

# INJECTION PUMP TEST SPECIFICATIONS

196000-1775

MANUFACTURER	TOYOTA	INJECTION PUMP		<b>196000-177#</b>				
ENGINE TYPE	5L			VE4/10F2200RND177				
VEHICLE MODEL	HIACE S.B.W	ROTATION	Clockwise viewed from drive side	GOVERNOR TYPE	Maximum-minimum speed			
RATED VOLTAGE	12V	INJECTION ORDER	A - B - C - D	INJECTION INTERVAL	90° ± 30'			
Dimension KF (mm)		6.50 ± 0.10		Dimension MS (mm)		0.45 ± 0.10		
Dimension K (mm)		3.30 ± 0.10		Dimension PS (mm)		—		
<b>1. TEST CONDITIONS</b>								
Nozzle		093400-0540 (DN12SD12A)		Feed Pressure		19.6 kPa (0.2 kgf/cm <sup>2</sup> )		
Nozzle Opening Pressure		14.7 ± 0.5 MPa (150 ± 5 kgf/cm <sup>2</sup> )		High Pressure Pipe		Ø2 X Ø6 X 840 mm		
Test Oil		SAE J967 (ISO4113)		Fuel Temperature		40 - 45 °C (104 - 113°F)		
NOTE : Apply 6 volts DC across the fuel cut solenoid during adjustment.								
<b>2. PRE-ADJUSTMENT</b> <span style="float:right">Applying 0 V to T.C.V.</span>								
	Lever Position (deg)	Pump Speed (rpm)	Absolute Pressure		Fuel Delivery		Max. Spread in Delivery	
			(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/200st)	(mm <sup>3</sup> )	(cc)
Full Load	28.5 ± 5°	1200	101.0 ± 0.2	760.0 ± 1.5	62.6 ± 0.5	12.5 ± 0.1	2.0	0.4
High Speed	(Full)	2450	101.0 ± 0.2	760.0 ± 1.5	27.0 ± 2.5	5.4 ± 0.5	—	—
<b>3. ADJUSTMENT OF INTERNAL PRESSURE</b> <span style="float:right">Applying 0 V to T.C.V.</span>								
Lever Position	Pump Speed (rpm)	Absolute Pressure		Internal Pressure		Remarks		
		(kPa)	(mmHg)	(kPa)	(kgf/cm <sup>2</sup> )			
Full	500	101.0 ± 0.2	760.0 ± 1.5	343.5 ± 29.5	3.5 ± 0.3	By the regulating valve		
	2100	101.0 ± 0.2	760.0 ± 1.5	647.0 ± 29.0	6.6 ± 0.3			
<b>4. OVERFLOW QUANTITY CHECK</b> <span style="float:right">Applying 0 V to T.C.V.</span>								
Lever Position	Pump Speed (rpm)	Absolute Pressure		Overflow Quantity		Remarks		
		(kPa)	(mmHg)	(L/h)	(cc/1000st)			
Full	2200	101.0 ± 0.2	760.0 ± 1.5	22 - 48	167 - 364			
NOTE : The overflow valve belonging to the pump should be used checking.								
<b>5. ADJUSTMENT OF TIMER</b> <span style="float:right">Applying 0 V to T.C.V.</span>								
Lever Position	Pump Speed (rpm)	Absolute Pressure		Piston Travel (mm)	Remarks			
		(kPa)	(mmHg)					
Full	800	101.0 ± 0.2	760.0 ± 1.5	2.05 ± 0.40	Max. piston travel			
	1200	101.0 ± 0.2	760.0 ± 1.5	3.81 ± 0.40				
	1900	101.0 ± 0.2	760.0 ± 1.5	6.89 ± 0.40				
	2200	101.0 ± 0.2	760.0 ± 1.5	7.30 ± 0.24				
NOTE : Hysteresis at each pump speed is less than 0.3 mm.								

**6. ADJUSTMENT OF DAC**

Applying 0 V to T.C.V.

Lever Position	Pump Speed (rpm)	Absolute Pressure		Fuel Delivery		Max. Spread in Delivery		Remarks
		(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/200st)	(mm <sup>3</sup> )	(cc)	
Full	1200	101.0 ± 0.2	760.0 ± 1.5	62.6 ± 0.5	12.5 ± 0.1	2.0	0.4	
	1200	85.3 ± 0.2	640.0 ± 1.5	56.0 ± 1.5	11.2 ± 0.3	—	—	

**7. ADJUSTMENT OF FUEL DELIVERY**

Applying 0 V to T.C.V.

