

INJECTION PUMP TEST SPECIFICATIONS

096500-3060

INJECTION PUMP	096500-3060 (VE4/10E2300RND306)	Rotation	Clockwise viewed from drive side
MANUFACTURER	MAZDA		
ENGINE TYPE	R2	Injection Order	A - B - C - D
VEHICLE MODEL	E SERIES	Injection Interval	90°
GOVERNOR TYPE	Electronic control	Rated Voltage	14 ± 0.1 V
TIMER	Electronic control	Dimension KF (mm)	5.30 ± 0.10
Pump Select Switch No. (ECD Controller)	4	Dimension K (mm)	3.30 ± 0.10

1. TEST CONDITIONS

1) Nozzle	093400-3230 (DN12SD12A)	4) Feed Pressure	19.6 kPa (0.2 kg/cm ²)
2) Nozzle Opening Pressure	14.7 ± 0.2 MPa (150 ± 2 kg/cm ²)	5) High Pressure Pipe	∅2 × ∅6 × 840 mm
3) Test Oil	SAE J967 (ISO4113)	6) Inlet Fuel Temperature	40 - 43 °C (104 - 109.4 °F)

2. INSPECTION OF FUEL TEMPERATURE SENSOR

Pump Speed (rpm)	ECD CONTROLLER SETTING				Sensor Resistance (kΩ)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
—	Fuel Temperat	—	—	REC OFF	1.85 ± 1.50	

3. INSPECTION OF Ne SENSOR

Pump Speed (rpm)	ECD CONTROLLER SETTING				Sensor Output Voltage (V)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
50	Np	—	—	REC OFF	0.1 or more	

4. BREAK-IN DRIVE

Pump Speed (rpm)	ECD CONTROLLER SETTING				Check	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
0	SPV OFF	446	0	REC OFF	—	Setting
1275	SPEED	446	0	REC OFF	No fuel leaks, no abnormal noise, and no abnormal temperature rising.	Drive more than 5 minutes.

5. INTERNAL PRESSURE

Pump Speed (rpm)	ECD CONTROLLER SETTING				Internal Pressure (kg/cm ²)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
0	SPV OFF	3D0	0	REC OFF	—	
2125	SPEED	3D0	0	REC OFF	8.75 ± 0.15 (857.9 ± 14.7 kPa)	Adjust by Regulating Valve
100	SPV OFF	539	0	REC OFF	2.00 or more (196 kPa)	Confirmation

6. OVERFLOW QUANTITY

Pump Speed (rpm)	ECD CONTROLLER SETTING				Overflow Quantity (cc/1000st)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
0	SPV OFF	3D0	0	REC OFF	—	
2125	SPEED	3D0	0	REC OFF	157 - 251	If it's out of specification, change overflow valve.

7. ADJUSTMENT OF TIMER (Always stop pump when changing the first digit of injection quantity command.)

Pump Speed (rpm)	ECD CONTROLLER SETTING				Timer Stroke (mm)	Remarks	
	Display Selector	Injection Quantity Command					Duty Ratio Command
2125	Timer Adjust	000			0	REC OFF	Internal Pressure : 2.0 kgf/cm ² or more (196.0 kPa)
1275	Timer Adjust	100			0	REC OFF	
1275	Timer Adjust	200			50	REC OFF	
1275	Timer Adjust	300			100	REC OFF	
200	Timer Adjust	400			0	REC OFF	
100	Timer Adjust	500			0	REC OFF	

NOTE : Adjustment should be done by Timer Adjust Shim.

