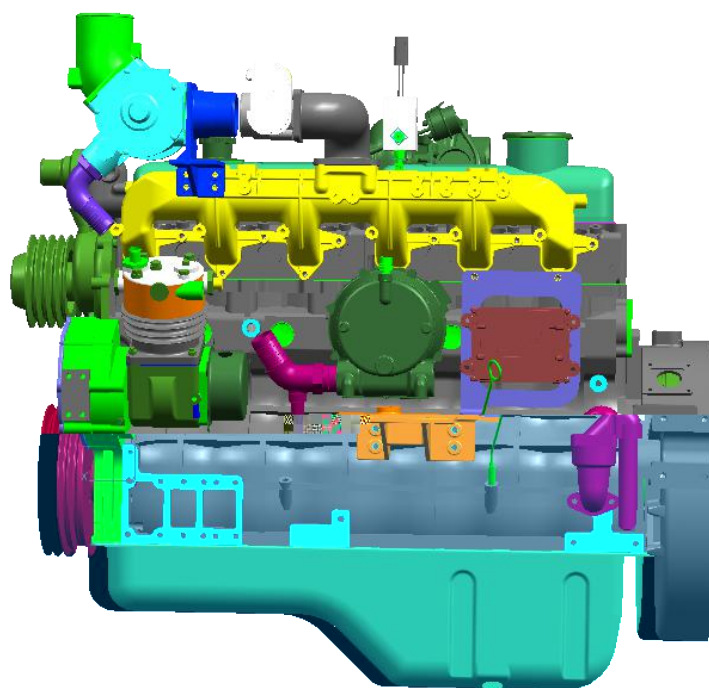


YC6J



YC6J/6B

YC6J/6B

“

”



!

1.

2.

3.

3 5

4.

3 5

5.

6.

7.

8.

9.

10.

11.

12.

13.

14.

15.

16.

17.

18.

19.

20

:

YC6J/6B

21.

22.

23.

24.

1YC6J/6B .....

1 .....■.....

2 .....■.....

2.1 .....■.....

2.2 .....■.....

3 .....■.....

3.1 .....■.....

3.2 .....■.....

3.3 .....■.....

3.4 .....■.....

3.5 .....■.....

3.6 .....■.....

3.7 .....■.....

3.8 .....■.....

3.9 .....■.....

3.10 .....■.....

3.11 .....■.....

3.12 .....■.....

3.13 .....■.....

3.14 .....■.....

4 .....■.....

5 .....■.....

5.1 .....■.....

5.2 .....■.....

5.3 .....■.....

5.4 .....■.....

6 .....■.....

6.1 .....■.....

6.2 .....■.....

6.3 .....■.....

6.4 .....■.....

6.5 .....■.....

6.6 .....■.....

6.7 .....■.....

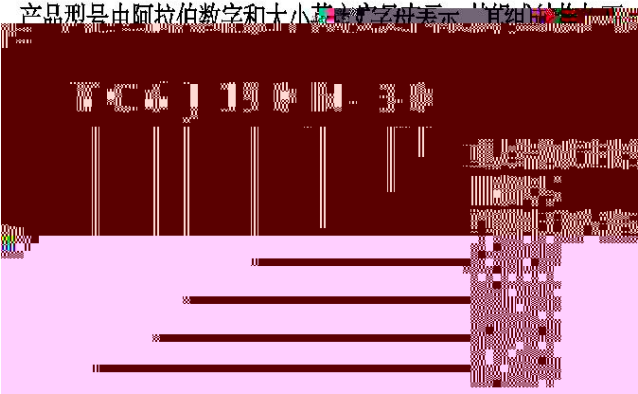


1

1.1

|         |           |   |   |   |         |        |
|---------|-----------|---|---|---|---------|--------|
| YC6J/6B | YC6105ZLQ |   |   |   |         |        |
| YC6J/6B | 2         | 3 | 4 | 5 | ECI/ESI | HD EPR |
| YC6J/6B | YC6J      |   |   |   |         |        |
| 5 15    | 7m 10m    |   |   |   |         |        |

1.2



1.3

|     |    |      |      |      |
|-----|----|------|------|------|
| -35 | 40 | 2000 |      |      |
| -35 | 40 | 2500 | -20℃ | -35℃ |

2

2.1

YC6J/6B

|    |       | J5300       | J5700       |
|----|-------|-------------|-------------|
| 1  |       | YC6J210N-20 | YC6J190N-20 |
| 2  |       | CNG         |             |
| 3  |       | —           |             |
| 4  |       | 6           |             |
| 5  | mm    | 105         |             |
| 6  | mm    | 125         |             |
| 7  | L     | 6.494       |             |
| 8  |       | 11:1        |             |
| 9  |       | 1—5—3—6—2—4 |             |
| 10 | %     | ≤ 0.2       |             |
| 11 |       | ≤ 210       |             |
| 12 | kW    | 155         | 140         |
| 13 | r/min | 2500        |             |

|    |       |                   |     |
|----|-------|-------------------|-----|
| 14 | N · m | 710               | 650 |
| 15 | r/min | 1500              |     |
| 16 | r/min | 2775 2825         |     |
| 17 | r/min | 650 ± 20          |     |
| 18 |       | CNG               |     |
| 19 |       |                   |     |
| 20 | kg    | ≤ 760             |     |
| 21 | × ×   | 1126 × 803 × 1012 |     |
| 22 |       | 2                 |     |
|    |       |                   |     |

|    |       | J5400             | J5500       | J3A00       |
|----|-------|-------------------|-------------|-------------|
| 1  |       | YC6J210N-30       | YC6J190N-30 | YC6J150N-30 |
| 2  |       | CNG               |             |             |
| 3  |       | —                 |             |             |
| 4  |       | 6                 |             |             |
| 5  | mm    | 105               |             |             |
| 6  | mm    | 125               |             |             |
| 7  | L     | 6.494             |             |             |
| 8  |       | 11:1              |             | 12:1        |
| 9  |       | 1—5—3—6—2—4       |             |             |
| 10 | %     | ≤ 0.2             |             |             |
| 11 |       | ≤ 215             |             | ≤ 220       |
| 12 | kW    | 155               | 140         | 110         |
| 13 | r/min | 2500              |             | 2800        |
| 14 | N · m | 710               | 650         | 430         |
| 15 | r/min | 1500              |             | 1400 1600   |
| 16 | r/min | 2775 2825         |             | 3080 ± 25   |
| 17 | r/min | 650 ± 20          |             |             |
| 18 |       | CNG               |             |             |
| 19 |       |                   |             |             |
| 20 | kg    | ≤ 760             |             |             |
| 21 | × ×   | 1126 × 803 × 1012 |             |             |
| 22 |       | 3                 |             |             |



|    |       |             |     |     |     |
|----|-------|-------------|-----|-----|-----|
| 7  | L     | 6.494       |     |     |     |
| 8  |       | 1—5—3—6—2—4 |     |     |     |
| 9  |       | ≤ 215       |     |     |     |
| 10 | kW    | 155         |     | 140 |     |
| 11 | r/min | 2500        |     |     |     |
| 12 | N · m | 710         |     | 650 |     |
| 13 | r/min | 1500        |     |     |     |
| 14 | r/min | 2775 2825   |     |     |     |
| 15 | r/min | 650 ± 20    |     |     |     |
| 16 | kg    | ≤ 760       |     |     |     |
| 17 |       | CNG         | LNG | CNG | LNG |
| 18 |       |             |     |     |     |
| 1- |       |             |     |     |     |

|    |        |                   |     |     |     |     |     |
|----|--------|-------------------|-----|-----|-----|-----|-----|
| 16 | r/min  | 650 ± 20          |     |     |     |     |     |
| 17 |        | CNG               | LNG | CNG | LNG | CNG | LNG |
| 18 |        |                   |     |     |     |     |     |
| 19 | kg     | ≤ 760             |     |     |     |     |     |
| 20 | × × mm | 1126 × 803 × 1012 |     |     |     |     |     |
| 21 |        | 5                 |     |     |     |     |     |

|    |           | J3C00             | J3D00 | J3E00       | J3F00 | J3G00       | J3H00 |
|----|-----------|-------------------|-------|-------------|-------|-------------|-------|
| 1  |           | YC6J225N-52       |       | YC6J210N-52 |       | YC6J190N-52 |       |
| 2  |           |                   |       |             |       |             |       |
| 3  |           | —                 |       |             |       |             |       |
| 4  |           | 6                 |       |             |       |             |       |
| 5  |           | 2                 |       |             |       |             |       |
| 6  | mm        | 105               |       |             |       |             |       |
| 7  | mm        | 125               |       |             |       |             |       |
| 8  | L         | 6.494             |       |             |       |             |       |
| 9  |           | 1—5—3—6—2—4       |       |             |       |             |       |
| 10 |           | ≤ 0.15            |       |             |       |             |       |
| 11 | g/ kW · h | ≤ 215             |       |             |       |             |       |
| 12 | kW        | 166               |       | 155         |       | 140         |       |
| 13 | r/min     | 2500              |       |             |       |             |       |
| 14 | N · m     | 750               |       | 710         |       | 650         |       |
| 15 | r/min     | ≤ 1500            |       |             |       |             |       |
| 16 | r/min     | 2800 ± 25         |       |             |       |             |       |
| 17 | r/min     | 650 ± 20          |       |             |       |             |       |
| 18 |           | CNG               | LNG   | CNG         | LNG   | CNG         | LNG   |
| 19 |           |                   |       |             |       |             |       |
| 20 | kg        | ≤ 760             |       |             |       |             |       |
| 21 | × × mm    | 1126 × 803 × 1012 |       |             |       |             |       |
| 22 |           | 5                 |       |             |       |             |       |



|     |  |         |              |
|-----|--|---------|--------------|
|     |  |         |              |
| 16. |  | M12     | 100 120(N.m) |
| 17. |  | M8      | 20 30(N.m)   |
| 18. |  | M10     | 35 55(N.m)   |
| 19. |  | M8 10.9 | 20 30(N.m)   |
| 20. |  | M10     | 35 55(N.m)   |
| 21. |  | M8      | 20 30(N.m)   |
| 22. |  |         | 220 300(N.m) |
| 23. |  | M8      | 20 30(N.m)   |
| 24. |  |         | 35 55(N.m)   |
| 25. |  | M8      | 20 30(N.m)   |
| 26. |  |         | 8 10         |

|     |      | N.m |
|-----|------|-----|
| M6  | 1/4  | 15  |
| M8  | 5/16 | 30  |
| M10 | 3/8  | 40  |
| M12 | 7/16 | 90  |
| M14 | 9/16 | 120 |

|       | NPT 1/8 | NPT 1/4 | NPT 3/8 | NPT 1/2 | NPT 3/4 | NPT 1 |
|-------|---------|---------|---------|---------|---------|-------|
| N · m | 8 14    | 24 34   | 47 68   | 68 95   | 88 102  |       |

:

| M6            | M8             | M10            | M12             | M14               |
|---------------|----------------|----------------|-----------------|-------------------|
| 8.8           |                | 10.9           |                 | N.m               |
| 8 12<br>10 15 | 18 24<br>20 30 | 28 45<br>35 55 | 65 90<br>85 100 | 90 110<br>110 130 |

