

PART NO.

TATA HITACHI

Reliable solutions

Technical Manual

Troubleshooting

ZAXIS

370

400

GI - SERIES

Hydraulic Excavator

Serial No. :

ZX370GI 000001 ONWARDS

ZX400GI 000001 ONWARDS

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SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 1 Introduction

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.

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 1 Introduction

Preparation for Performance Tests

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

THE MACHINE

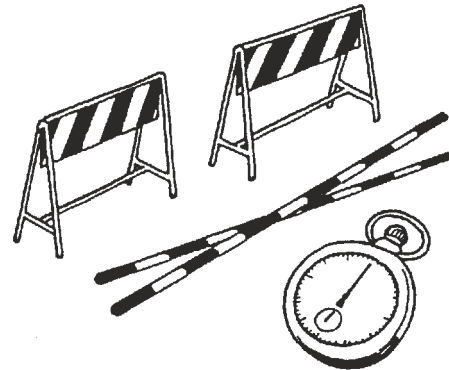
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

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

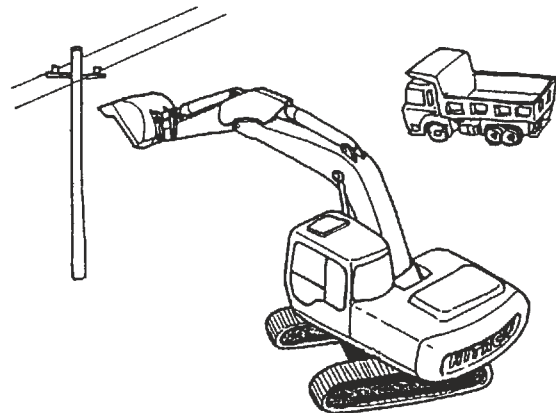
1. Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
2. Operate the machine carefully and always give first priority to safety.
3. While 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.



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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.



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SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

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.

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:

- Engine Control Dial : Fast Idle
- Power Mode : PWR
- Auto-Idle Switch: OFF
- Work Mode: Digging Mode
- Hydraulic Oil Temperature : 50 ± 5 °C (122 ± 9 °F)

ZX 370GI / ZX 400GI

Performance Test Designation	Performance Standard	Remarks	Reference Page
Engine Speed min⁻¹			T4-3-1
Slow Idle Speed	1000±100	Lever in neutral, Value indicated on MPDr.	
Fast Idle Speed (with ECO deactivated)	2100±50	Lever in neutral, Value indicated on MPDr.	
Fast Idle Speed (Heater control: OFF)	2000±75	Lever in neutral, Pilot shut-off lever: UNLOCK position, Value indicated on MPDr.	
Fast Idle Speed (Heater control: ON)	1950 to 2200	Pilot shut-off lever: LOCK position, Coolant temperature: 5 °C or lower, Value indicated on MPDr.	
Fast Idle Speed (Relief operation)	1950±75	Boom raise relief operation, Value indicated on MPDr.	
Fast Idle Speed (ECO mode)	2000±50	Lever in neutral, Value indicated on MPDr.	
Auto-Idle Speed	1300±100	Value indicated on MPDr.	
Warming-Up Speed	1400±100	Value indicated on MPDr.	

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

	ZX 370GI	ZX 400GI		
Performance Test Designation	Performance Standard	Performance Standard	Remarks	Reference Page
Engine Compression Pressure MPa (kgf/cm ² , psi)	3.24 (33, 470)	3.24 (33,470)	Engine speed: 200 min ⁻¹	T4-3-4
Valve Clearance (IN, EX) mm	0.4	0.4	With the engine cold	T4-3-6
Lubricant Consumption (Rated output) mL/h	70 or less	70 or less	Hour meter: 2000 hours or less	T4-3-20
Travel Speed sec/20 m		sec/20m		T4-4-1
Fast Speed	15.0±2.0	14.1±1.0		
Slow Speed	22.4±2.0	24.82±2.0		
Track Revolution Speed sec/3 rev		sec/3rev		T4-4-2
Fast Speed	34.8±2.0	41.3±2.0	H, LCH: 34.8±2.0	
Slow Speed	34.8±2.0	41.3±2.0	H, LCH: 34.8±2.0	
Mistrack (With fast and slow travel speed modes) mm/20 m	200 or less	≤150		T4-4-3
Travel Motor Leakage mm/5 min	0	0		T4-4-4

