# ENGINE CONTROL SYSTEM

# SECTION EC



**MODIFICATION NOTICE:**
TD25 and TD25Ti engine models without EGR have been added for Turkey, Argentina and Brazil.

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**QD & TD**

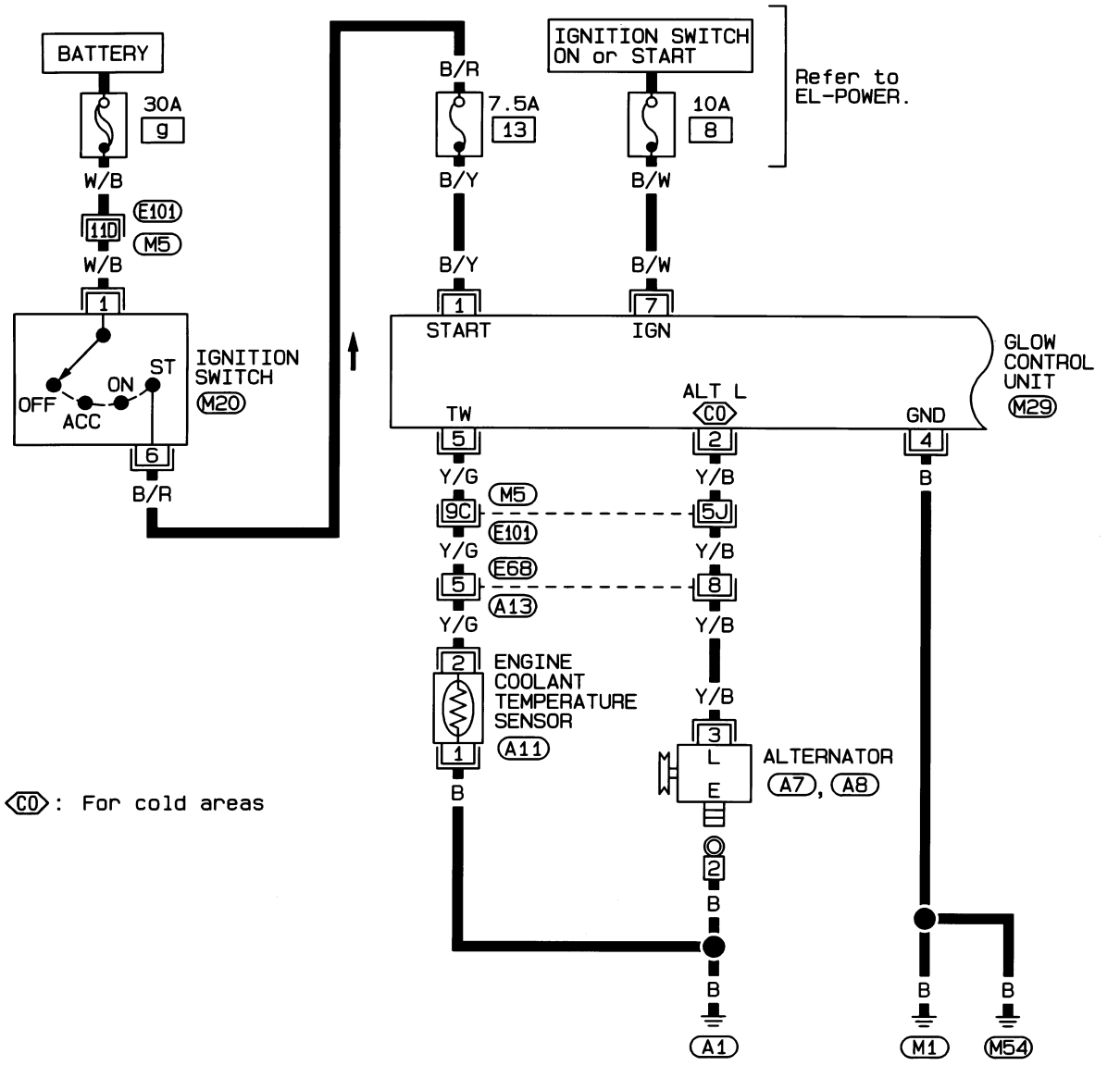


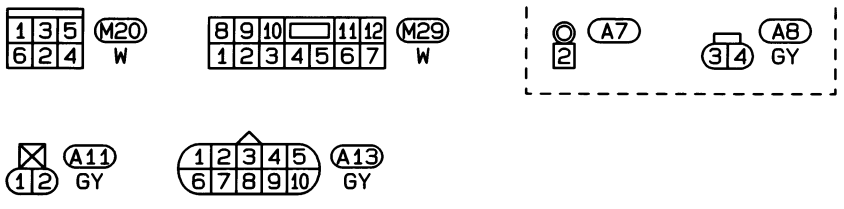
**TD**

## Wiring Diagram

### LHD MODELS WITH TD25, TD25Ti WITHOUT EGR, TD27 EXCEPT COLD AREAS QD32 ENGINES

EC-GLOW-01

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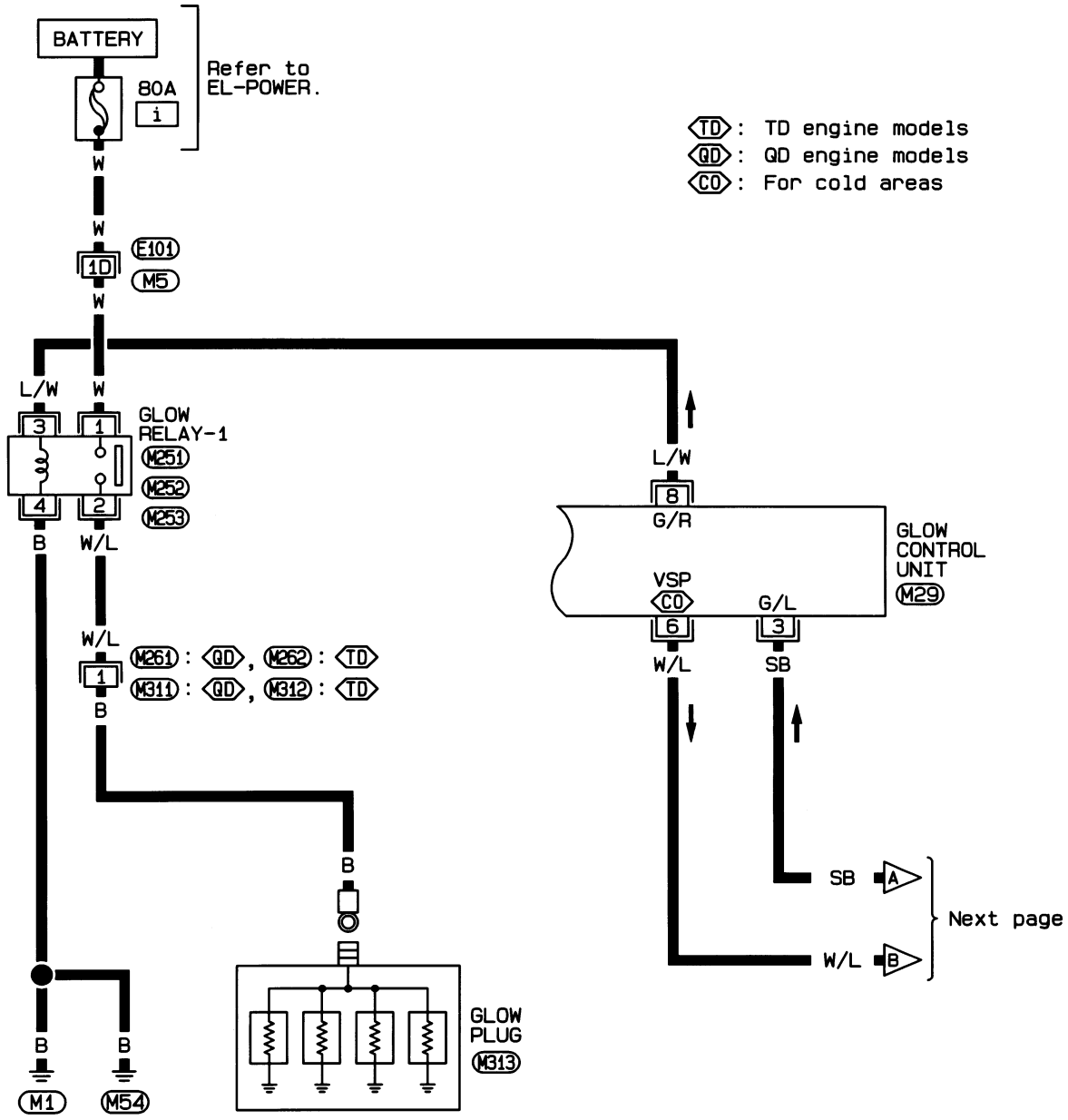
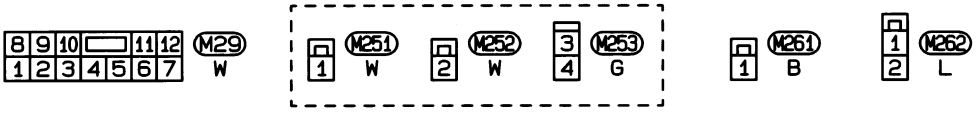
## Wiring Diagram (Cont'd)