### 3

#### 3.1

HT250

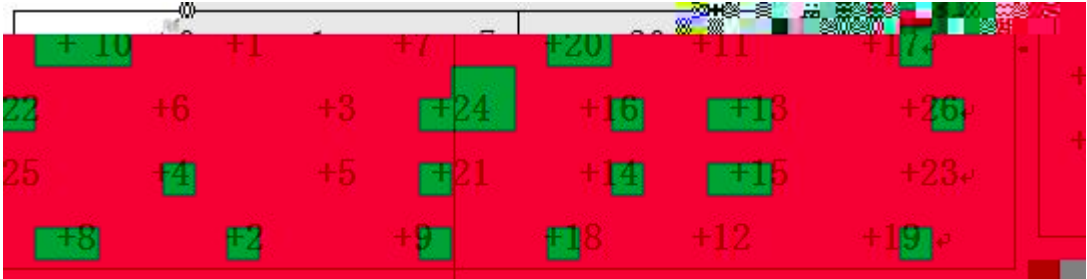
160 180N.m  
230 300N.m

230 N · m 300N · m

3.2

3.2.1

|                 |        |        |       |
|-----------------|--------|--------|-------|
|                 | 140N.m |        |       |
| ( )330-1003019B | 180 °  | 100N.m | 150 ° |
| 330-1003013B    | 180 °  | 100N.m | 120 ° |
| 330-1003012B    | 180 °  | 100N.m | 120 ° |
| 330-1003014B    | 180 °  | 100N.m | 120 ° |
| ( )330-1003018B | 180 °  | 110N.m | 90 °  |



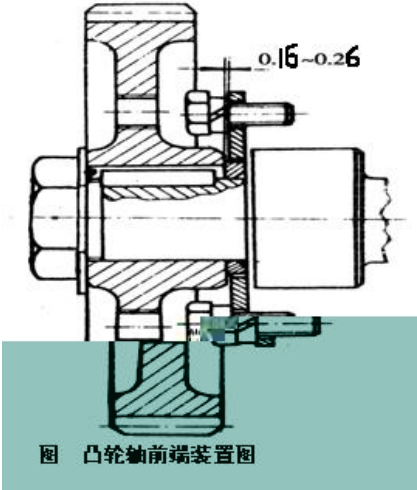
3.2.2

3.2.3

3.2.3.1

100)N.m

(0.16 0.26)mm





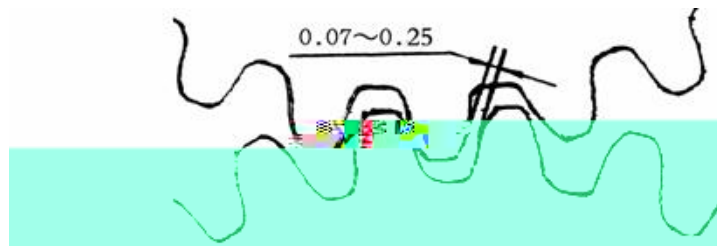
1

2

3

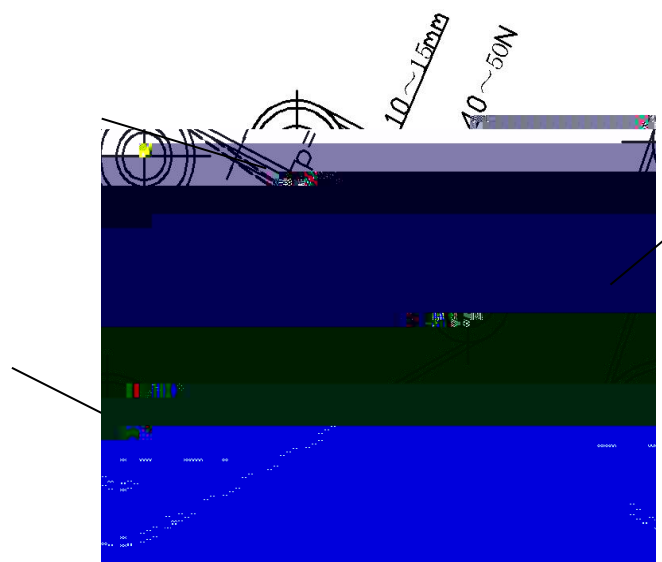
4

0.07 0.25mm



(40 50)N

(10 15)mm



3.4

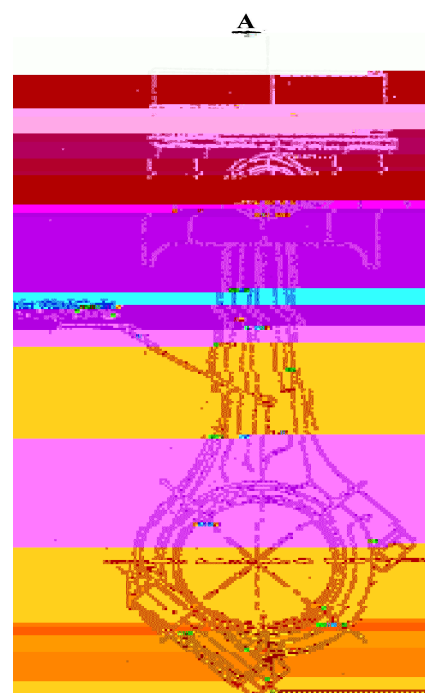
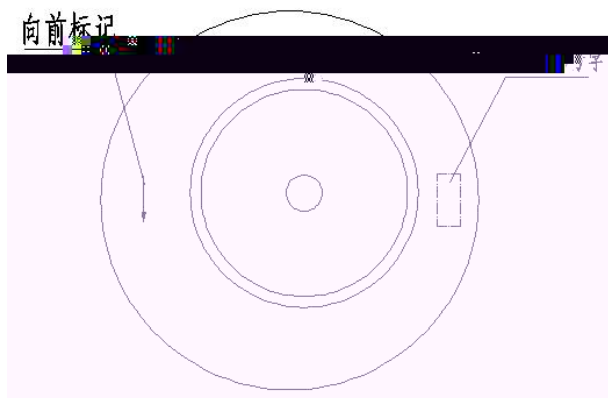


图 活塞连杆组



(190 260) N · m

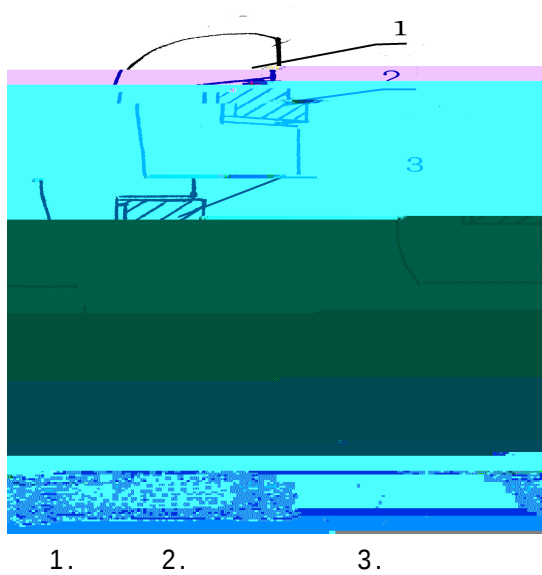
(60 80)N.m

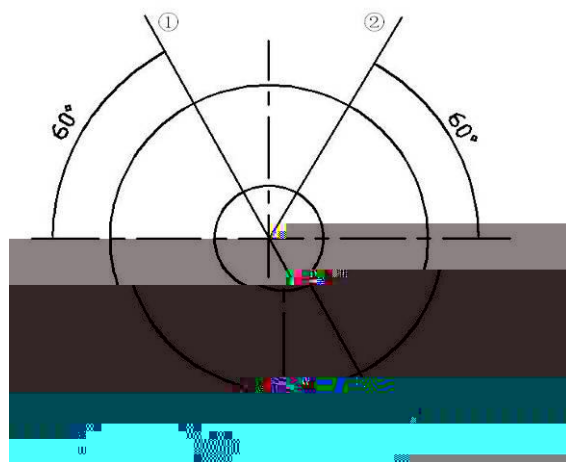
(110 130)N.m

(190 260)N.m

(190 260)N · m

“ TOP ”



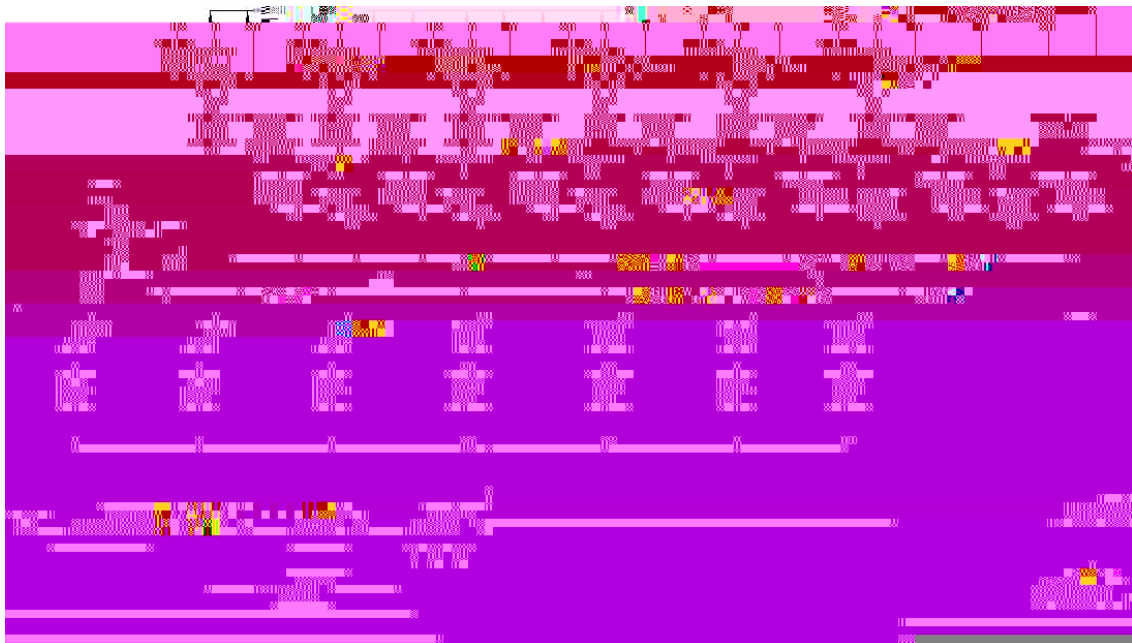


0.1 0.27mm

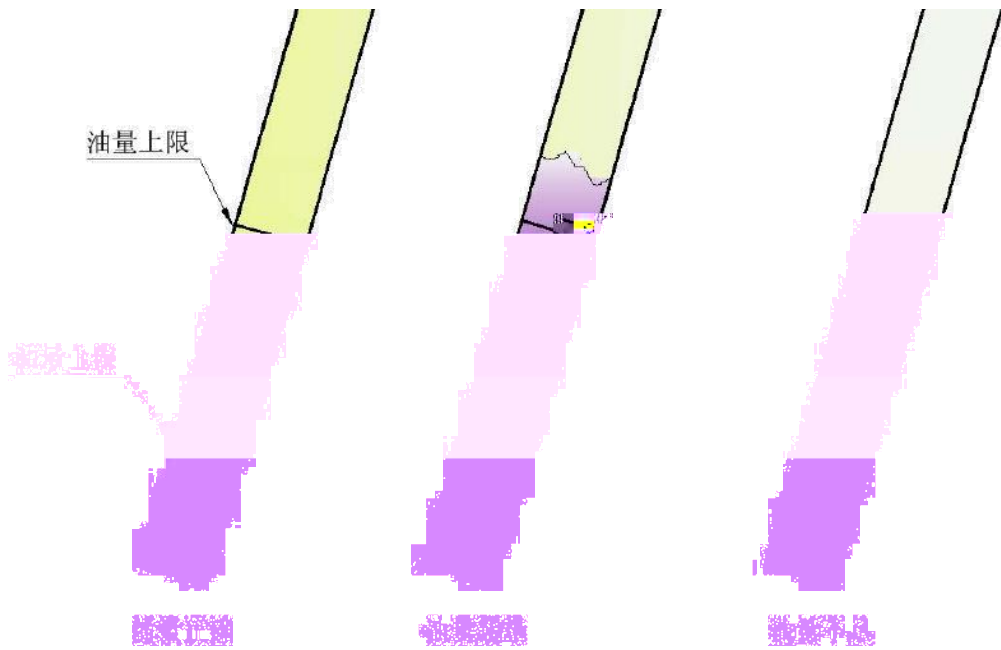
3.5

0.15MPa,

0.6MPa



10000km 250



10000km 250

1 30 8

2 30 1 30 2

m " -

|  |      |      |      |  |
|--|------|------|------|--|
|  | L    |      |      |  |
|  | 17   | 21   | 24   |  |
|  | 15.5 | 19.5 | 22.5 |  |
|  | 1.5  |      |      |  |