Lever Position	Pump Speed (rpm)	Absolute Pressure		Fuel Delivery		Max. Spread in Delivery		Remarks
		(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/200st)	(mm <sup>3</sup> )	(cc)	
Full	1200	101.0 ± 0.2	760.0 ± 1.5	62.6 ± 0.5 = A	12.5 ± 0.1 = A	2.0	0.4	By full load setting screw
	2450	101.0 ± 0.2	760.0 ± 1.5	27.0 ± 2.5	5.4 ± 0.5	—	—	By max. speed setting screw
	2300	101.0 ± 0.2	760.0 ± 1.5	42.3 ± 4.0	8.5 ± 0.8	—	—	
	2700	101.0 ± 0.2	760.0 ± 1.5	Less than 5.0	Less than 1.0	—	—	
	100	101.0 ± 0.2	760.0 ± 1.5	80.0 ± 10.0	16.0 ± 2.0	7.0	1.4	By governor sleeve plug
	500	101.0 ± 0.2	760.0 ± 1.5	55.0 ± 2.0	11.0 ± 0.4	2.5	0.5	
	2000	101.0 ± 0.2	760.0 ± 1.5	59.8 ± 1.8	12.0 ± 0.4	2.5	0.5	

**8. SETTING OF LOAD SENSING TIMER**

Applying 0 V to T.C.V.

Lever Position	Pump Speed (rpm)	Absolute Pressure		Fuel Delivery		Remarks
		(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/200st)	
Start of Load Sensing	1200	101.0 ± 0.2	760.0 ± 1.5	(A – 5.0) ± 2.0	(A – 1.0) ± 0.4	By governor shaft
End of Pressure Drop	1200	101.0 ± 0.2	760.0 ± 1.5	43.6 ± 1.0	8.7 ± 0.2	Check
Check Points	1. Piston Travel at End of Pressure Drop : 2.17 ± 0.50 mm (pump speed 1200 rpm) 2. Dimension of Governor Shaft : L = 1.25 ± 0.75 mm					

9. SETTING OF ADJUSTING LEVER AT LOW SPEED							Applying 0 V to T.C.V.
Lever Position (deg)	Pump Speed (rpm)	Absolute Pressure (kPa)	Fuel Delivery		Max. Spread in Delivery		Remarks
			(mm <sup>3</sup> /st)	(cc/500st)	(mm <sup>3</sup> )	(cc)	
- 17.5 ± 5° (Idle)	400	101.0 ± 0.2 (760.0 ± 1.5 mmHg)	15.2 ± 1.5 = B	7.6 ± 0.8 = B	1.7	0.9	Lever setting
	475	101.0 ± 0.2 (760.0 ± 1.5 mmHg)	(B - 7.0) ± 2.5	(B - 3.5) ± 1.3	—	—	

10. SETTING OF ADJUSTING LEVER AT PARTIAL RANGE							— : Not Applicable
Pump Speed (rpm)	Absolute Pressure		Fuel Delivery		Remarks		
	(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/500st)			
—	—	—	—	—	—		

11. CHARACTERISTIC OF A.C.S.D.							Applying 0 V to T.C.V.
Lever Position	Pump Speed (rpm)	Absolute Pressure		Measuring Value	Remarks		
		(kPa)	(mmHg)				
Idle	400	101.0 ± 0.2	760.0 ± 1.5	0.69 ± 0.10 mm	Piston Travel		
	400	101.0 ± 0.2	760.0 ± 1.5	1.0 ± 0.5 mm <sup>3</sup> /st	Idle-up Quantity (0.5 ± 0.3 cc/500st)		
Fuel temperature : 39 - 41°C							

12. ADJUSTMENT OF T.C.V.						
Lever Position	Pump Speed (rpm)	Absolute Pressure		Piston Travel (mm)	Remarks	
		(kPa)	(mmHg)			
At End Pressure Drop	1200	101.0 ± 0.2	760.0 ± 1.5	3.81 ± 0.7	With applying 6.0 ± 0.1 (V)	

13. SETTING OF DIAPHRAGM FOR HEATER & POWER STEERING							Absolute Pressure : 760 ± 1.5 mmHg, Applying 0 V to T.C.V.
Pump Speed (rpm)	Vacuum Pressure		Fuel Delivery		Remarks		
	(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/500st)			
450	- 46.7	- 350	19.5 ± 1.5	9.8 ± 0.8	PS Idle up (No. 1 Actuator), Make ACSD free		
475	- 46.7	- 350	21.9 ± 1.0	11.0 ± 0.5	A/C Idle up (No. 2 Actuator), Make ACSD free		

14. ADJUSTMENT OF POWER CONTROL							— : Not Applicable
Lever Position	Pump Speed (rpm)	Boost Pressure		Fuel Delivery		Remarks	
		(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/200st)		
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15. ADJUSTMENT OF THROTTLE POSITION SENSOR							— : Not Applicable
Lever Position	Pump Speed (rpm)	Absolute Pressure		Fuel Delivery		Sensor Output Voltage (V)	Remarks
		(kPa)	(mmHg)	(mm <sup>3</sup> /st)	(cc/500st)		
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16. FINAL CHECK AFTER ADJUSTMENT
1. Range of lever angle between idle and full lever position is $46 \pm 5^\circ$ . 2. Resistance of pick-up tachometer must be $810 \pm 160$ ohms. 3. After adjustment has been completed, delivery quantity must be 0 mm <sup>3</sup> /st (0 cc/200st) when voltage at fuel cut solenoid is reduced to zero. (Pump Speed Np = 100 rpm)