8. PRESETTING FOR CAM ANGLE ADJUSTMENT

Pump Speed (rpm)	Display Selector	Injection Quantity Command			Duty Ratio Command	Pump Select Switch	DENSO Standard [ND - CPS] (cc/200st-cyl.)	Bench Standard (mm ³ /st-cyl.)	Remarks
		First digit	Second digit	Third digit					
0	SPV OFF	4	5	3	100	REC OFF	—	—	
360	SPL	4	5	3	100	REC OFF	3.4 ± 0.1	17.0 ± 0.1	
360	SPV OFF	4	<input type="checkbox"/>	<input type="checkbox"/>	100	REC OFF	—	—	If Q is out of Target Quantity with 4, 5, 3, adjust 2nd. and 3rd. digits to get "Target Quantity".
360	SPL	4	<input type="checkbox"/>	<input type="checkbox"/>	100	REC OFF	3.4 ± 0.1	17.0 ± 0.1	Re-measurement

- When the correction value is raised by 1 level, the injection quantity is increased approx. 0.2 - 0.3 mm³/st (0.04 - 0.06 cc/200st).

9. ADJUSTMENT OF CAM ANGLE

Pump Speed (rpm)	Display Selector	Injection Quantity Command			Duty Ratio Command	Pump Select Switch	Target Angle (°CA) [Data on Display]	Remarks
		First digit	Second digit	Third digit				
0 to 360	Cam Angle	0	0	0	100	REC OFF	14.05 ± 0.50	
360	Cam Angle	0	<input type="checkbox"/>	<input type="checkbox"/>	100	REC OFF	14.05 ± 0.50	Adjust 2nd. and 3rd. digits to get "Target Angle".

NOTE : Select "REC ON" position after "Target Angle" is gotten.
: Never forget removing pressure sensor from piping.

10. ADJUSTMENT OF FUEL DELIVERY (When the correction value is raised by 1 level, the injection quantity is increased approx. 0.2 - 0.3 mm³/st·cyl (0.04 - 0.06 cc/200st·cyl).)

Pump Speed (rpm)	ECD CONTROLLER SETTING				Target Quantity [DENSO Standard] (cc/200st·cyl.)	Bench Standard (mm ³ /st·cyl.)	Max. Spread In Delivery (mm ³ /st)	Outlet Fuel Temperature (°C)
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch				
100	Q Adjust	000	0	REC OFF	3.8 ± 0.3	17.6 ± 1.7	—	41.0 ± 1.5
100	Q Adjust	100	0	REC OFF	10.2 ± 0.5	49.1 ± 2.5	6.0	41.0 ± 1.5
340	Q Adjust	200	0	REC OFF	1.6 ± 0.2	6.9 ± 1.0	2.0	41.0 ± 1.5
340	Q Adjust	300	0	REC OFF	6.8 ± 0.3	31.7 ± 1.5	—	41.0 ± 1.5
850	Q Adjust	400	0	REC OFF	2.8 ± 0.3	13.2 ± 1.5	2.5	42.0 ± 1.5
850	Q Adjust	500	0	REC OFF	8.3 ± 0.3	40.7 ± 1.5	—	42.0 ± 1.5
1275	Q Adjust	600	0	REC OFF	2.8 ± 0.3	13.3 ± 1.5	2.5	44.0 ± 1.5
1275	Q Adjust	700	0	REC OFF	9.1 ± 0.3	44.3 ± 1.5	—	44.0 ± 1.5
2125	Q Adjust	800	0	REC OFF	3.4 ± 0.4	16.9 ± 1.8	2.5	50.0 ± 1.5
2125	Q Adjust	900	0	REC OFF	8.8 ± 0.3	40.4 ± 1.5	—	50.0 ± 1.5

NOTE : Adjust 2nd. and 3rd. degits of "Injection Volume Command Value" switch to get target quantity.