3.6

3.6.1

CNG CNG

LNG

3.6.1.1

3.6.1.2

3.6.1.3

LPG

LPG

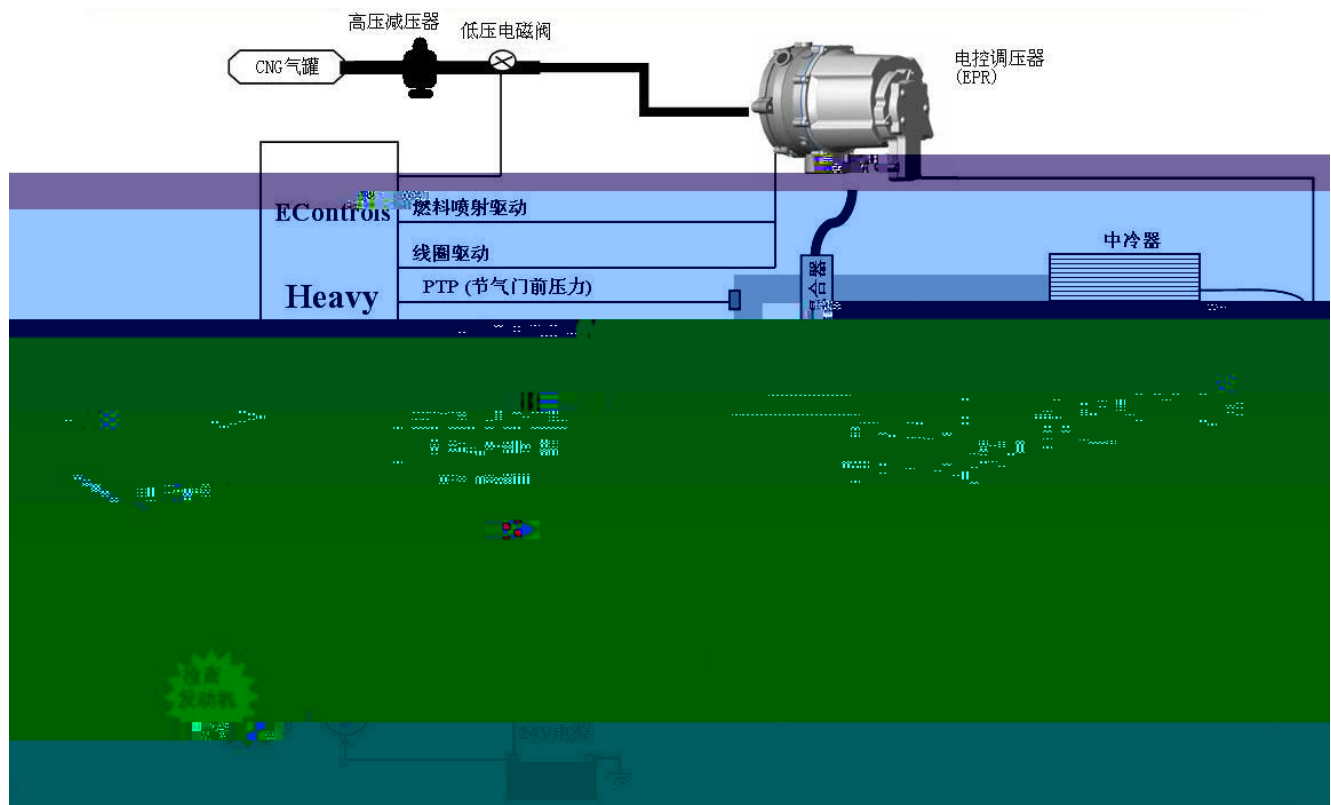
LPG

11 J3A00 12 J3B00 8.5

3.6.1.4

3.6.2

3.6.2.1 CNG



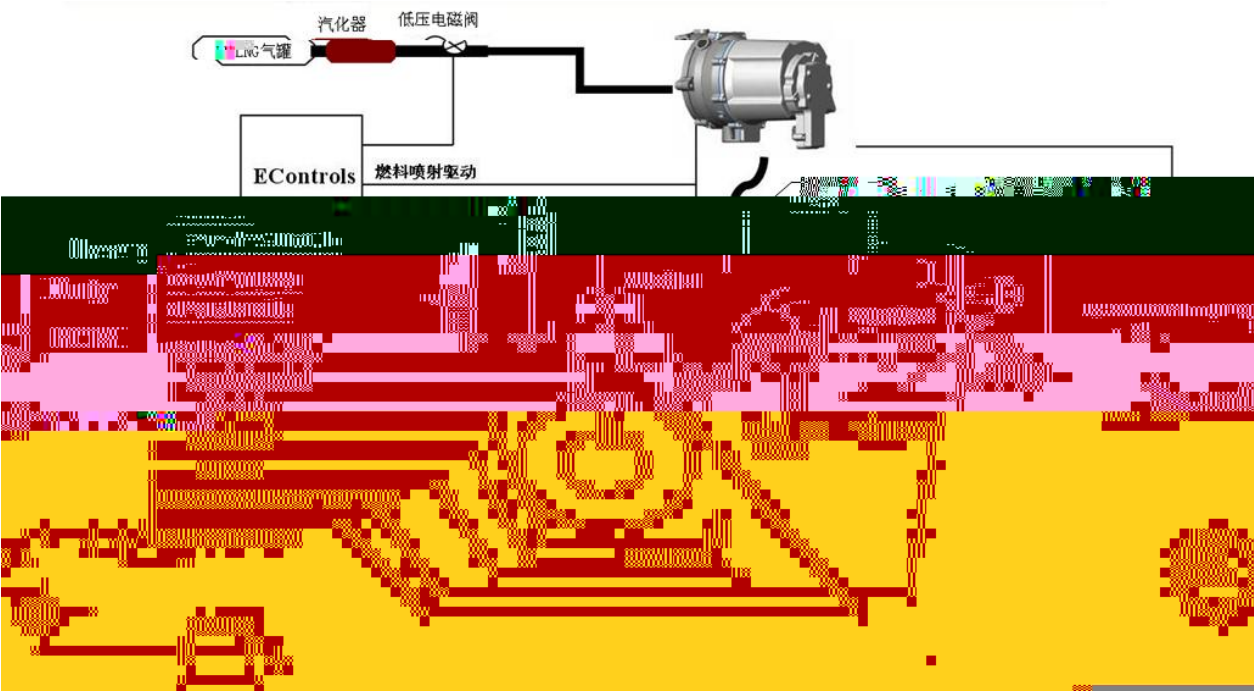
CNG

ECM  
7bar - 9bar

30bar - 200bar

ECM

ECM



LNG

CNG

ECM

ECM

3.6.2.3 LPG

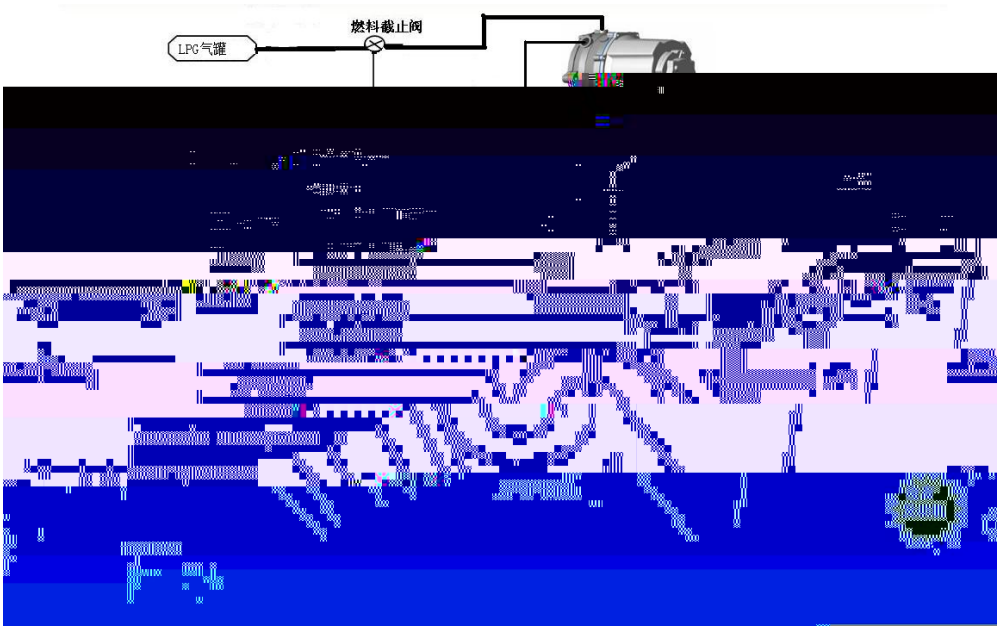
NG

LPG

LPG

LPG

NG



### 3.6.2.4 ESI

#### 3.6.2.4.1 ESI CNG

玉柴ESI系统CNG天然气发动机系统原理图



#### 3.6.2.4.2 ESI LNG

玉柴ESI系统LNG天然气发动机系统原理图



1

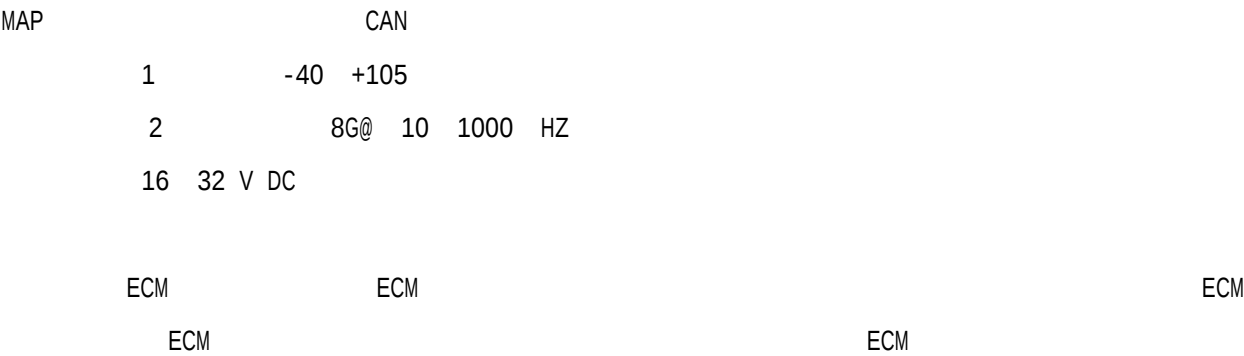
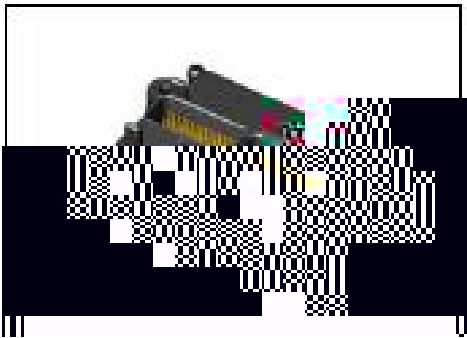
2