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

ZX 370GI / ZX 400GI

Performance Test Designation	Performance Standard	Remarks	Reference Page
Dig Function Drift Check (Mono Boom) mm/5 min		2.67 m arm 1.3 m ³ (PCSA heaped) bucket	T4-4-16
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	

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

ZX 370GI / ZX 400GI


Performance Test Designation		Performance Standard	Remarks	Reference Page
Control Lever Operating Force	N (kgf)		ISO lever pattern	T4-4-19
Boom Lever		16(1.6) or less		
Swing Lever (Hitachi Lever Pattern: Arm Lever)		13(1.3) or less		
Bucket Lever		13(1.3) or less		
Arm Lever (Hitachi Lever Pattern: Swing Lever)		16(1.6) or less		
Travel Lever		28(2.8) or less		
Control Lever Stroke	mm		ISO lever pattern	T4-4-20
Boom Lever		96±10		
Swing Lever (Hitachi Lever Pattern: Arm Lever)		81±10		
Bucket Lever		81±10		
Arm Lever (Hitachi Lever Pattern: Swing Lever)		96±10		
Travel Lever		120±10		
Boom Raise/Swing	sec	4.0±0.4	2.67 m arm 1.3 m ³ (PCSA heaped) bucket Bucket: empty	T4-4-21
(Bucket Teeth Height: H)	mm	6400 or more		
Boom Raise/Arm Roll-In	sec	(5.5±0.5)	2.67 m arm 1.3 m ³ (PCSA heaped) bucket	T4-4-22

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

Main Pump P-Q Diagram

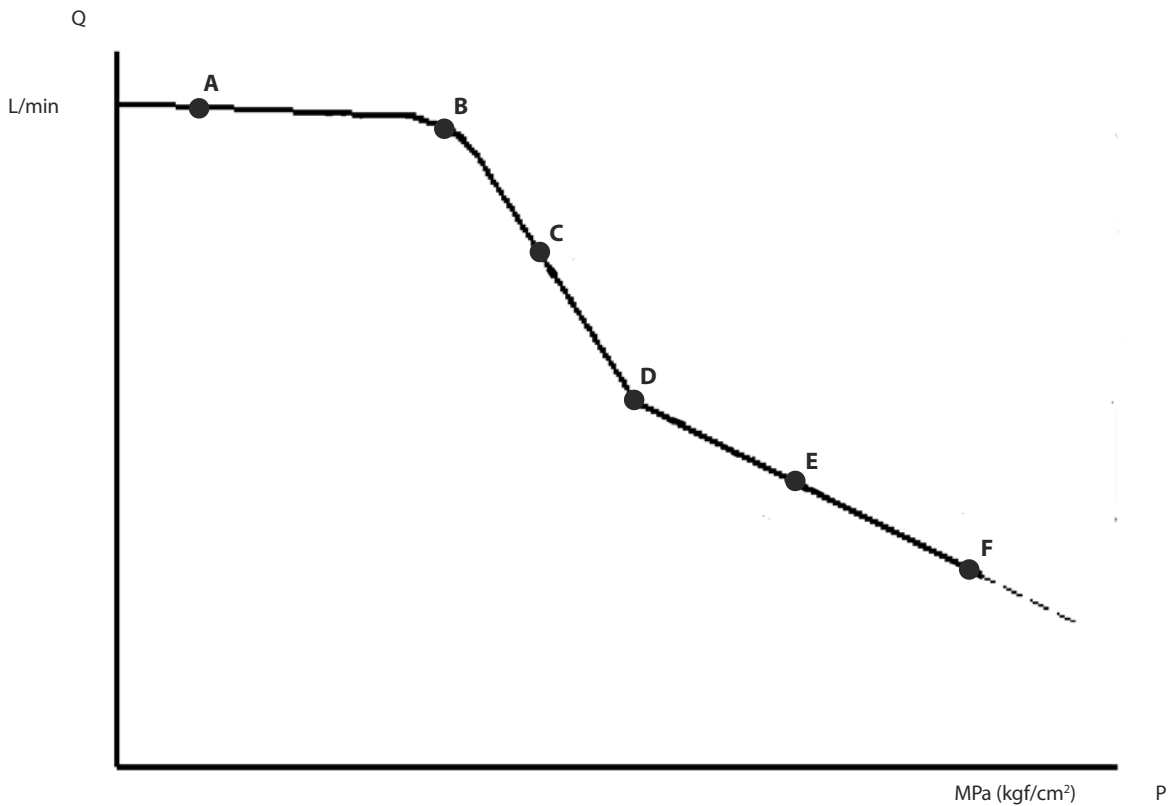
- P-Q Control (Torque Control)
(Reference: Measured at Test Stand)
 - Rated Pump Speed: 1900 min⁻¹ (rpm)
 - Hydraulic Oil Temperature: 50±5 °C (122±9 °F)