11. RECONFIRMATION OF FUEL DELIVERY

Pump Speed (rpm)	ECD CONTROLLER SETTING				Target Quantity [DENSO Standard] (cc/200st·cyl.)	Bench Standard (mm ³ /st·cyl.)	Max. Spread In Delivery (mm ³ /st)	Outlet Fuel Temperature (°C)
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch				
100	Confirm	000	0	REC OFF	3.8 ± 0.3	17.6 ± 1.7	—	41.0 ± 1.5
100	Confirm	100	0	REC OFF	10.2 ± 0.5	49.1 ± 2.5	6.0	41.0 ± 1.5
340	Confirm	200	0	REC OFF	1.6 ± 0.2	6.9 ± 1.0	2.0	41.0 ± 1.5
340	Confirm	300	0	REC OFF	6.8 ± 0.3	31.7 ± 1.5	—	41.0 ± 1.5
850	Confirm	400	0	REC OFF	2.8 ± 0.3	13.2 ± 1.5	2.5	42.0 ± 1.5
850	Confirm	500	0	REC OFF	8.3 ± 0.3	40.7 ± 1.5	—	42.0 ± 1.5
1275	Confirm	600	0	REC OFF	2.8 ± 0.3	13.3 ± 1.5	2.5	44.0 ± 1.5
1275	Confirm	700	0	REC OFF	9.1 ± 0.3	44.3 ± 1.5	—	44.0 ± 1.5
2125	Confirm	800	0	REC OFF	3.4 ± 0.4	16.9 ± 1.8	2.5	50.0 ± 1.5
2125	Confirm	900	0	REC OFF	8.8 ± 0.3	40.4 ± 1.5	—	50.0 ± 1.5

12. CHECK POINT

Pump Speed (rpm)	ECD CONTROLLER SETTING				Target Quantity [DENSO Standard] (cc/200st·cyl.)	Bench Standard (mm ³ /st·cyl.)	Outlet Fuel Temperature (°C)
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch			
2550	Confirm	A00	0	REC OFF	3.6 ± 0.6	18.3 ± 3.0	52.0 ± 4.0
2600	Confirm	B00	0	REC OFF	2.0 or less	9.9 or less	53.0 ± 4.0

13. NOTE

Timing mark re-marking position : Based on cylinder A, cam lift distance (plunger) should be 1.25 mm

INJECTION PUMP TEST SPECIFICATIONS

096500-306#

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MANUFACTURER	MAZDA		
ENGINE TYPE	R2	Injection Order	A - B - C - D
VEHICLE MODEL	E SERIES	Injection Interval	90°
GOVERNOR TYPE	Electronic control	Rated Voltage	14 V
TIMER	Electronic control	Dimension KF (mm)	5.30 ± 0.10
Pump Select Switch No. (ECD Controller)	4	Dimension K (mm)	3.30 ± 0.10

1. TEST CONDITIONS

1) Nozzle	093400-3230 (DN12SD12A)	4) Feed Pressure	19.6 kPa (0.2 kg/cm ²)
2) Nozzle Opening Pressure	14.7 ± 0.2 MPa (150 ± 2 kg/cm ²)	5) High Pressure Pipe	∅2 × ∅6 × 840 mm
3) Test Oil	SAE J967 (ISO4113)	6) Inlet Fuel Temperature	40 - 43 °C (104 - 109.4 °F)

2. INSPECTION OF FUEL TEMPERATURE SENSOR

Pump Speed (rpm)	ECD CONTROLLER SETTING				Sensor Resistance (kΩ)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
—	Fuel Temperat	—	—	REC OFF	3.48 ± 3.13	

3. INSPECTION OF Ne SENSOR

Pump Speed (rpm)	ECD CONTROLLER SETTING				Sensor Output Voltage (V)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
50	Np	—	—	REC OFF	0.1 or more	

4. BREAK-IN DRIVE

Pump Speed (rpm)	ECD CONTROLLER SETTING				Check	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
0	SPV OFF	446	0	REC OFF	—	Setting
1275	SPEED	446	0	REC OFF	No fuel leaks, no abnormal noise, and no abnormal temperature rising.	Drive more than 5 minutes.