EC-GLOW-02

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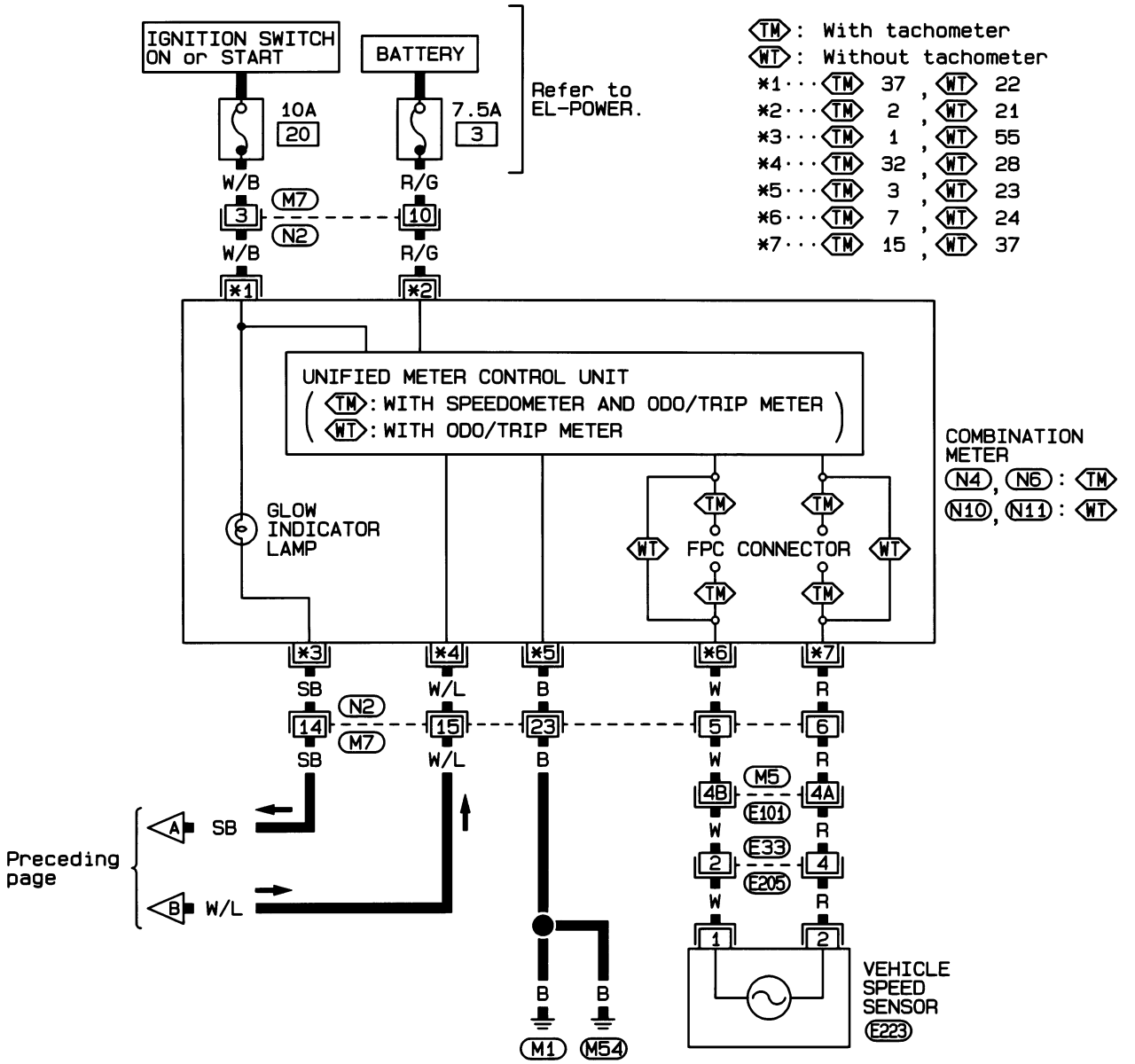
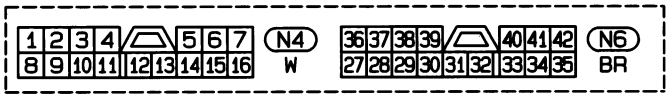
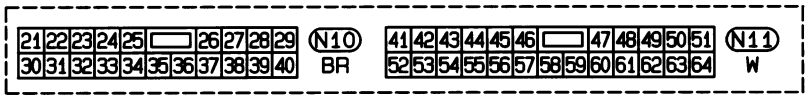
## Wiring Diagram (Cont'd)

EC-GLOW-03





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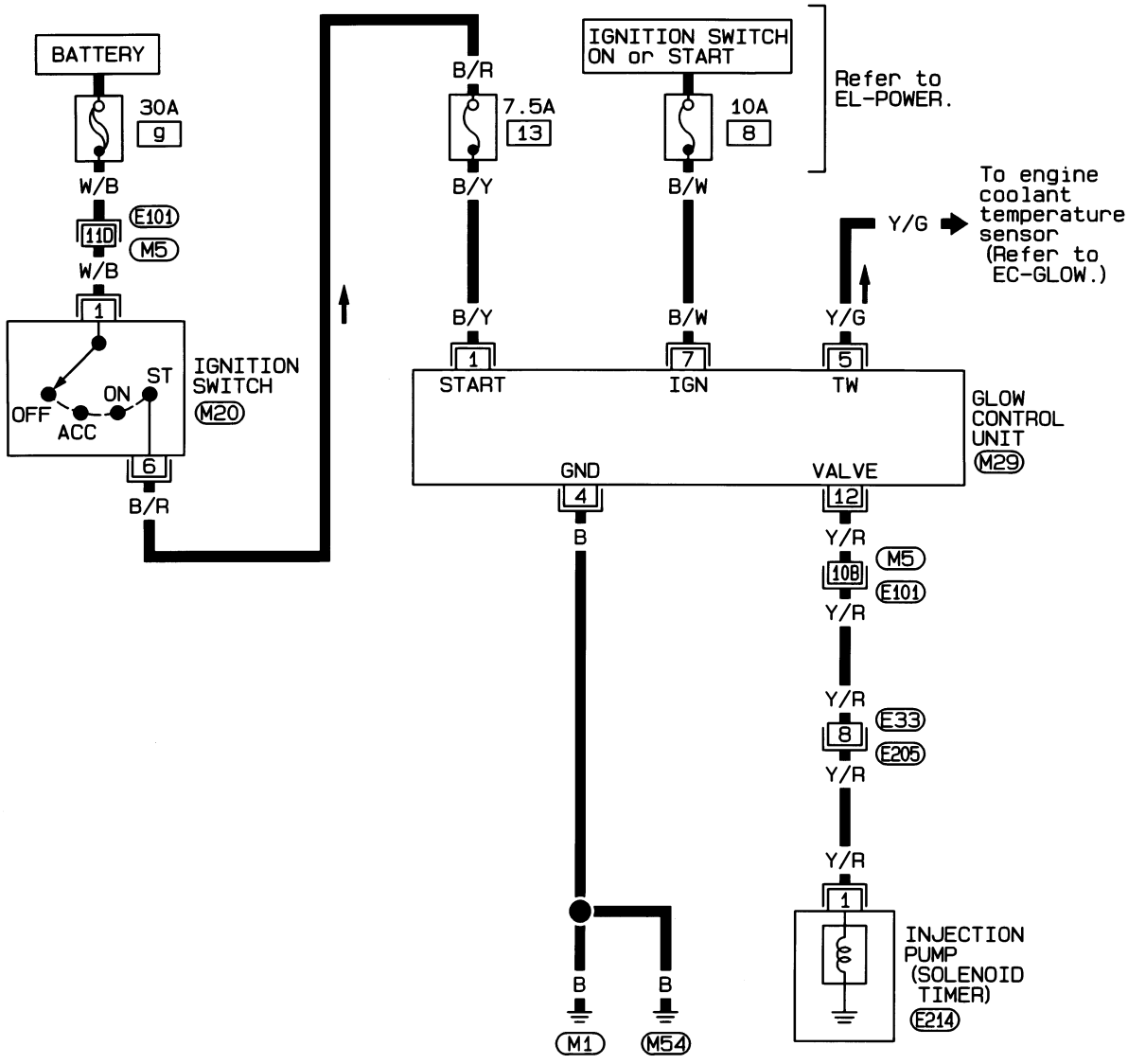
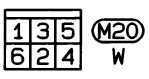
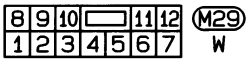
## Wiring Diagram

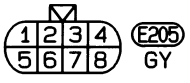
### TD25, TD25Ti WITHOUT EGR AND QD32 ENGINES