3.6.2.5 CFV



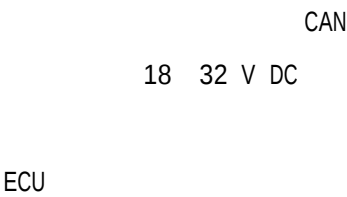
3.6.3

3.6.3.1 ECI



- ECM
- a. 20 G ECM 8 G
  - b. ECM
  - c. 4

3.6.3.2 ESI



ESI

|     |                           |                               |
|-----|---------------------------|-------------------------------|
|     |                           |                               |
| ECU | $R \leq 80\text{m}\Omega$ | $L \leq 5\text{ }\mu\text{H}$ |

- 1)
- 2)
- 3)



ECU

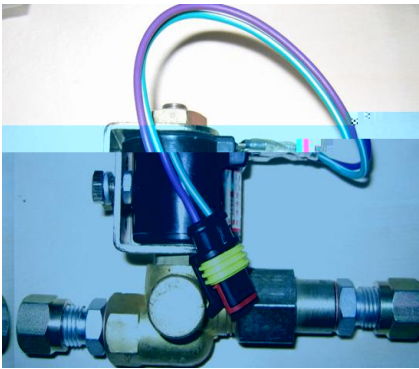
ECU

3.6.4

3.6.4.1ECI

CNG

ECM



3.6.4.2ECI CNG CNG

ECM

EPR

HD EPR

A

262

B

1/4 18 NPT

2 3

360 °

C

-40 105

3.6.4.3 CNG



ECI

3.6.4.3.1 ECI

250bar 8bar

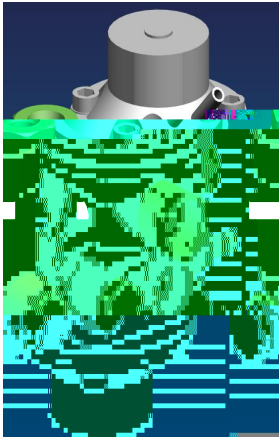
CNG

7bar -9bar

1

2

0



3  
4  
5

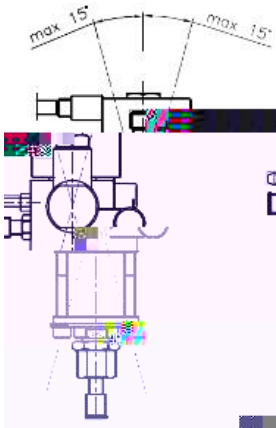
QC/T 245-1998 “ ”

3.6.4.3.2 ESI

Metatron 350kPaG( : 35barG 12kg/h)

- 1. -40~120
- 2. QC/T 245-1998 “ ”

± 15 °



3.6.4.4 LNG

A  
262  
B:  
  
C

3.6.4.5 LNG LNG

CNG

ECM

EPR

HD EPR

A

262

B

C

-40 —105

3.6.4.6

EPR

ECI

HD EPR

CNG HD EPR

-18 ~+13

CNG

100 psig

200 psig

HD EPR

/

CAN

ECM

HD EPR

ECM

EPR

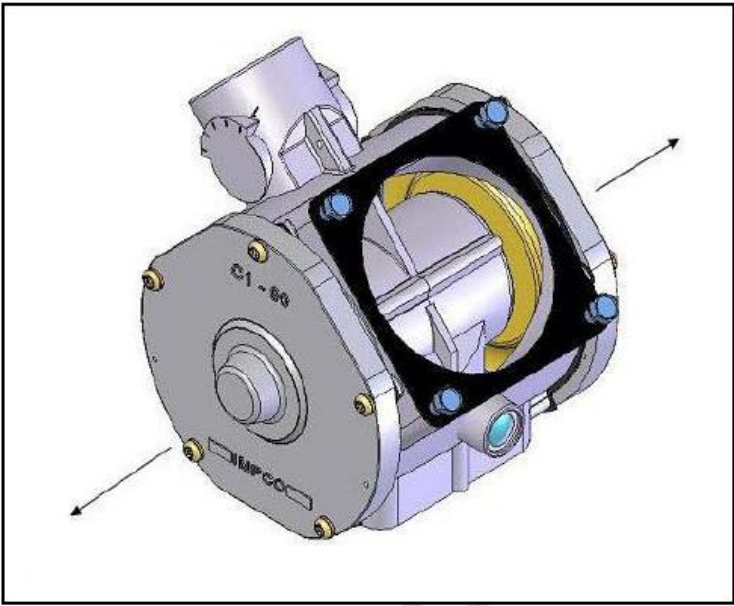
ECM

EPR

/

ECM

< 10 ms



ECI

ECI

/

200DM

I

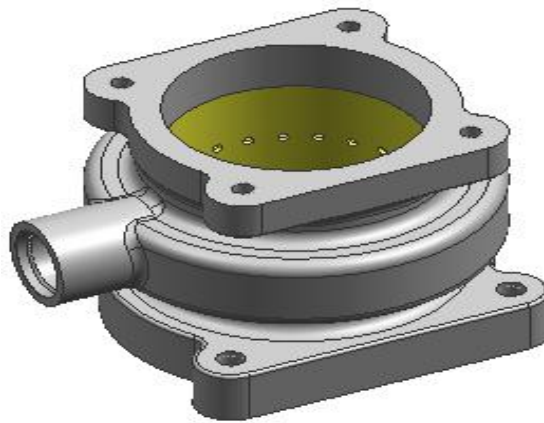
II

I

II

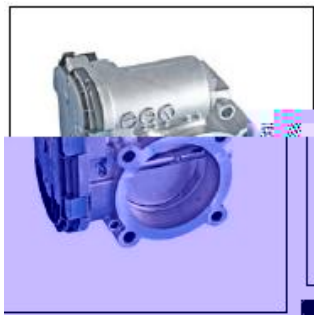


ECI



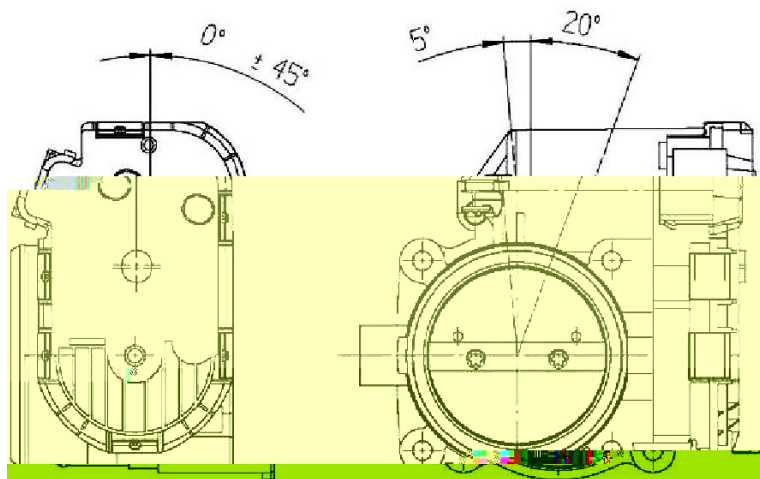
ECI

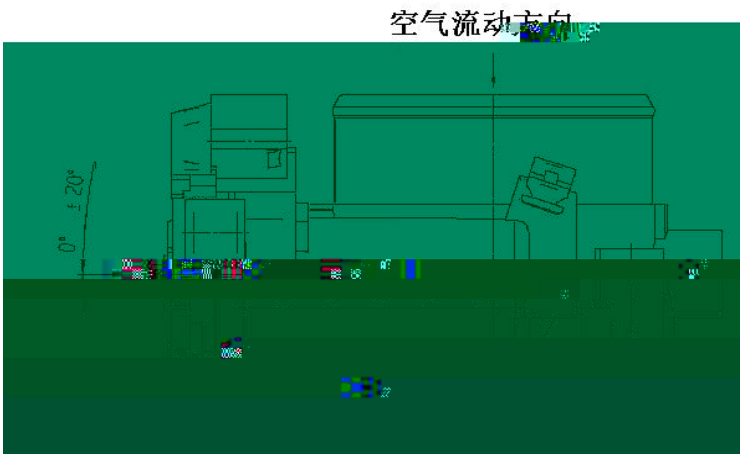
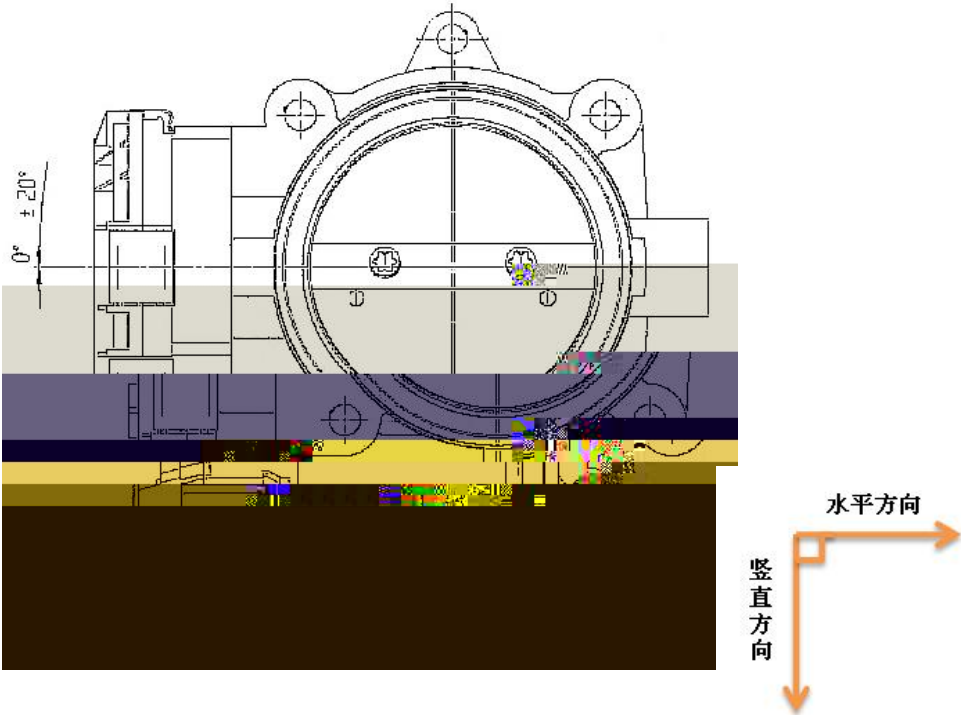
### 3.6.4.8

