/cm <sup>2</sup> , psi)		(Reference values at 50 L/min)	T4-5-12
Boom Lower, Arm Roll-In, Bucket Roll-In	37.2 <sup>+1.0</sup> <sub>-0</sub> (380 <sup>+10</sup> <sub>-0</sub> , 5400 <sup>+142</sup> <sub>-0</sub> )		
Boom Raise, Arm Roll-Out, Bucket Roll-Out	39.2 <sup>+1.0</sup> <sub>-0</sub> (400 <sup>+10</sup> <sub>-0</sub> , 5690 <sup>+142</sup> <sub>-0</sub> )		
<b>MAIN PUMP FLOW RATE</b> (L/min)	-	Refer to pages T4-2-10, 11.	T4-5-14
<b>SWING MOTOR DRAINAGE</b> (L/min)			T4-5-20
With constant speed	0.2 to 0.6		
With the motor relieved	(5 to 12)		
<b>TRAVEL MOTOR DRAINAGE</b> (L/min)			T4-5-22
With the track jacked up	Less than 10	Allowable limit: 10	
With the motor relieved	Less than 15	Allowable limit: 15	

## **OPERATIONAL PERFORMANCE TEST / Standard**

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