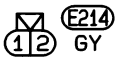
EC-PLA-01

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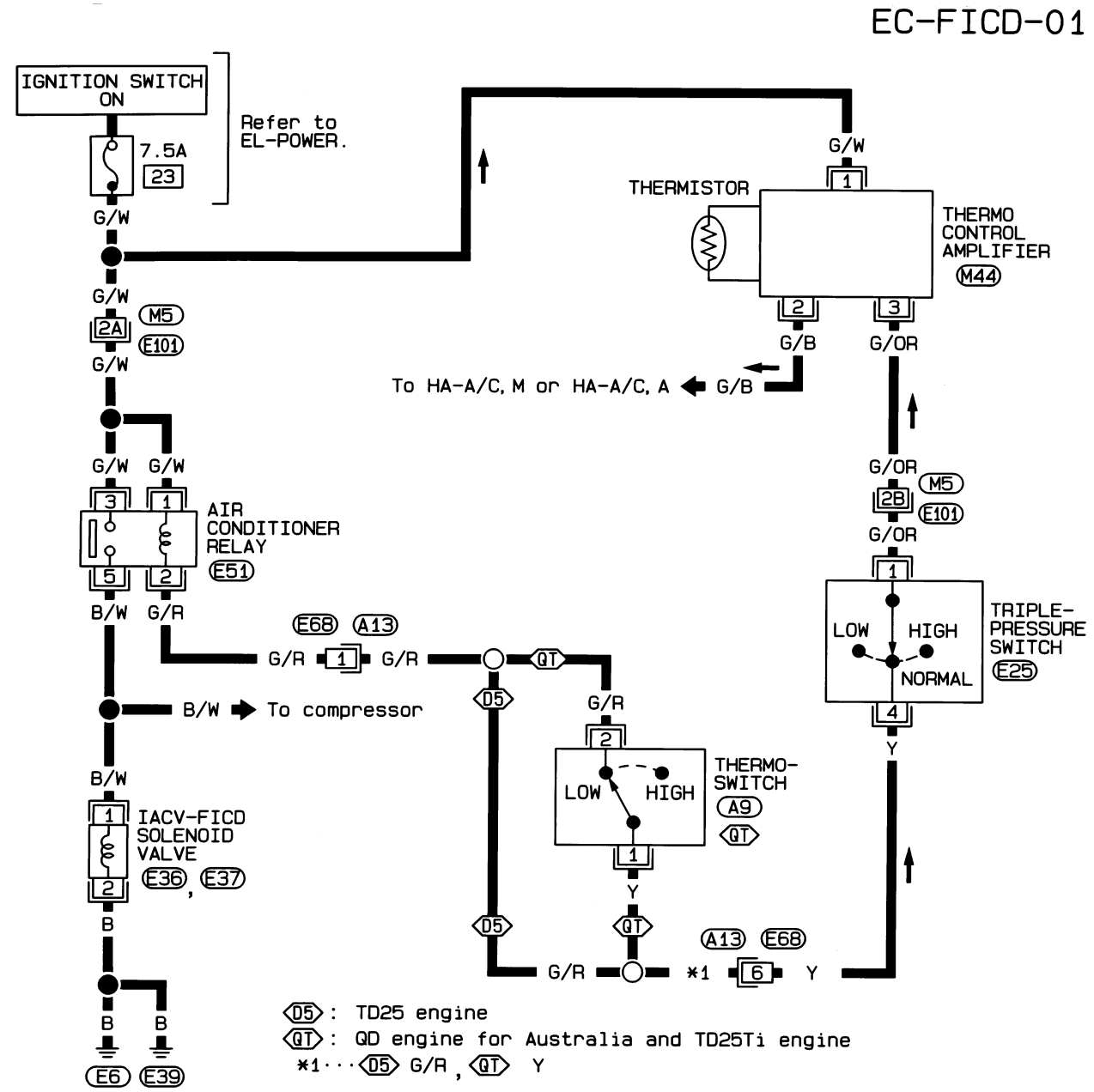
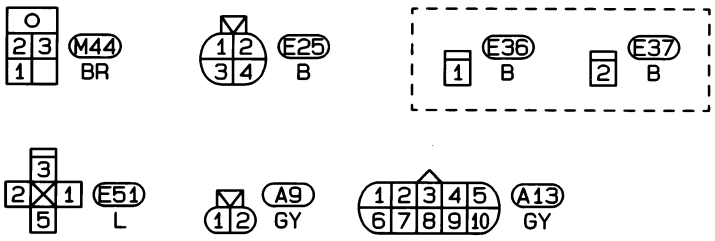
## Wiring Diagram

### QD32 ENGINE FOR AUSTRALIA, TD25 AND TD25Ti ENGINES WITH EGR

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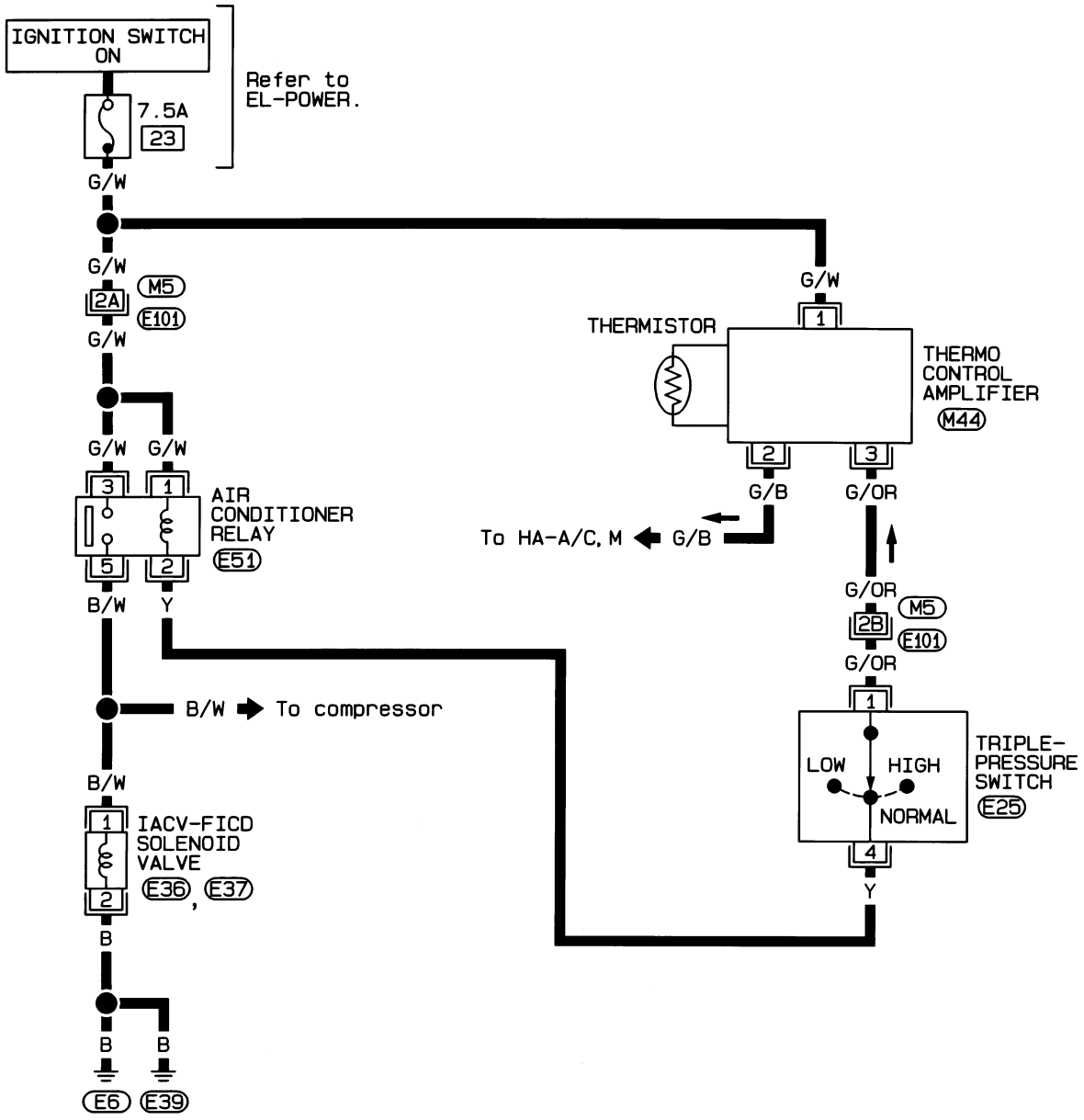
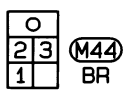
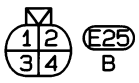
## Wiring Diagram (Cont'd)

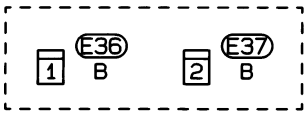
### QD32 ENGINE EXCEPT AUSTRALIA, TD25, TD25Ti ENGINES WITHOUT EGR AND TD27 ENGINE

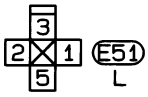
EC-FICD-02

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M5, E101

# VE-type Injection Pump

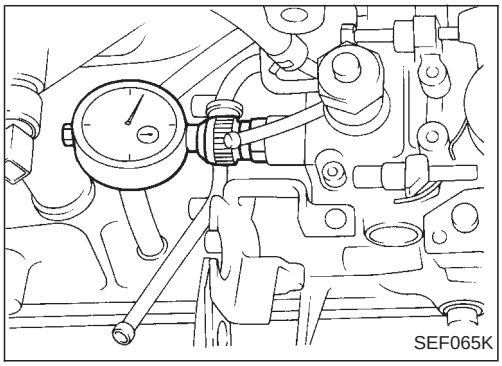
## APPLICATION

| Engine | Destination | Part No. | Pump assembly No. | Remarks |
|---|---|---|---|---|
| TD25 | Europe | 16700 3S300 | 104680-4952 | |
| | | 16700 3S301 | 104680-4961 | |
| | | 16700 3S302 | 104680-9350 | |
| | | 16700 3S303 | 104680-9360 | |
| | | 16700 3S304 | 104680-9290 | |
| | | 16700 3S305 | 104680-9370 | |
| | | 16700 3S900<br>16700 3S901 | 104680-9016 | For standard models |
| | | 16700 3S902<br>16700 3S903 | 104680-9210 | For standard models |
| | | 16700 3S904 | 104680-9380 | |