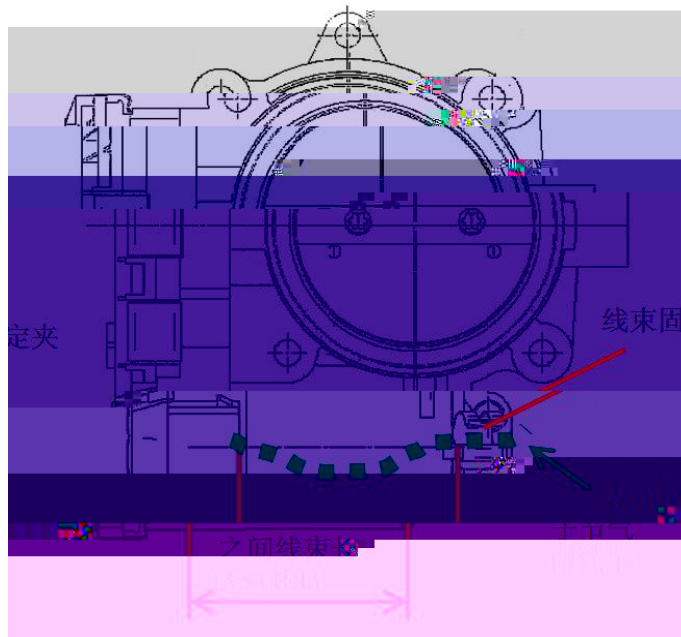


ECM ECM

1

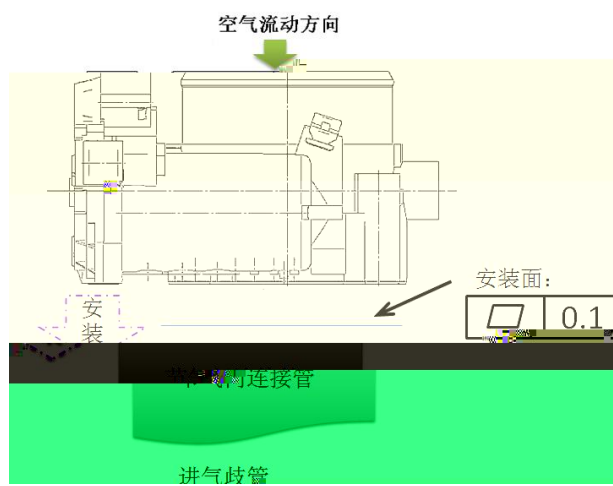




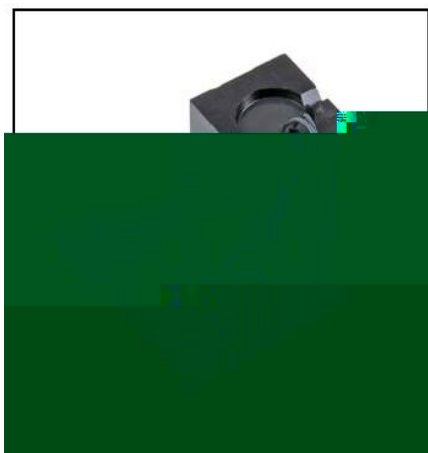


5

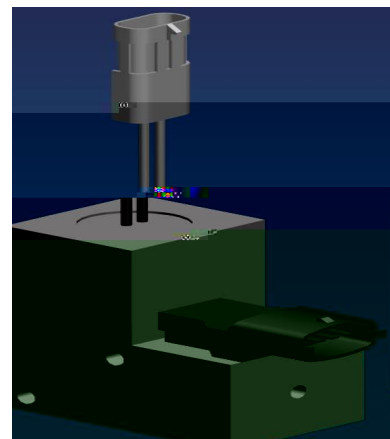
0.1mm



### 3.6.4.9



ECI



ECI

ECI

ECM

ECM

XX

XY

a.

0 °

60 °

b.

30

95

c.

22 /

—25 /

d.

-40 —130

e.

-40 —125

f.

6 mm 8.8

¼ " 5

g.

SAE J1926 7/16 " —20 UNF 2B

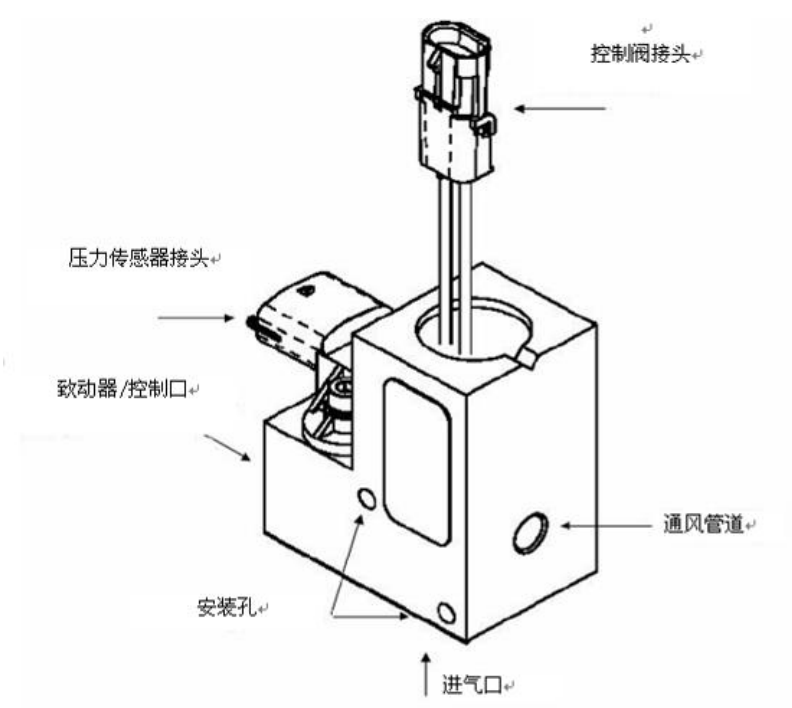
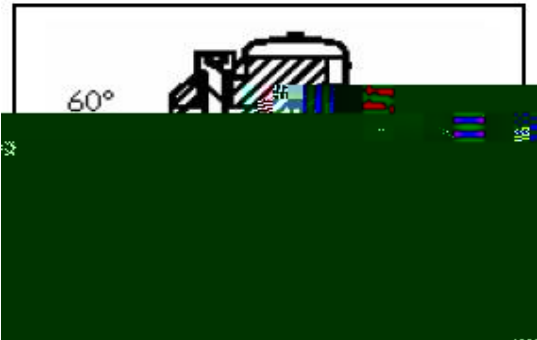
h.

/

SAE J1926 7/16 " —20 UNF 2B

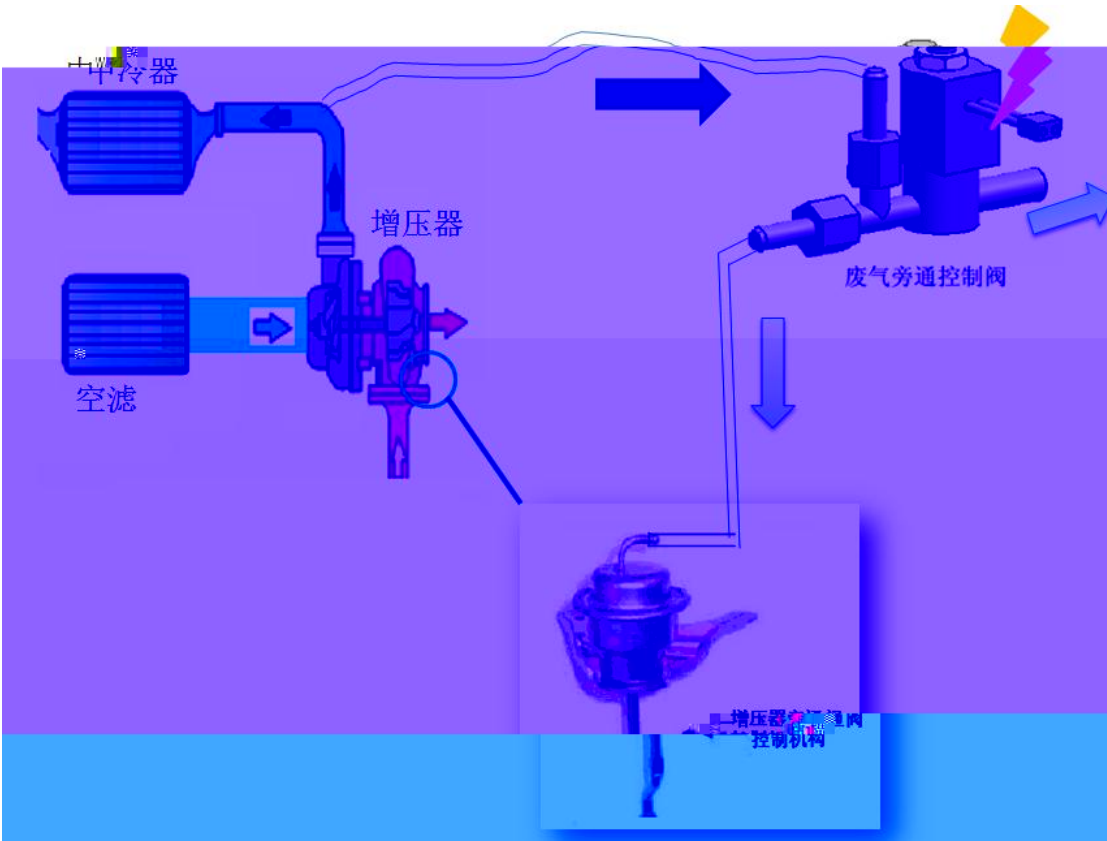
i.