 NOTE: Refer to T4-5-16.

Points on P-Q Line

	Delivery Pressure MPa (kgf/cm ² , psi)	Flow Rate L/min (gpm)
A	4.9 (50, 710)	272±3 (71.8±0.79)
B	18.0 (184, 2610)	[269 (71)]
C	20.4 (208, 2960)	234±6 (61.7±1.58)
D	22.1 (225, 3210)	[210 (55.4)]
E	26.4 (269, 3830)	180±6 (47.5±1.58)
F	34.3 (350, 4970)	127±6 (33.5±1.58)

The valve indicated in parentheses is only a reference valve.



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SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 2 Standard

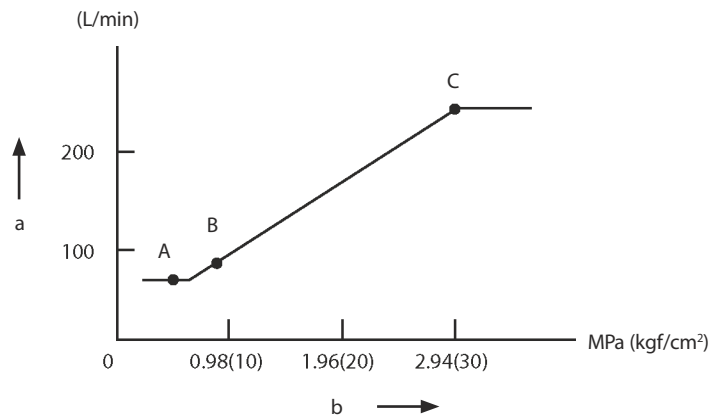
- P-Q Control by Pump Control Pilot Pressure Signal
(Reference: Measured at Test Stand)

- Rated Pump Speed: 1900 min⁻¹ (rpm)
- Hydraulic Oil Temperature: 50±5 °C (122±9°F)

 NOTE: Refer to T4-5-18.

Points on P-Q Line

	Pilot Pump Control Pressure MPa (kgf/cm ²)	Flow Rate L/min
A	-	73±3 (19.3±0.79)
B	1.67±0.05 (17±0.5, 240±7.3)	93±3 (24.5±0.79)
C	2.9 ^{+0.05} _{-0.29} (30 ^{+0.5} ₋₃ , 420 ^{+7.3} ₋₄₂)	272±3 (71.8±0.79)



TDDE-04-02-001

a- Flow Rate

b- Pump Control Pressure

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