5. INTERNAL PRESSURE

Pump Speed (rpm)	ECD CONTROLLER SETTING				Internal Pressure (kg/cm ²)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
0	SPV OFF	3D0	0	REC OFF	—	
2125	SPEED	3D0	0	REC OFF	8.75 ± 0.15 (857.9 ± 14.7 kPa)	Adjust by Regulating Valve
100	SPV OFF	539	0	REC OFF	2.00 or more (196 kPa)	Confirmation

6. OVERFLOW QUANTITY

Pump Speed (rpm)	ECD CONTROLLER SETTING				Overflow Quantity (cc/1000st)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
0	SPV OFF	3D0	0	REC OFF	—	
2125	SPEED	3D0	0	REC OFF	157 - 251	If it's out of specification, change overflow valve.

7. ADJUSTMENT OF TIMER

(Always stop pump when changing the first digit of injection quantity command.)

Pump Speed (rpm)	ECD CONTROLLER SETTING				Timer Stroke (mm)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch		
2125	Timer Adjust	000	0	REC OFF	10.30 ± 0.24	Internal Pressure : 8.8 ± 0.2 kgf/cm ² (857.9± 14.7 kPa)
1275	Timer Adjust	100	0	REC OFF	10.30 ± 0.24	
1275	Timer Adjust	200	50	REC OFF	5.00 ± 2.50	
1275	Timer Adjust	300	100	REC OFF	0	
200	Timer Adjust	400	0	REC OFF	3.60 or more	
100	Timer Adjust	500	0	REC OFF	0.40 or more	

NOTE : Adjustment should be done by Timer Adjust Shim.

8. PRESETTING FOR CAM ANGLE ADJUSTMENT

Pump Speed (rpm)	Display Selector	Injection Quantity Command			Duty Ratio Command	Pump Select Switch	Target Quantity [ND - CPS] (cc/200st-cyl.)	Dealer Original (cc/200st-cyl.)	Remarks
		First digit	Second digit	Third digit					
0	SPV OFF	4	5	3	100	REC OFF	—	—	
360	SPL	4	5	3	100	REC OFF	3.4 ± 0.1	3.4 ± 0.1	
360	SPV OFF	4	<input type="checkbox"/>	<input type="checkbox"/>	100	REC OFF	—	—	If Q is out of Target Quantity with 4, 5, 3, adjust 2nd. and 3rd. digits to get "Target Quantity".
360	SPL	4	<input type="checkbox"/>	<input type="checkbox"/>	100	REC OFF	3.4 ± 0.1	3.4 ± 0.1	Re-measurement

- When the correction value is raised by 1 level, the injection quantity is increased approx. 0.2 - 0.3 mm³/st (0.04 - 0.06 cc/200st).

9. ADJUSTMENT OF CAM ANGLE

Pump Speed (rpm)	Display Selector	Injection Quantity Command			Duty Ratio Command	Pump Select Switch	Target Angle (°CA) [Data on Display]	Remarks
		First digit	Second digit	Third digit				
0 to 360	Cam Angle	0	0	0	100	REC OFF	18.57 ± 0.5	
360	Cam Angle	0	<input type="checkbox"/>	<input type="checkbox"/>	100	REC OFF	18.57 ± 0.5	Adjust 2nd. and 3rd. digits to get "Target Angle".

NOTE:

1. Select "REC ON" position every time when recording the final correction value.
2. Never forget removing pressure sensor from piping.
3. When Adjusting: Set the nozzle opening pressure for cylinder "A" to 17.2 ± 0.1 MPa (175.0 ± 1.0 Kgf/cm²).
4. After Adjustment: Return nozzle opening pressure to the original value of 14.7 ± 0.1 MPa (15.0 ± 1.0 Kgf/cm²).

10. ADJUSTMENT OF FUEL DELIVERY

(When the correction value is raised by 1 level, the injection quantity is increased approx. 0.2 - 0.3 mm³/st·cyl (0.04 - 0.06 cc/200st·cyl).)