SAE J1926 7/16 " —20 UNF 2B



ESI

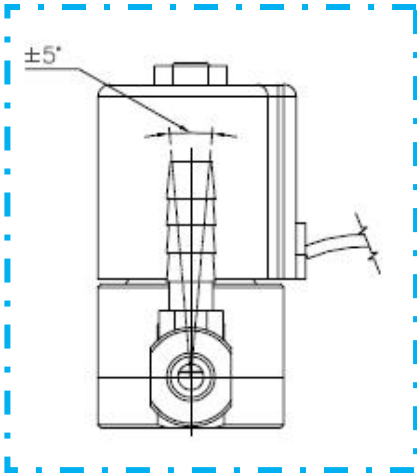
ACT



ESI

- 1
- 2

$\pm 5^\circ$

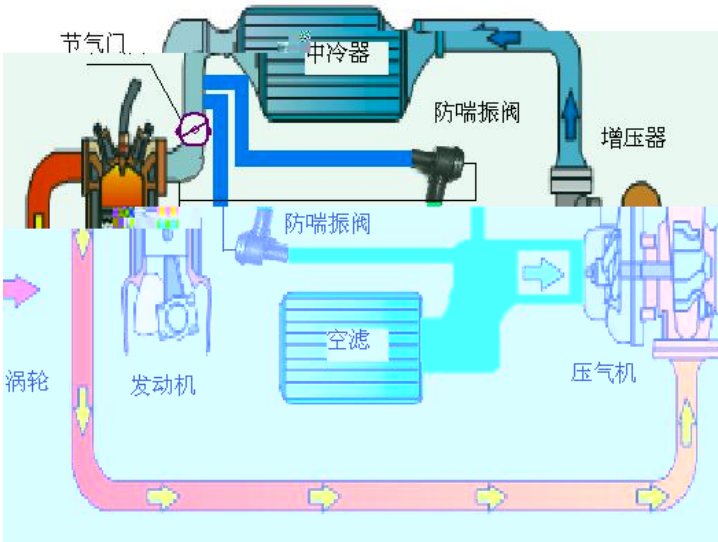


3.6.4.10



6J CNG  
φ 25

φ 25



3.6.4.11



ECI

ECM

ECM

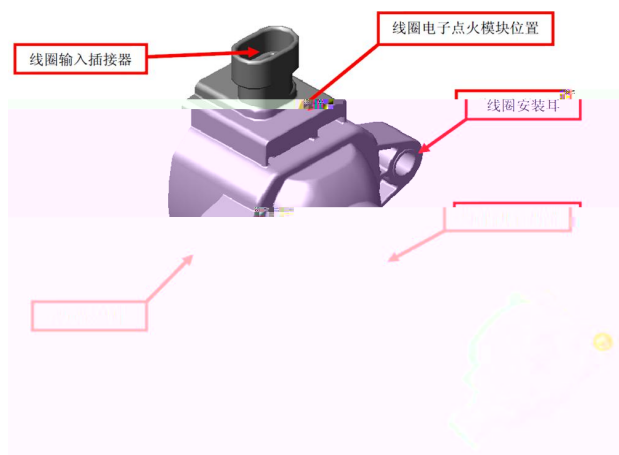
ECI

ESI

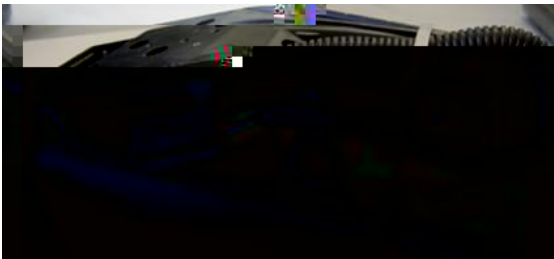
1

2

3



3.6.4.13



ECM

3.6.4.14

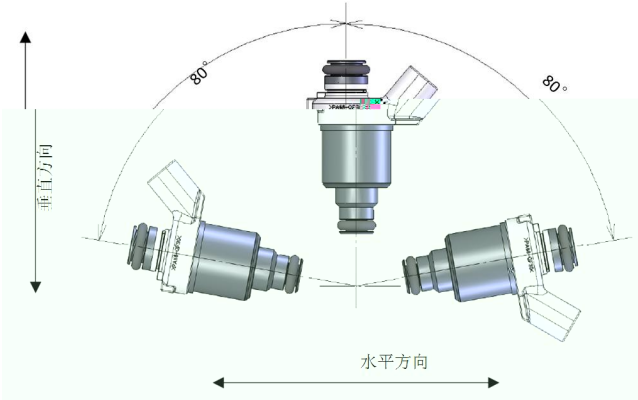
ECM/ECU      ECM/ECU

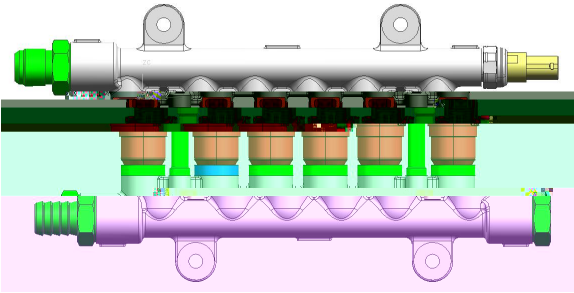
3.6.4.15    ESI

ECU

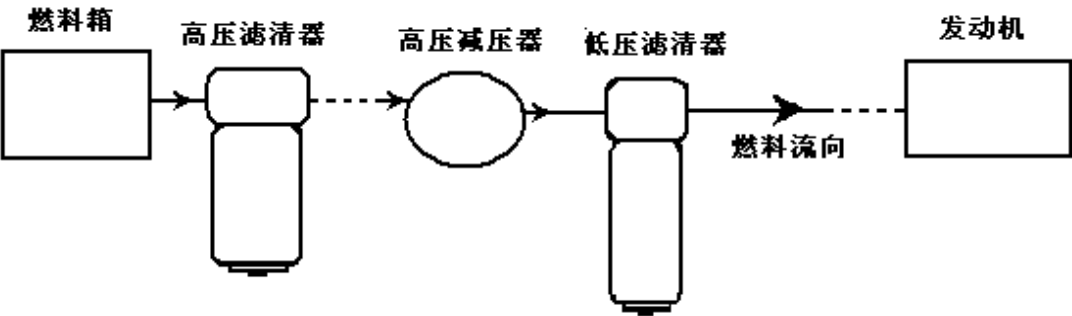
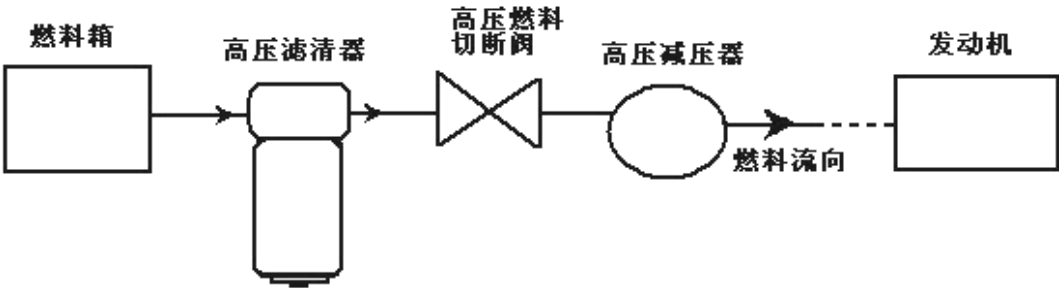
- 1
- 2
- 3
- 4

± 80 °  
≤ 15g      50 Hz    400Hz





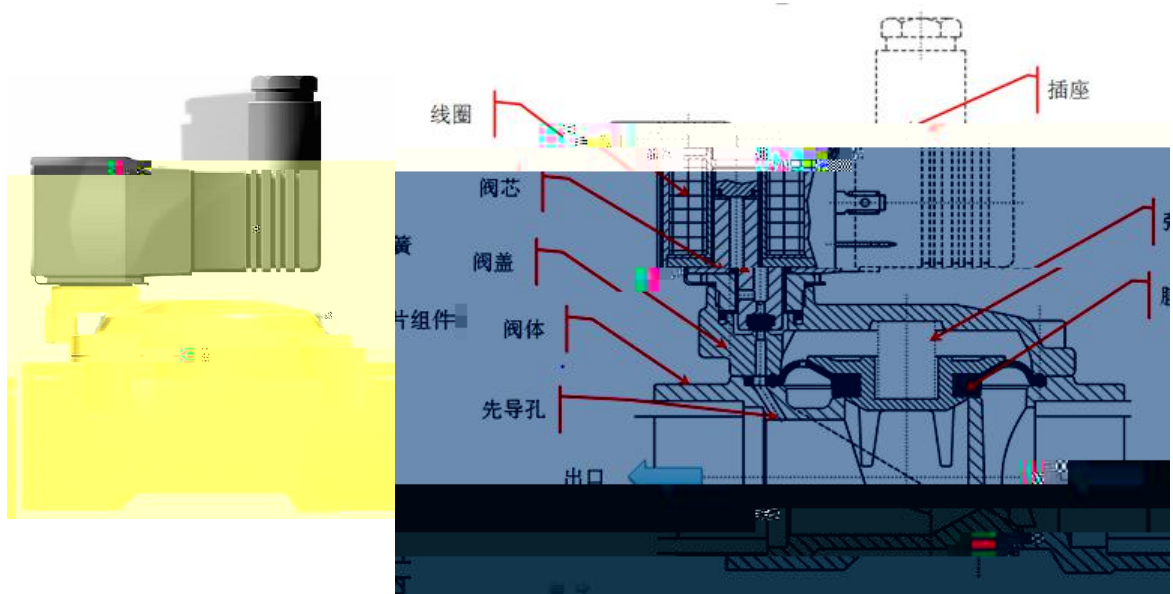
3.6.4.16 ESI /  
/ CNG



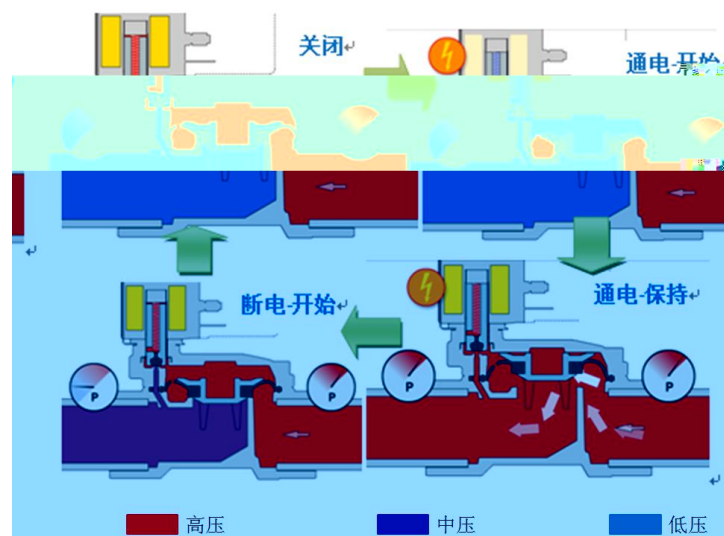
3

4

### 3.6.4.17 ESI



ESI



ESI

- 1)

-40~+120

2)

-40~+120

3)

≤ 30m/s<sup>2</sup> 25~500Hz

4)

5)

± 30 °

6)

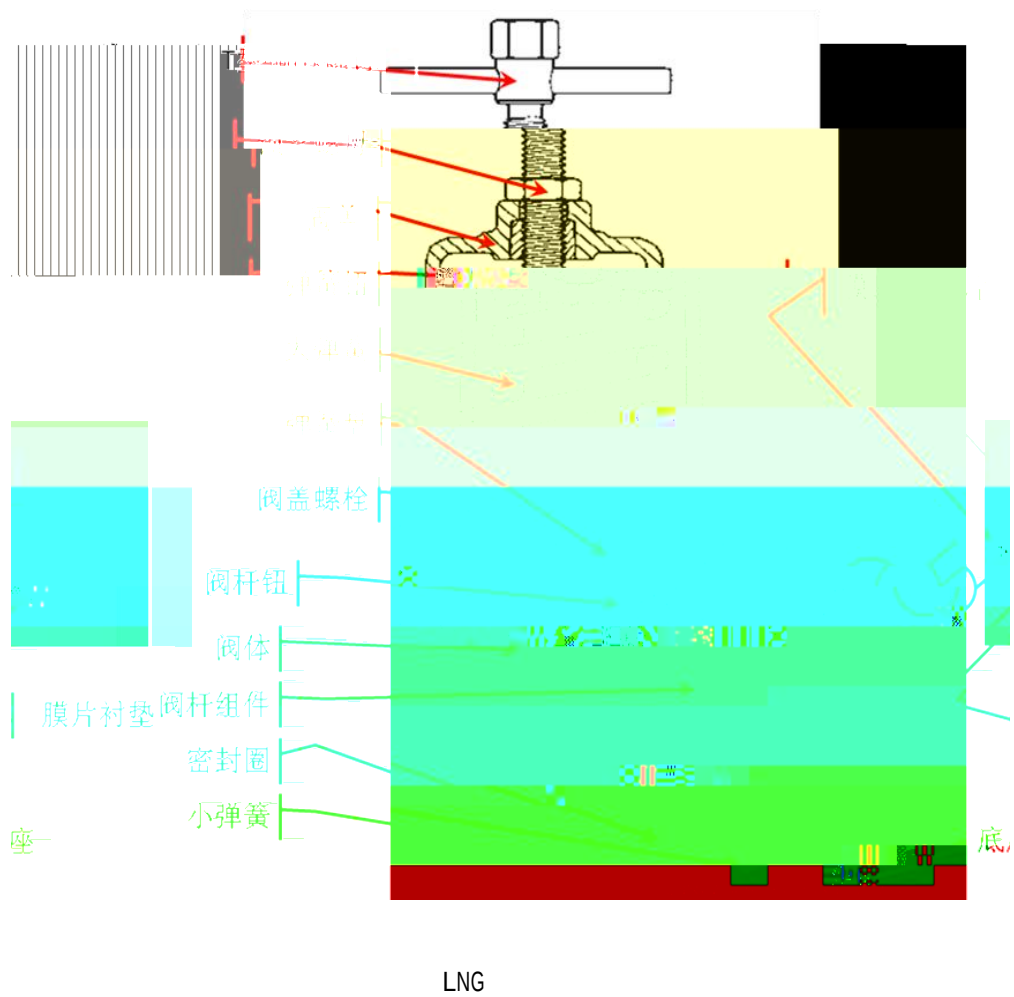
7)