## INSPECTION AND ADJUSTMENT

### Plunger lift

| Engine | Plunger lift at TDC mm (in) | | Part No. | Pump assembly No. |
|---|---|---|---|---|
| | Inspection | Adjustment | | |
| TD25 | 0.71±0.05 (0.0280± 0.0020) | 0.71±0.02 (0.0280± 0.0008) | 16700 3S300 | 104680-4952 |
| | | | 16700 3S301 | 104680-4961 |
| | | | 16700 3S302 | 104680-9350 |
| | | | 16700 3S303 | 104680-9360 |
| | | | 16700 3S304 | 104680-9290 |
| | | | 16700 3S305 | 104680-9370 |
| | | | 16700 3S900<br>16700 3S901 | 104680-9016 |
| | | | 16700 3S902<br>16700 3S903 | 104680-9210 |
| | | | 16700 3S904 | 104680-9380 |


SEF065K

### Maximum engine speed

| Engine | Maximum engine speed (Under no load) rpm |
|---|---|
| TD25 | 5,000 $^{+100}_{-200}$ |

# Injection Nozzle

## INSPECTION AND ADJUSTMENT

### Injection nozzle assembly

Unit: kPa (bar, kg/cm$^2$, psi)

| | |
|---|---|
| Initial injection pressure | |
| New | 10,297 - 11,278 (103.0 - 112.8, 105 - 115, 1,493 - 1,635) |
| Used | 9,807 - 10,297 (98.1 - 103.0, 100 - 105, 1,422 - 1,493) |

### Adjusting shims

| Thickness mm (in) | Part No. |
|---|---|
| 0.1 (0.004) | 16613-65N00 |
| 0.2 (0.008) | 16613-65N01 |
| 0.3 (0.012) | 16613-65N02 |
| 0.4 (0.016) | 16613-65N03 |
| 0.5 (0.020) | 16613-65N04 |
| 0.52 (0.0205) | 16613-65N05 |
| 0.54 (0.0213) | 16613-65N06 |
| 0.56 (0.0220) | 16613-65N07 |
| 0.58 (0.0228) | 16613-65N08 |
| 0.8 (0.031) | 16613-65N09 |

# Injection Pump Calibration Standard

## TD25 ENGINE MODEL

| | |
|---|---|
| Injection pump assembly No. | 104680-4952 |
| Part No. | 16700 3S300 |

Pump rotation: Clockwise—viewed from drive side

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)
1 - 2 Nozzle holder: 105780-2150
1 - 3 Nozzle opening pressure: 13,043$^{+294}$ kPa (130.4$^{+2.9}$ bar, 133$^{+3}$ kg/cm$^2$, 1,891$^{+43}$ psi)
1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)
1 - 5 Fuel oil temperature: 45$^{+5}_{0}$ °C (113$^{+9}_{0}$°F)
1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)
1 - 7 Joint assembly: 157641-4720
1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| 2 - 1 | Full load delivery | 1,100 | 47.4±0.5 cm$^3$ (2.892±0.031 cu in) | — | 3.5 (0.214) |
| 2 - 2 | Supply pump pressure | 1,100 | ON 510±39 kPa (5.10±0.39 bar, 5.2±0.4 kg/cm$^2$, 74±6 psi) OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | | — |
| 2 - 3 | Timing device travel | 1,100 | ON 3.8±0.4 mm (0.150±0.016 in) OFF 2.0±0.2 mm (0.079±0.008 in) | | — |
| 2 - 4 | Idle speed regulation | 375 | 7.1±2.0 cm$^3$ (0.433±0.122 cu in) | | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | 75.0$^{+20.0}_{-15.0}$ cm$^3$ (4.577$^{+1.220}_{-0.915}$ cu in) | | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 14.9±2.0 cm$^3$ (0.909±0.122 cu in) | | — |
| 2 - 7 | Load-timer adjustment | 1,100 | Δ0.3±0.2 mm (0.012±0.008 in) | | — |

| 3. Test specifications | | Solenoid timer | ON | | OFF | | |
|---|---|---|---|---|---|---|---|
| 3 - 1 | Timing device | N = rpm mm (in) | 1,100 3.8±0.5 (0.150±0.020) | 2,150 7.8$^{+0.4}_{-0.5}$ (0.307$^{+0.016}_{-0.020}$) | 700 Below 0.8 (0.031) | 1,100 2.0±0.3 (0.079±0.012) | 2,150 6.9±0.6 (0.272±0.024) |
| 3 - 2 | Supply pump | N = rpm kPa (bar, kg/cm$^2$, psi) | | | | 1,100 432±39 (4.32±0.39, 4.4±0.4, 63±6) | 2,150 657±39 (6.57±0.39, 6.7±0.4, 95±6) |
| 3 - 3 | Overflow delivery | N = rpm cm$^3$ (cu in)/min. | 1,100 (O-Ring) 440±130 (26.85±7.93) | | | | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/ 1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,100 | 47.4±1.0 (1.67±0.04) | — |
| | 500 | 44.3±3.0 (1.56±0.11) | |
| | 2,150 | 44.7±3.5 (1.57±0.12) | |
| | 2,500 | 14.9±3.0 (0.52±0.11) | |
| | 2,700 | Below 5.0 (0.18) | |
| Switch OFF Magnet valve | 375 | 0 (0) | — |
| Idling | 375 | 7.1±2.5 (0.25±0.09) | — |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 1.5±1.0 mm (0.059±0.004 in) |
| BCS | — |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 36.0±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### Load timer adjustment

1. Adjust the governor shaft so that the clearance between the end of the flange and the end of the governor shaft is approximately 3 mm (0.12 in) and then lock the nut.
2. Load timer adjustment

(1) Fix the control lever in the position satisfying the following conditions:

**Boost pressure: — kPa (— mbar, — mmHg, — inHg)**
**Pump speed: 1,100 rpm**
**Fuel injection quantity: 33.0±0.5 mℓ (1.16±0.02 Imp fl oz)/1,000 st**

(2) With the control lever positioned as described in (1) above, adjust the governor sleeve so that the timer reduction value (ΔT) conforms to the specified values (Item 2 - 7).

**: 17 - 21 N·m (1.7 - 2.2 kg-m, 13 - 15 ft-lb)**

3. Confirmation of timer characteristics
   Fix the control lever in the position satisfying the following condition, and confirm the timer stroke.

| Control lever position | | | Specified values | |
|---|---|---|---|---|
| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Boost pressure kPa (mbar, mmHg, inHg) | Timer stroke mm (in) | Timer reduction value mm (in) |
| 1,100 | 33.0±1.0 (1.16±0.04) | — | 1.7 (0.067) | 0.3±0.3 (0.012±0.012) |
| 1,100 | 20.0±2.5 (0.70±0.09) | — | 1.1 (0.043) | 0.9±0.4 (0.035±0.016) |

### Potentiometer adjustment

| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Output voltage V | Control lever angle | Remarks |
|---|---|---|---|---|
| 1,075 | 23.3±1.0 (0.82±0.04) | 5.64±0.03 | — | Adjusting point |
| — | — | (1.34) | Idle | Check point |
| — | — | Below 9.7 | Full | Check point |

Input voltage: 10V

1. Hold the control lever in the idling position.
2. Adjust the potentiometer so that the output voltage is 5.64±0.03V. Then fix the potentiometer.
3. After adjusting the potentiometer, remove the dummy bolt and then confirm the potentiometer's output voltage specifications above.

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

| | |
|---|---|
| Injection pump assembly No. | 104680-4961 |
| Part No. | 16700-3S301 |

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}$ kPa ($130.4^{+2.9}$ bar, $133^{+3}$ kg/cm$^2$, $1{,}891^{+43}$ psi)

1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)

1 - 5 Fuel oil temperature: $45^{+5}_{0}$°C ($113^{+9}_{0}$°F)

1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)

1 - 7 Joint assembly: 157641-4720

1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| 2 - 1 | Full load delivery | 1,100 | 47.4±0.5 cm$^3$ (2.892±0.031 cu in) | — | 3.5 (0.214) |
| 2 - 2 | Supply pump pressure | 1,100 | ON 510±39 kPa (5.10±0.39 bar, 5.2±0.4 kg/cm$^2$, 74±6 psi)<br>OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | | — |
| 2 - 3 | Timing device travel | 1,100 | ON 3.8±0.4 mm (0.150±0.016 in)<br>OFF 2.0±0.2 mm (0.079±0.008 in) | | — |
| 2 - 4 | Idle speed regulation | 375 | 7.1±2.0 cm$^3$ (0.433±0.122 cu in) | | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | $75.0^{+20.0}_{-15.0}$ cm$^3$ ($4.577^{+1.220}_{-0.915}$ cu in) | | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 14.9±2.0 cm$^3$ (0.909±0.122 cu in) | | — |
| 2 - 7 | Load-timer adjustment | 1,100 | Δ0.3±0.2 mm (0.012±0.008 in) | | — |

| 3. Test specifications | | Solenoid timer | ON | | OFF | | |
|---|---|---|---|---|---|---|---|
| 3 - 1 | Timing device | N = rpm<br>mm (in) | 1,100<br>3.8±0.5<br>(0.150±0.020) | 2,150<br>$7.8^{+0.4}_{-0.5}$ ($0.307^{+0.016}_{-0.020}$) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3<br>(0.079±0.012) | 2,150<br>6.9±0.6<br>(0.272±0.024) |
| 3 - 2 | Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>657±39<br>(6.57±0.39, 6.7±0.4, 95±6) |
| 3 - 3 | Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | 1,100 (O-Ring)<br>440±130<br>(26.85±7.93) | | | | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/ 1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,100 | 47.4±1.0 (1.67±0.04) | — |
| | 500 | 44.3±3.0 (1.56±0.11) | |
| | 2,150 | 44.7±3.5 (1.57±0.12) | |
| | 2,500 | 14.9±3.0 (0.52±0.11) | |
| | 2,700 | Below 5.0 (0.18) | |
| Switch OFF Magnet valve | 375 | 0 (0) | — |
| Idling | 375 | 7.1±2.5 (0.25±0.09) | — |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 1.5±1.0 mm (0.059±0.004 in) |
| BCS | — |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 36.0±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### Load timer adjustment

1. Adjust the governor shaft so that the clearance between the end of the flange and the end of the governor shaft is approximately 3 mm (0.12 in) and then lock the nut.
2. Load timer adjustment

(1) Fix the control lever in the position satisfying the following conditions:

**Boost pressure: — kPa (— mbar, — mmHg, — inHg)**
**Pump speed: 1,100 rpm**
**Fuel injection quantity: 33.0±0.5 mℓ (1.16±0.02 Imp fl oz)/1,000 st**

(2) With the control lever positioned as described in (1) above, adjust the governor sleeve so that the timer reduction value (ΔT) conforms to the specified values (Item 2 - 7).