Pump Speed (rpm)	ECD CONTROLLER SETTING				Target Quantity [ND - CPS] (cc/200st·cyl.)	Dealer Original (cc/200st·cyl.)	Max. Spread In Delivery (mm ³ /st)	Outlet Fuel Temperature (°C)
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch				
100	Q Adjust	000	0	REC OFF	3.8 ± 0.3	4.3 ± 0.3	—	41.0 ± 1.5
100	Q Adjust	100	0	REC OFF	10.2 ± 0.5	10.9 ± 0.5	1.2	41.0 ± 1.5
340	Q Adjust	200	0	REC OFF	1.6 ± 0.2	1.8 ± 0.2	0.4	41.0 ± 1.5
340	Q Adjust	300	0	REC OFF	6.8 ± 0.3	6.7 ± 0.3	—	41.0 ± 1.5
850	Q Adjust	400	0	REC OFF	2.8 ± 0.3	2.6 ± 0.3	—	42.0 ± 1.5
850	Q Adjust	500	0	REC OFF	8.3 ± 0.3	8.2 ± 0.3	0.5	42.0 ± 1.5
1275	Q Adjust	600	0	REC OFF	2.8 ± 0.3	2.5 ± 0.3	—	44.0 ± 1.5
1275	Q Adjust	700	0	REC OFF	9.1 ± 0.3	8.0 ± 0.3	0.5	44.0 ± 1.5
2125	Q Adjust	800	0	REC OFF	3.4 ± 0.4	2.5 ± 0.4	—	50.0 ± 1.5
2125	Q Adjust	900	0	REC OFF	8.8 ± 0.3	7.9 ± 0.3	0.5	50.0 ± 1.5

NOTE : Adjust 2nd. and 3rd. degits of "Injection Volume Command Value" switch to get target quantity.

11. RECONFIRMATION OF FUEL DELIVERY

Pump Speed (rpm)	ECD CONTROLLER SETTING				Target Quantity [ND - CPS] (cc/200st·cyl.)	Dealer Original (cc/200st·cyl.)	Max. Spread In Delivery (mm ³ /st)	Outlet Fuel Temperature (°C)
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch				
100	Confirm	000	0	REC OFF	3.8 ± 0.3	4.3 ± 0.3	—	41.0 ± 1.5
100	Confirm	100	0	REC OFF	10.2 ± 0.5	10.9 ± 0.5	1.2	41.0 ± 1.5
340	Confirm	200	0	REC OFF	1.6 ± 0.2	1.8 ± 0.2	0.4	41.0 ± 1.5
340	Confirm	300	0	REC OFF	6.8 ± 0.3	6.7 ± 0.3	—	41.0 ± 1.5
850	Confirm	400	0	REC OFF	2.8 ± 0.3	2.6 ± 0.3	—	42.0 ± 1.5
850	Confirm	500	0	REC OFF	8.3 ± 0.3	8.2 ± 0.3	0.5	42.0 ± 1.5
1275	Confirm	600	0	REC OFF	2.8 ± 0.3	2.5 ± 0.3	—	44.0 ± 1.5
1275	Confirm	700	0	REC OFF	9.1 ± 0.3	8.0 ± 0.3	0.5	44.0 ± 1.5
2125	Confirm	800	0	REC OFF	3.4 ± 0.4	2.5 ± 0.4	—	50.0 ± 1.5
2125	Confirm	900	0	REC OFF	8.8 ± 0.3	7.9 ± 0.3	0.5	50.0 ± 1.5

12. CHECK POINT

Pump Speed (rpm)	ECD CONTROLLER SETTING				Target Quantity [ND - CPS] (cc/200st·cyl.)	Dealer Original (cc/200st·cyl.)	Outlet Fuel Temperature (°C)
	Display Selector	Injection Quantity Command	Duty Ratio Command	Pump Select Switch			
2550	Confirm	A00	0	REC OFF	3.6 ± 0.6	2.4 ± 0.6	52.0 ± 4.0
2600	Confirm	B00	0	REC OFF	2.0 or less	2.0 or less	53.0 ± 4.0

13. NOTE

Timing mark re-marking position : Based on cylinder A, cam lift distance (plunger) should be 1.25 mm