8)

LNG
- Loctite 565

Loctite 567
- Loctite 592

3.6.4.18
ESI
LNG



- 1)

LNG

- 2) T
- 3) LNG
- 4) LNG

|          |        |                       |     |     |
|----------|--------|-----------------------|-----|-----|
| 3.6.4.19 | ECI    | CFV                   |     |     |
|          | CFV    | Continuous Flow Valve | ECI | CFV |
|          | CFV    |                       |     |     |
| 1)       | CFV    |                       |     |     |
|          |        |                       |     |     |
| 2)       |        |                       |     |     |
|          | 2-3bar |                       | LNG | CFV |
| 3)       |        |                       |     |     |
|          |        | CFV                   | PWM |     |
|          |        |                       | CFV |     |

60~100psiG( 410~690kpaG)  
 5%  
 125lb/hr NG (300hp) 56.7kg/h  
 185lb/hr NG (450hp) 83.9kg/h  
 10  
 SAE J1616  
 >10ms >30ms  
 -40~105 ° C  
 125 ° C 10% 5min  
 8G



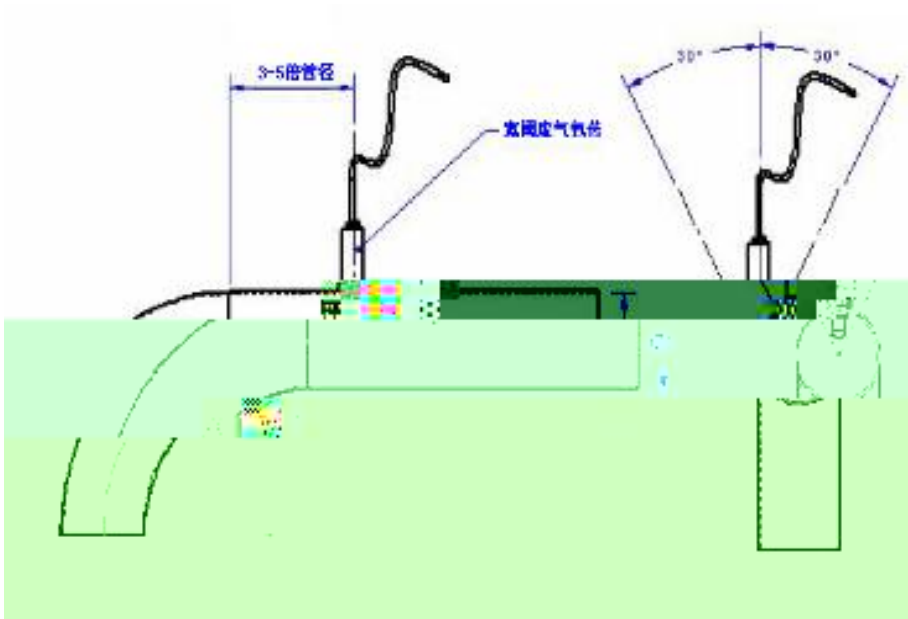
ECI CFV

3.6.4.20

(1

- 1
- 2 D
- 3

AD



(2



ECI      “ Envirotech ”

CAN      ECM

Envirotech

- a.
- b.
- c.
- d.

-40      105

Envirotech

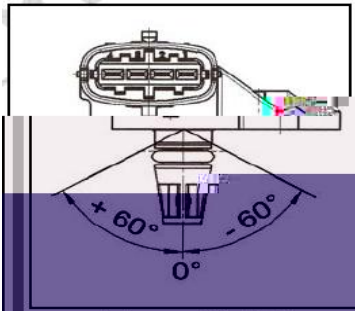
- a.
- b.
- c.

+/- 20

4

(3

/



ECI TMAP /

/ 60 ° 9.7mm 12.7mm.

ESI

1)

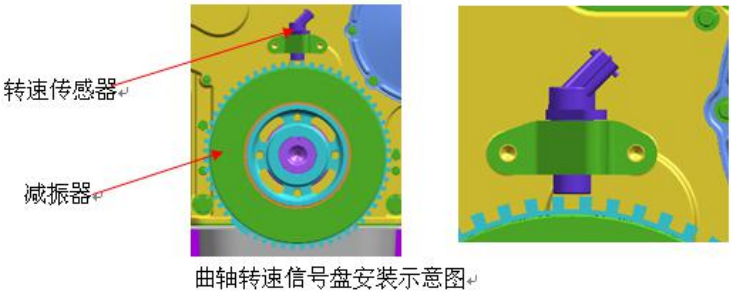
2

(4

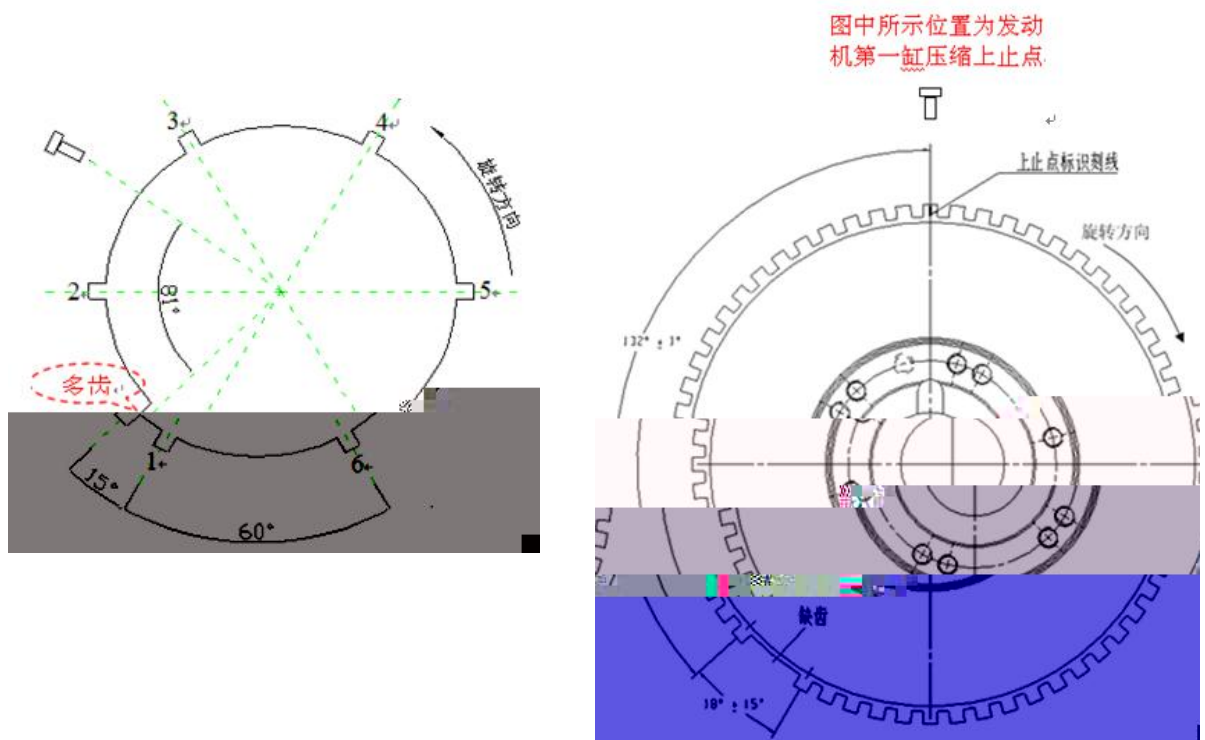
ECM

ECM MAP

1 ± 0.3mm



1.0 ± 0.3mm  
1.0 ± 0.3mm



(5)

ECM ECM

15 20 N.m



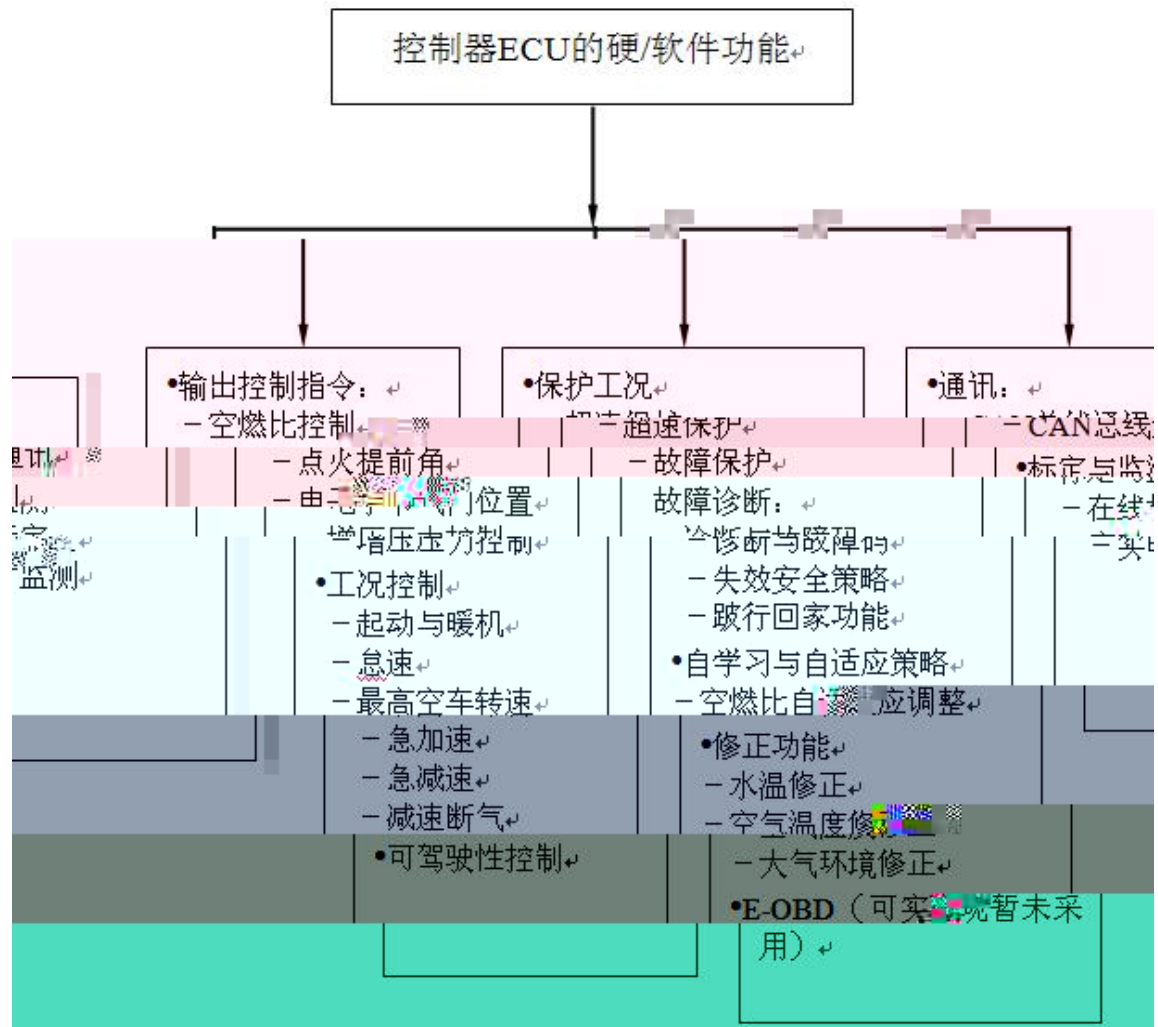
(6)