**: 17 - 21 N·m (1.7 - 2.2 kg-m, 13 - 15 ft-lb)**

3. Confirmation of timer characteristics
   Fix the control lever in the position satisfying the following condition, and confirm the timer stroke.

| Control lever position | | | Specified values | |
|---|---|---|---|---|
| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Boost pressure kPa (mbar, mmHg, inHg) | Timer stroke mm (in) | Timer reduction value mm (in) |
| 1,100 | 33.0±1.0 (1.16±0.04) | — | 1.7 (0.067) | 0.3±0.3 (0.012±0.012) |
| 1,100 | 17.0±2.5 (0.60±0.09) | — | 1.1 (0.043) | 0.9±0.4 (0.035±0.016) |

### Potentiometer adjustment

| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Output voltage V | Control lever angle | Remarks |
|---|---|---|---|---|
| 1,075 | 23.3±1.0 (0.82±0.04) | 5.64±0.03 | — | Adjusting point |
| — | — | (1.34) | Idle | Check point |
| — | — | Below 9.7 | Full | Check point |

Input voltage: 10V

1. Hold the control lever in the idling position.
2. Adjust the potentiometer so that the output voltage is 5.64±0.03V. Then fix the potentiometer.
3. After adjusting the potentiometer, remove the dummy bolt and then confirm the potentiometer's output voltage specifications above.

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

| | |
|---|---|
| Injection pump assembly No. | 104680-9350 |
| Part No. | 16700-3S302 |

Pump rotation: Clockwise—viewed from drive side

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)

1 - 2 Nozzle holder: 101580-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}$ kPa ($130.4^{+2.9}$ bar, $133^{+3}$ kg/cm$^2$, $1{,}891^{+43}$ psi)

1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)

1 - 5 Fuel oil temperature: $45^{+5}_{0}$°C ($113^{+9}_{0}$°F)

1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)

1 - 7 Joint assembly: 157641-4720

1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| 2 - 1 | Full load delivery | 1,100 | 44.4±0.5 cm$^3$ (2.709±0.031 cu in) | — | 3.5 (0.214) |
| 2 - 2 | Supply pump pressure | 1,100 | OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | | — |
| 2 - 3 | Timing device travel | 1,100 | OFF 2.0±0.2 mm (0.079±0.008 in) | | — |
| 2 - 4 | Idle speed regulation | 375 | 7.1±2.0 cm$^3$ (0.433±0.122 cu in) | | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | $75.0^{+20.0}_{-15.0}$ cm$^3$ ($4.577^{+1.220}_{-0.915}$ cu in) | | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 14.9±2.0 cm$^3$ (0.909±0.122 cu in) | | — |
| 2 - 7 | Load-timer adjustment | 1,100 | OFF Δ0.3±0.2 mm (0.012±0.008 in) | | — |

| 3. Test specifications | Solenoid timer | ON | | OFF | | |
|---|---|---|---|---|---|---|
| 3 - 1 Timing device | N = rpm<br>mm (in) | 1,100<br>3.8±0.5<br>(0.150±0.020) | 2,150<br>$7.8^{+0.4}_{-0.5}$ ($0.307^{+0.016}_{-0.020}$) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3<br>(0.079±0.012) | 2,150<br>6.9±0.6<br>(0.272±0.024) |
| 3 - 2 Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>657±39<br>(6.57±0.39, 6.7±0.4, 95±6) |
| 3 - 3 Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | 1,100 (O-Ring)<br>440±130<br>(26.85±7.93) | | | | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/ 1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,100 | 44.4±1.0 (1.56±0.04) | — |
| | 500 | 41.3±3.0 (1.45±0.11) | |
| | 2,150 | 41.7±3.5 (1.45±0.12) | |
| | 2,500 | 14.9±3.0 (0.52±0.11) | |
| | 2,700 | Below 5.0 (0.18) | |
| Switch OFF Magnet valve | 375 | 0 (0) | — |
| Idling | 375 | 7.1±2.5 (0.25±0.09) | — |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 1.5±1.0 mm (0.059±0.004 in) |
| BCS | — |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 36.0±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### Load timer adjustment

1. Adjust the governor shaft so that the clearance between the end of the flange and the end of the governor shaft is approximately 3 mm (0.12 in) and then lock the nut.
2. Load timer adjustment

(1) Fix the control lever in the position satisfying the following conditions:

**Boost pressure: — kPa (— mbar, — mmHg, — inHg)**
**Pump speed: 1,100 rpm**
**Fuel injection quantity: 30.0±0.5 mℓ (1.06±0.02 Imp fl oz)/1,000 st**

(2) With the control lever positioned as described in (1) above, adjust the governor sleeve so that the timer reduction value (ΔT) conforms to the specified values (Item 2 - 7).

**: 17 - 21 N·m (1.7 - 2.2 kg-m, 13 - 15 ft-lb)**

3. Confirmation of timer characteristics
   Fix the control lever in the position satisfying the following condition, and confirm the timer stroke.

| Control lever position | | | Specified values | |
|---|---|---|---|---|
| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Boost pressure kPa (mbar, mmHg, inHg) | Timer stroke mm (in) | Timer reduction value mm (in) |
| 1,100 | 30.0±1.0 (1.06±0.04) | — | 1.7 (0.067) | 0.3±0.3 (0.012±0.012) |
| 1,100 | 17.0±2.5 (0.60±0.09) | — | 1.1 (0.043) | 0.9±0.4 (0.035±0.016) |

### Potentiometer adjustment

| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Output voltage V | Control lever angle | Remarks |
|---|---|---|---|---|
| 1,075 | 23.3±1.0 (0.82±0.04) | 5.64±0.03 | — | Adjusting point |
| — | — | (1.34) | Idle | Check point |
| — | — | Below 9.7 | Full | Check point |

Input voltage: 10V

1. At a pump speed of 1,075 rpm, hold the control lever in a position where a fuel injection quantity of 23.3±1.0 mℓ (1.422±0.061 Imp fl oz)/1,000 st can be obtained.
2. Screw in the dummy bolt until it contacts the control lever and lock it using the nut.
3. Adjust the potentiometer so that the output voltage is 5.64±0.03V.
4. After adjusting the potentiometer, remove the dummy bolt and confirm the potentiometer's specifications above.

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

| | |
|---|---|
| Injection pump assembly No. | 104680-9360 |
| Part No. | 16700-3S303 |

Pump rotation: Clockwise—viewed from drive side

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)

1 - 2 Nozzle holder: 101580-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}$ kPa ($130.4^{+2.9}$ bar, $133^{+3}$ kg/cm$^2$, $1{,}891^{+43}$ psi)

1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)

1 - 5 Fuel oil temperature: $45^{+5}_{0}$°C ($113^{+9}_{0}$°F)

1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)

1 - 7 Joint assembly: 157641-4720

1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| 2 - 1 | Full load delivery | 1,100 | 44.4±0.5 cm$^3$ (2.709±0.031 cu in) | — | 3.5 (0.214) |
| 2 - 2 | Supply pump pressure | 1,100 | OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | | — |
| 2 - 3 | Timing device travel | 1,100 | OFF 2.0±0.2 mm (0.079±0.008 in) | | — |
| 2 - 4 | Idle speed regulation | 375 | 7.1±2.0 cm$^3$ (0.433±0.122 cu in) | | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | $75.0^{+20.0}_{-15.0}$ cm$^3$ ($4.577^{+1.220}_{-0.915}$ cu in) | | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 14.9±2.0 cm$^3$ (0.909±0.122 cu in) | | — |
| 2 - 7 | Load-timer adjustment | 1,100 | OFF Δ0.3±0.2 mm (0.012±0.008 in) | | — |

| 3. Test specifications | Solenoid timer | ON | | OFF | | |
|---|---|---|---|---|---|---|
| 3 - 1 Timing device | N = rpm<br>mm (in) | 1,100<br>3.8±0.5<br>(0.150±0.020) | 2,150<br>$7.8^{+0.4}_{-0.5}$ ($0.307^{+0.016}_{-0.020}$) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3<br>(0.079±0.012) | 2,150<br>6.9±0.6<br>(0.272±0.024) |
| 3 - 2 Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>657±39<br>(6.57±0.39, 6.7±0.3, 95±4) |
| 3 - 3 Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | 1,100 (O-Ring)<br>440±130<br>(26.85±7.93) | | | | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/ 1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,100 | 44.4±1.0 (1.56±0.04) | — |
| | 500 | 41.3±3.0 (1.45±0.11) | |
| | 2,150 | 41.7±3.5 (1.45±0.12) | |
| | 2,500 | 14.9±3.0 (0.52±0.11) | |
| | 2,700 | Below 5.0 (0.18) | |
| Switch OFF Magnet valve | 375 | 0 (0) | — |
| Idling | 375 | 7.1±2.5 (0.25±0.09) | — |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 1.5±1.0 mm (0.059±0.004 in) |
| BCS | — |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 36.0±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### Load timer adjustment

1. Adjust the governor shaft so that the clearance between the end of the flange and the end of the governor shaft is approximately 3 mm (0.12 in) and then lock the nut.
2. Load timer adjustment

(1) Fix the control lever in the position satisfying the following conditions:

**Boost pressure: — kPa (— mbar, — mmHg, — inHg)**
**Pump speed: 1,100 rpm**
**Fuel injection quantity: 30.0±0.5 mℓ (1.06±0.02 Imp fl oz)/1,000 st**

(2) With the control lever positioned as described in (1) above, adjust the governor sleeve so that the timer reduction value (ΔT) conforms to the specified values (Item 2 - 7).

**: 17 - 21 N·m (1.7 - 2.2 kg-m, 13 - 15 ft-lb)**

3. Confirmation of timer characteristics
   Fix the control lever in the position satisfying the following condition, and confirm the timer stroke.

| Control lever position | | | Specified values | |
|---|---|---|---|---|
| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Boost pressure kPa (mbar, mmHg, inHg) | Timer stroke mm (in) | Timer reduction value mm (in) |
| 1,100 | 30.0±1.0 (1.06±0.04) | — | 1.7 (0.067) | 0.3±0.3 (0.012±0.012) |
| 1,100 | 17.0±2.5 (0.60±0.09) | — | 1.1 (0.043) | 0.9±0.4 (0.035±0.016) |

### Potentiometer adjustment

| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Output voltage V | Control lever angle | Remarks |
|---|---|---|---|---|
| 1,075 | 23.3±1.0 (0.82±0.04) | 5.64±0.03 | — | Adjusting point |
| — | — | (1.34) | Idle | Check point |
| — | — | Below 9.7 | Full | Check point |

Input voltage: 10V

1. At a pump speed of 1,075 rpm, hold the control lever in a position where a fuel injection quantity of 23.3±1.0 mℓ (1.422±0.061 Imp fl oz)/1,000 st can be obtained.
2. Screw in the dummy bolt until it contacts the control lever and lock it using the nut.
3. Adjust the potentiometer so that the output voltage is 5.64±0.03V.
4. After adjusting the potentiometer, remove the dummy bolt and confirm the potentiometer's specifications above.

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

| | |
|---|---|
| Injection pump assembly No. | 104680-9290 |
| Part No. | 16700-3S304 |

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)

1 - 2 Nozzle holder: 101580-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}$ kPa ($130.4^{+2.9}$ bar, $133^{+3}$ kg/cm$^2$, $1{,}891^{+43}$ psi)

1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)

1 - 5 Fuel oil temperature: $45^{+5}_{0}$°C ($113^{+9}_{0}$°F)

1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)

1 - 7 Joint assembly: 157641-4720

1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| 2 - 1 | Full load delivery | 1,100 | 44.4±0.5 cm$^3$ (2.709±0.031 cu in) | — | 3.5 (0.214) |
| 2 - 2 | Supply pump pressure | 1,100 | OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | | — |
| 2 - 3 | Timing device travel | 1,100 | OFF 2.0±0.2 mm (0.079±0.008 in) | | — |
| 2 - 4 | Idle speed regulation | 375 | 7.1±2.0 cm$^3$ (0.433±0.122 cu in) | | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | $75.0^{+20.0}_{-15.0}$ cm$^3$ ($4.577^{+1.220}_{-0.915}$ cu in) | | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 14.9±2.0 cm$^3$ (0.909±0.122 cu in) | | — |
| 2 - 7 | Load-timer adjustment | 1,100 | Δ0.3±0.2 mm (0.012±0.008 in) | | — |

| 3. Test specifications | | Solenoid timer | | | |
|---|---|---|---|---|---|
| 3 - 1 | Timing device | N = rpm<br>mm (in) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3 (0.079±0.012) | 2,150<br>6.9±0.6 (0.272±0.024) |
| 3 - 2 | Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>657±39<br>(6.57±0.39, 6.7±0.4, 95±6) |
| 3 - 3 | Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | | 1,100<br>440±130 (26.85±7.93) | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/ 1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,100 | 44.4±1.0 (1.56±0.04) | — |
| | 500 | 41.3±3.0 (1.45±0.11) | |
| | 2,150 | 41.7±3.5 (1.45±0.12) | |
| | 2,500 | 14.9±3.0 (0.52±0.11) | |
| | 2,700 | Below 5.0 (0.18) | |
| Switch OFF Magnet valve | 375 | 0 (0) | — |
| Idling | 350 | 7.1±2.5 (0.25±0.09) | — |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 1.5±1.0 mm (0.059±0.004 in) |
| BCS | — |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 36.0±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### Load timer adjustment

1. Adjust the governor shaft so that the clearance between the end of the flange and the end of the governor shaft is approximately 3 mm (0.12 in) and then lock the nut.
2. Load timer adjustment

(1) Fix the control lever in the position satisfying the following conditions:

**Boost pressure: — kPa (— mbar, — mmHg, — inHg)**
**Pump speed: 1,100 rpm**
**Fuel injection quantity: 30.0±0.5 mℓ (1.06±0.02 Imp fl oz)/1,000 st**

(2) With the control lever positioned as described in (1) above, adjust the governor sleeve so that the timer reduction value (ΔT) conforms to the specified values (Item 2 - 7).

**: 17 - 21 N·m (1.7 - 2.2 kg-m, 13 - 15 ft-lb)**

3. Confirmation of timer characteristics
   Fix the control lever in the position satisfying the following condition, and confirm the timer stroke.

| Control lever position | | | Specified values | |
|---|---|---|---|---|
| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Boost pressure kPa (mbar, mmHg, inHg) | Timer stroke mm (in) | Timer reduction value mm (in) |
| 1,100 | 30.0±1.0 (1.06±0.04) | — | 1.7 (0.067) | 0.3±0.3 (0.012±0.012) |
| 1,100 | 17.0±2.5 (0.60±0.09) | — | 1.1 (0.043) | 0.9±0.4 (0.035±0.016) |

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

| | |
|---|---|
| Injection pump assembly No. | 104680-9370 |
| Part No. | 16700-3S305 |

Pump rotation: Clockwise—viewed from drive side

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)

1 - 2 Nozzle holder: 101580-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}$ kPa ($130.4^{+2.9}$ bar, $133^{+3}$ kg/cm$^2$, $1{,}891^{+43}$ psi)

1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)

1 - 5 Fuel oil temperature: $45^{+5}_{0}$°C ($113^{+9}_{0}$°F)

1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)

1 - 7 Joint assembly: 157641-4720

1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| 2 - 1 | Full load delivery | 1,100 | 44.4±0.5 cm$^3$ (2.709±0.031 cu in) | — | 3.5 (0.214) |
| 2 - 2 | Supply pump pressure | 1,100 | OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | | — |
| 2 - 3 | Timing device travel | 1,100 | OFF 2.0±0.2 mm (0.079±0.008 in) | | — |
| 2 - 4 | Idle speed regulation | 375 | 7.1±2.0 cm$^3$ (0.433±0.122 cu in) | | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | $75.0^{+20.0}_{-15.0}$ cm$^3$ ($4.577^{+1.220}_{-0.915}$ cu in) | | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 14.9±2.0 cm$^3$ (0.909±0.122 cu in) | | — |
| 2 - 7 | | | | | |

| 3. Test specifications | Solenoid timer | ON | | OFF | | |
|---|---|---|---|---|---|---|
| 3 - 1 Timing device | N = rpm<br>mm (in) | 1,100<br>3.8±0.5<br>(0.150±0.020) | 2,150<br>$7.8^{+0.4}_{-0.5}$ ($0.307^{+0.016}_{-0.020}$) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3<br>(0.079±0.012) | 2,150<br>6.9±0.6<br>(0.272±0.024) |
| 3 - 2 Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>657±39<br>(6.57±0.39, 6.7±0.3, 95±4) |
| 3 - 3 Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | 1,100 (O-Ring)<br>440±130<br>(26.85±7.93) | | | | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/ 1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,100 | 44.4±1.0 (1.56±0.04) | — |
| | 500 | 41.3±3.0 (1.45±0.11) | |
| | 2,150 | 41.7±3.5 (1.45±0.12) | |
| | 2,500 | 14.9±3.0 (0.52±0.11) | |
| | 2,700 | Below 5.0 (0.18) | |
| Switch OFF Magnet valve | 375 | 0 (0) | — |
| Idling | 375 | 7.1±2.5 (0.25±0.09) | — |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 1.5±1.0 mm (0.059±0.004 in) |
| BCS | — |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 36.0±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

| | |
|---|---|
| Injection pump assembly No. | 104680-9016 |
| Part No. | 16700 3S900<br>16700 3S901 |

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)

1 - 2 Nozzle holder: 101580-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}$ kPa ($130.4^{+2.9}$ bar, $133^{+3}$ kg/cm$^2$, $1{,}891^{+43}$ psi)

1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)

1 - 5 Fuel oil temperature: $45^{+5}_{0}$°C ($113^{+9}_{0}$°F)

1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)

1 - 7 Joint assembly: 157641-4720

1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| | Full load delivery | 1,000 (Full) | 66.6±0.5 cm$^3$ (4.064±0.031 cu in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | |
| 2 - 1 | Full load delivery | 800 (BCS) | 54.8±0.5 cm$^3$ (3.344±0.031 cu in) | 37.3±1.3 (373±13, 280±10, 11.02±0.39) | 6.0 (0.366) |
| | Full load delivery | 500 (NA) | 44.5±0.5 cm$^3$ (2.175±0.031 cu in) | 0 | |
| 2 - 2 | Supply pump pressure | 1,100 | OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 3 | Timing device travel | 1,100 | OFF 2.0±0.2 mm (0.079±0.008 in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 4 | Idle speed regulation | 350 | 16.4±2.0 cm$^3$ (1.001±2.0 cu in) | 0 | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | $75.0^{+20.0}_{-15.0}$ cm$^3$ ($4.577^{+1.220}_{-0.915}$ cu in) | 0 | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 16.7±2.0 cm$^3$ (1.019±0.122 cu in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 7 | Load-timer adjustment | 1,100 | OFF △0.3±0.2 mm (0.012±0.008 in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |

| 3. Test specifications | | Charge air press | 80.0±1.3 kPa (800±13 mbar, 600±10 mmHg, 23.62±0.39 inHg) | | | | |
|---|---|---|---|---|---|---|---|
| | | Solenoid timer | ON | | OFF | | |
| 3 - 1 | Timing device | N = rpm<br>mm (in) | 1,100<br>3.8±0.5<br>(0.150±0.020) | 2,150<br>$7.8^{+0.4}_{-0.5}$ ($0.307^{+0.016}_{-0.020}$) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3<br>(0.079±0.012) | 2,150<br>6.9±0.6<br>(0.272±0.024) |
| 3 - 2 | Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>647±39<br>(6.47±0.39, 6.6±0.4, 94±6) |
| 3 - 3 | Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | 1,100 (O-Ring)<br>440±130<br>(26.85±7.93) | | | | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,000 (Full) | 66.6±1.0 (2.34±0.04) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 800 (BCS) | 54.8±1.0 (1.93±0.04) | 37.3±1.3 (373±13, 280±10, 11.02±0.39) |
| | 500 (NA) | 44.5±1.0 (1.57±0.04) | 0 |
| | 1,200 | 68.3±2.5 (2.40±0.09) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 1,500 | 68.3±3.0 (2.40±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,000 | 63.7±3.0 (2.24±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,250 | 50.4 (1.77) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,500 | 16.7±3.0 (0.59±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,750 | Below 5.0 (0.18) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| Switch OFF Magnet valve | 350 | 0 (0) | 0 |
| Idling | 350 | 16.4±2.5 (0.58±0.09) | 0 |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 0.7±1.0 mm (0.028±0.004 in) |
| BCS | 4.5±0.2 mm (0.177±0.008 in) |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 33.5±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### Load timer adjustment

1. Adjust the governor shaft so that the clearance between the end of the flange and the end of the governor shaft is approximately 3 mm (0.12 in) and then lock the nut.
2. Load timer adjustment

(1) Fix the control lever in the position satisfying the following conditions:

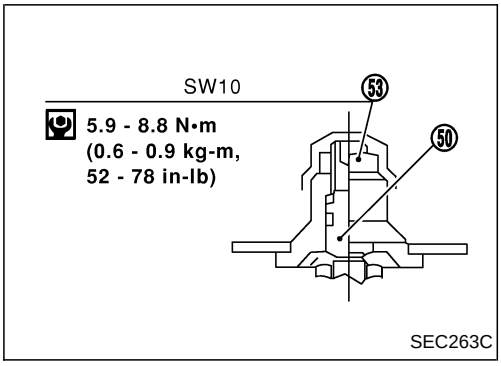
**Boost pressure: 80.0±1.3 kPa (800±13 mbar, 600±10 mmHg, 23.62±0.39 inHg)**
**Pump speed: 1,100 rpm**
**Fuel injection quantity: 47.0±0.5 mℓ (1.65±0.02 Imp fl oz)/1,000 st**

(2) With the control lever positioned as described in (1) above, adjust the governor sleeve so that the timer reduction value (ΔT) conforms to the specified values (Item 2 - 7).

**: 17 - 21 N·m (1.7 - 2.2 kg-m, 13 - 15 ft-lb)**

3. Confirmation of timer characteristics
   Fix the control lever in the position satisfying the following condition, and confirm the timer stroke.

| Control lever position | | | Specified values | |
|---|---|---|---|---|
| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Boost pressure kPa (mbar, mmHg, inHg) | Timer stroke mm (in) | Timer reduction value mm (in) |
| 1,100 | 47.0±1.0 (1.65±0.04) | 80.0±1.3 kPa (800±13 mbar, 600±10 mmHg, 23.62±0.39 inHg) | 1.7 (0.067) | 0.3±0.3 (0.012±0.012) |
| 1,100 | 35.0±2.5 (1.23±0.09) | 80.0±1.3 kPa (800±13 mbar, 600±10 mmHg, 23.62±0.39 inHg) | 1.1 (0.043) | 0.9±0.4 (0.035±0.016) |




### Boost compensator adjustment BCS ①

1. Adjust full load injection quantities to value as described in item 2-1.
2. Adjust BCS's injection quantities to value as described in item 2-1.
3. Confirm the NA's injection quantities to value as described in item 2-1.
4. If the NA above is not specified, loosen nut ㊸ and adjust screw ㊿ so that NA is as specified and tighten the nut ㊸.

**CAUTION:**
**Do not tighten or loosen screw ㊿ more than 1 turn.**

### Potentiometer adjustment

| Control lever position | Output voltage V | Remarks | Input voltage V |
|---|---|---|---|
| Idling | 1.93±0.03 | Adjusting point | 10 |
| Full speed | Above 9.97 | Adjusting point | 10 |

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

| | |
|---|---|
| Injection pump assembly No. | 104680-9210 |
| Part No. | 16700-3S902<br>16700-3S903 |

Pump rotation: Clockwise—viewed from drive side

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)
1 - 2 Nozzle holder: 101580-2150
1 - 3 Nozzle opening pressure: 13,043$^{+294}$ kPa (130.4$^{+2.9}$ bar, 133$^{+3}$ kg/cm$^2$, 1,891$^{+43}$ psi)
1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)
1 - 5 Fuel oil temperature: 45$^{+5}_{0}$°C (113$^{+9}_{0}$°F)
1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)
1 - 7 Joint assembly: 157641-4720
1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| | Full load delivery | 1,000 (Full) | 63.6±0.5 cm$^3$ (3.881±0.031 cu in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | |
| 2 - 1 | Full load delivery | 800 (BCS) | 51.8±0.5 cm$^3$ (3.161±0.031 cu in) | 37.3±1.3 (373±13, 280±10, 11.02±0.39) | 3.5 (0.214) |
| | Full load delivery | 500 (NA) | 41.5±0.5 cm$^3$ (2.532±0.031 cu in) | 0 | |
| 2 - 2 | Supply pump pressure | 1,100 | OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 3 | Timing device travel | 1,100 | OFF 2.0±0.2 mm (0.079±0.008 in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 4 | Idle speed regulation | 350 | 9.4±2.0 cm$^3$ (0.574±0.122 cu in) | 0 | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | 75.0$^{+20.0}_{-15.0}$ cm$^3$ (4.577$^{+1.220}_{-0.915}$ cu in) | 0 | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 16.7±2.0 cm$^3$ (1.019±0.122 cu in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 7 | Load-timer adjustment | 1,100 | OFF 1.4±0.2 mm (0.055±0.008 in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |

| 3. Test specifications | | Charge air press | 80.0±1.3 kPa (800±13 mbar, 600±10 mmHg, 23.62±0.39 inHg) | | | | |
|---|---|---|---|---|---|---|---|
| | | Solenoid timer | ON | | OFF | | |
| 3 - 1 | Timing device | N = rpm<br>mm (in) | 1,100<br>3.8±0.5<br>(0.150±0.020) | 2,150<br>7.8$^{+0.4}_{-0.5}$ (0.307$^{+0.016}_{-0.020}$) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3<br>(0.079±0.012) | 2,150<br>6.9±0.6<br>(0.272±0.024) |
| 3 - 2 | Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>647±39<br>(6.47±0.39, 6.6±0.4, 94±6) |
| 3 - 3 | Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | 1,100 (O-Ring)<br>440±130<br>(26.85±7.93) | | | | |

3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,000 (Full) | 63.6±1.0 (2.24±0.04) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 800 (BCS) | 51.8±1.0 (1.82±0.04) | 37.3±1.3 (373±13, 280±10, 11.02±0.39) |
| | 500 (NA) | 41.5±1.0 (1.46±0.04) | 0 |
| | 1,200 | 65.3±2.5 (2.30±0.09) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 1,500 | 65.3±3.0 (2.30±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,000 | 60.7±3.0 (2.14±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,250 | 50.4 (1.77) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,500 | 16.7±3.0 (0.59±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,750 | Below 5.0 (0.18) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| Switch OFF Magnet valve | 350 | 0 (0) | 0 |
| Idling | 350 | 9.4±2.5 (0.33±0.09) | 0 |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 0.7±1.0 mm (0.028±0.004 in) |
| BCS | 4.5±0.2 mm (0.177±0.008 in) |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 36.0±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)

### Load timer adjustment

1. Adjust the governor shaft so that the clearance between the end of the flange and the end of the governor shaft is approximately 3 mm (0.12 in) and then lock the nut.
2. Load timer adjustment

(1) Fix the control lever in the position satisfying the following conditions:

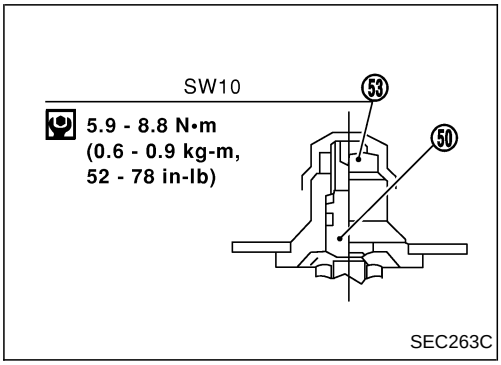
**Boost pressure: 80±1.3 kPa (800±13 mbar, 600±10 mmHg, 23.62±0.39 inHg)**
**Pump speed: 1,100 rpm**
**Fuel injection quantity: 41.0±0.5 mℓ (1.44±0.02 Imp fl oz)/1,000 st**

(2) With the control lever positioned as described in (1) above, adjust the governor sleeve so that the timer reduction value (ΔT) conforms to the specified values (Item 2 - 7).

**: 17 - 21 N·m (1.7 - 2.2 kg-m, 13 - 15 ft-lb)**

3. Confirmation of timer characteristics
   Fix the control lever in the position satisfying the following condition, and confirm the timer stroke.

| Control lever position | | | Specified values | |
|---|---|---|---|---|
| Pump speed rpm | Fuel injection quantity mℓ (Imp fl oz)/1,000 st | Boost pressure kPa (mbar, mmHg, inHg) | Timer stroke mm (in) | Timer reduction value mm (in) |
| 1,100 | 41.0±1.0 (1.44±0.04) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | 1.4 (0.055) | 0.6 (0.024) |
| 1,100 | 17.0±2.5 (0.60±0.09) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | $0.4^{+0.5}_{-0.4}$ ($0.016^{+0.020}_{-0.016}$) | 1.6 (0.063) |




### Boost compensator adjustment BCS ①

1. Adjust full load injection quantities to value as described in item 2-1.
2. Adjust BCS's injection quantities to value as described in item 2-1.
3. Confirm the NA's injection quantities to value as described in item 2-1.
4. If the NA above is not specified, loosen nut ㊸ and adjust screw ㊿ so that NA is as specified and tighten the nut ㊸.

**CAUTION:**
**Do not tighten or loosen screw ㊿ more than 1 turn.**

### Potentiometer adjustment

| Control lever position | Output voltage V | Remarks | Input voltage V |
|---|---|---|---|
| Idling | 1.4±0.03 | Adjusting point | 10 |
| Full speed | Above 9.5 | Adjusting point | 10 |

## Injection Pump Calibration Standard (Cont'd)

### TD25 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

| | |
|---|---|
| Injection pump assembly No. | 104680-9380 |
| Part No. | 16700-3S904 |

1. Test conditions

1 - 1 Nozzle: 105780-0060 (NP-DN0SD1510)
1 - 2 Nozzle holder: 101580-2150
1 - 3 Nozzle opening pressure: $13{,}043^{+294}$ kPa ($130.4^{+2.9}$ bar, $133^{+3}$ kg/cm$^2$, $1{,}891^{+43}$ psi)
1 - 4 Injection pipe: 2 dia. x 6 dia. x 450 mm (0.08 dia. x 0.24 dia. x 17.72 in)
1 - 5 Fuel oil temperature: $45^{+5}_{0}$°C ($113^{+9}_{0}$°F)
1 - 6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm$^2$, 2.8 psi)
1 - 7 Joint assembly: 157641-4720
1 - 8 Tube assembly: 157641-4020

| 2. Setting | | Pump speed rpm | Settings | Charge air press kPa (mbar, mmHg, inHg) | Difference in delivery cm$^3$ (cu in) |
|---|---|---|---|---|---|
| | Full load delivery | 1,000 (Full) | 63.6±0.5 cm$^3$ (3.881±0.031 cu in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | |
| 2 - 1 | Full load delivery | 800 (BCS) | 51.8±0.5 cm$^3$ (3.161±0.031 cu in) | 37.3±1.3 (373±13, 280±10, 11.02±0.39) | 3.5 (0.214) |
| | Full load delivery | 500 (NA) | 41.5±0.5 cm$^3$ (2.532±0.031 cu in) | 0 | |
| 2 - 2 | Supply pump pressure | 1,100 | OFF 432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm$^2$, 63±4 psi) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 3 | Timing device travel | 1,100 | OFF 2.0±0.2 mm (0.079±0.008 in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 4 | Idle speed regulation | 350 | 16.4±2.0 cm$^3$ (1.001±0.122 cu in) | 0 | 2.0 (0.122) |
| 2 - 5 | Start (Full) | 100 | $75.0^{+20.0}_{-15.0}$ cm$^3$ ($4.577^{+1.220}_{-0.915}$ cu in) | 0 | — |
| 2 - 6 | Full-load speed regulation | 2,500 | 16.7±2.0 cm$^3$ (1.019±0.122 cu in) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) | — |
| 2 - 7 | | | | | |

| 3. Test specifications | | Charge air press | 80.0±1.3 kPa (800±13 mbar, 600±10 mmHg, 23.62±0.39 inHg) | | | | |
|---|---|---|---|---|---|---|---|
| | | Solenoid timer | ON | | OFF | | |
| 3 - 1 | Timing device | N = rpm<br>mm (in) | 1,100<br>3.8±0.5<br>(0.150±0.020) | 2,150<br>$7.8^{+0.4}_{-0.5}$ ($0.307^{+0.016}_{-0.020}$) | 700<br>Below 0.8 (0.031) | 1,100<br>2.0±0.3<br>(0.079±0.012) | 2,150<br>6.9±0.6<br>(0.272±0.024) |
| 3 - 2 | Supply pump | N = rpm<br>kPa (bar, kg/cm$^2$, psi) | | | | 1,100<br>432±39<br>(4.32±0.39, 4.4±0.4, 63±6) | 2,150<br>647±39<br>(6.47±0.39, 6.6±0.4, 94±6) |
| 3 - 3 | Overflow delivery | N = rpm<br>cm$^3$ (cu in)/min. | 1,100 (O-Ring)<br>440±130<br>(26.85±7.93) | | | | |

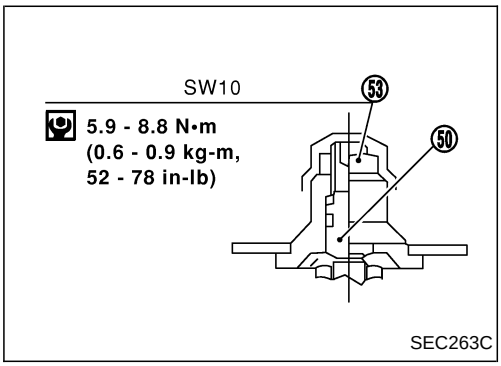
3 - 4 Fuel injection quantities

| Speed control lever position | Pump speed rpm | Fuel delivery mℓ (Imp fl oz)/ 1,000 st | Charge air press kPa (mbar, mmHg, inHg) |
|---|---|---|---|
| Max. speed | 1,000 (Full) | 63.6±1.0 (2.24±0.04) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 800 (BCS) | 51.8±1.0 (1.82±0.04) | 37.3±1.3 (373±13, 280±10, 11.02±0.39) |
| | 500 (NA) | 41.5±1.0 (1.46±0.04) | 0 |
| | 1,200 | 65.3±2.5 (2.30±0.09) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 1,500 | 65.3±3.0 (2.30±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,000 | 60.7±3.0 (2.14±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,250 | 50.4 (1.77) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,500 | 16.7±3.0 (0.59±0.11) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| | 2,750 | Below 5.0 (0.18) | 80.0±1.3 (800±13, 600±10, 23.62±0.39) |
| Switch OFF Magnet valve | 350 | 0 (0) | 0 |
| Idling | 350 | 16.4±2.5 (1.001±0.153) | 0 |
| 3 - 5 Solenoid | Max. cut-in voltage: 8V<br>Test voltage: 12 - 14V | | |

| 4. Dimensions | |
|---|---|
| K | 3.3±0.1 mm (0.130±0.004 in) |
| KF | 5.8±0.1 mm (0.228±0.004 in) |
| MS | 0.7±1.0 mm (0.028±0.004 in) |
| BCS | 4.5±0.2 mm (0.177±0.008 in) |
| Pre-stroke | 0.1±0.02 mm (0.0039±0.0008 in) |
| Control lever angle | |
| α | 55.5±4.0 degree |
| β | 33.5±5.0 degree |
| γ | — |

*: Reference value

## Injection Pump Calibration Standard (Cont'd)




### Boost compensator adjustment BCS ①

1. Adjust full load injection quantities to value as described in item 2-1.
2. Adjust BCS's injection quantities to value as described in item 2-1.
3. Confirm the NA's injection quantities to value as described in item 2-1.
4. If the NA above is not specified, loosen nut ⑤③ and adjust screw ⑤⓪ so that NA is as specified and tighten the nut ⑤③.

**CAUTION:**
**Do not tighten or loosen screw ⑤⓪ more than 1 turn.**