ECM

15 20 N.m



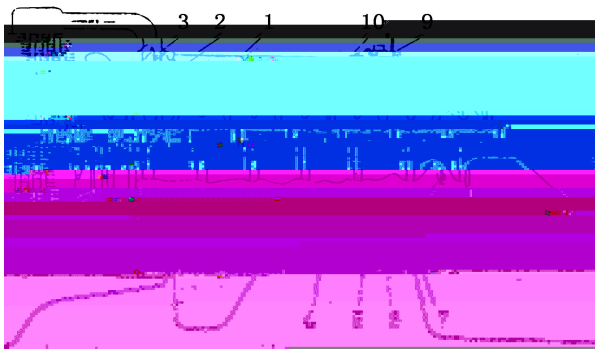
3.6.5



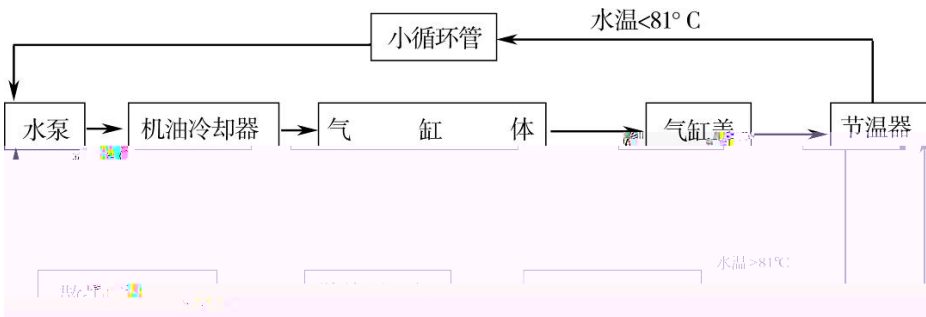
|   |  |  |
|---|--|--|
|   |  |  |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |

|    |  |  |
|----|--|--|
|    |  |  |
| 9  |  |  |
| 10 |  |  |
| 11 |  |  |

3.7



1. 2. 3. 4. 5.
6. 7. 8. 9. 10.



3.7.1

10000 11000 km

3.7.2

2

2)

3.7.3

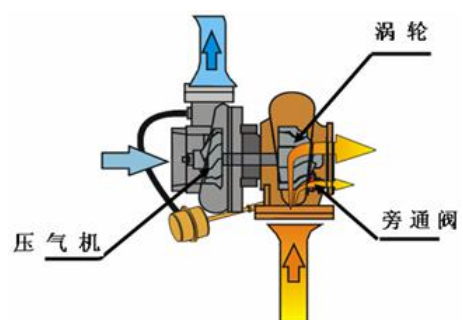
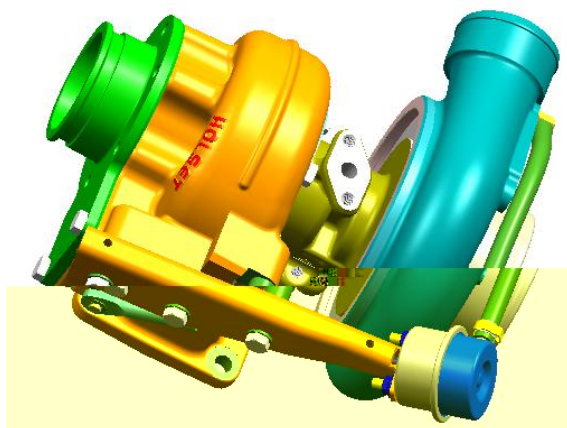
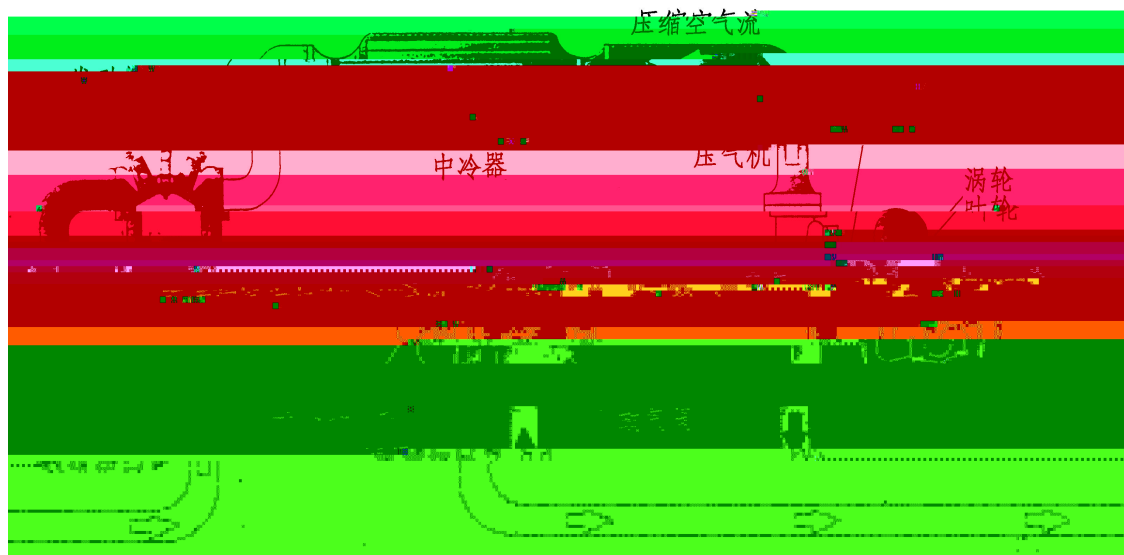
0

(4)

(5)

### 3.8

#### 3.8.1



- 
- 
- 

3 5

5 10

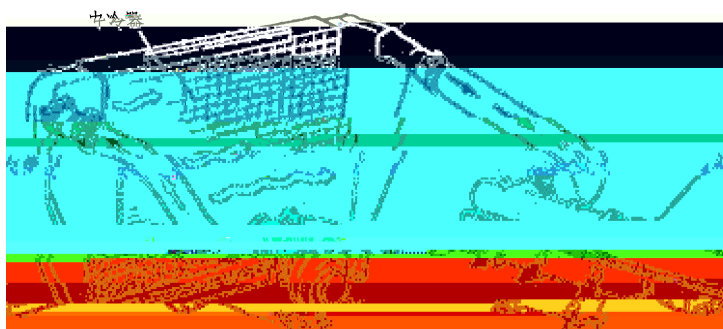
- 
- 

### 3.8.2

( )

—

207KPa



## 3.9

### 3.9.1

:

- 1. 2500 5000km
- 2. 100 200h
- 3.

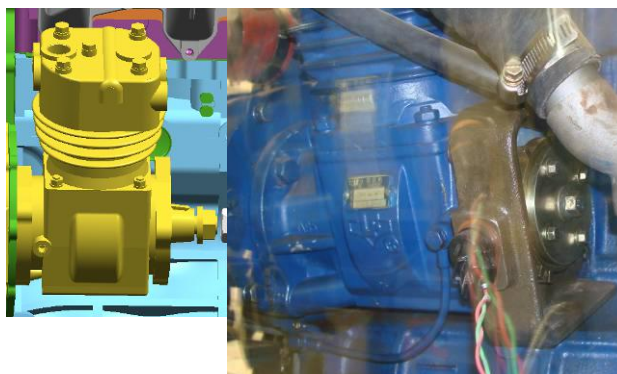
### 3.9.2

### 3.9.3

85N · m

### 3.10

#### 3.10.1



|  |                       |                       |
|--|-----------------------|-----------------------|
|  |                       |                       |
|  | ➤<br>➤                | ➤<br>➤                |
|  | ➤<br>➤<br>➤<br>➤<br>➤ | ➤<br>➤<br>➤<br>➤<br>➤ |
|  | ➤<br>➤<br>➤           | ➤<br>➤<br>➤           |
|  | ➤<br>➤<br>➤           | ➤<br>➤<br>➤           |
|  | ➤<br>➤<br>➤           | ➤<br>➤<br>➤           |

3.10.2



3.10.2.1

- 1).
- 2).

3).

3.10.2.2

- 1)0N68HM N46HM0N32HM
- 2)25 μ m“ ”
- 3)
- 4)
- 5)3000km5000km
- 6)
- 7)
- 8)

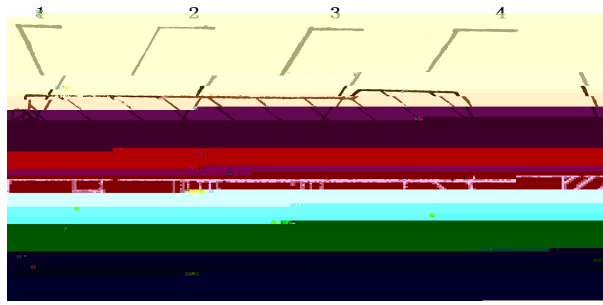
3.10.2.3

|  |  |         |
|--|--|---------|
|  |  |         |
|  |  |         |
|  |  | N32—N46 |
|  |  |         |
|  |  |         |
|  |  |         |
|  |  |         |
|  |  |         |
|  |  |         |
|  |  | “ 0 ”   |
|  |  |         |
|  |  |         |
|  |  |         |

3.10.2.4

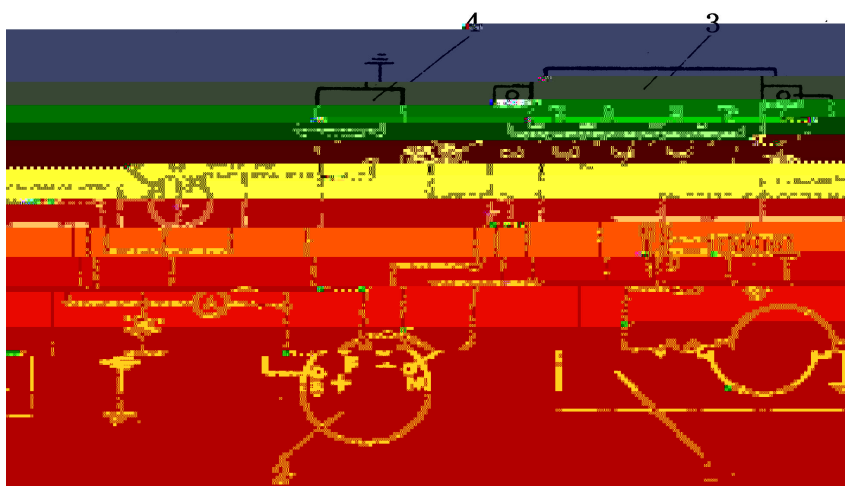
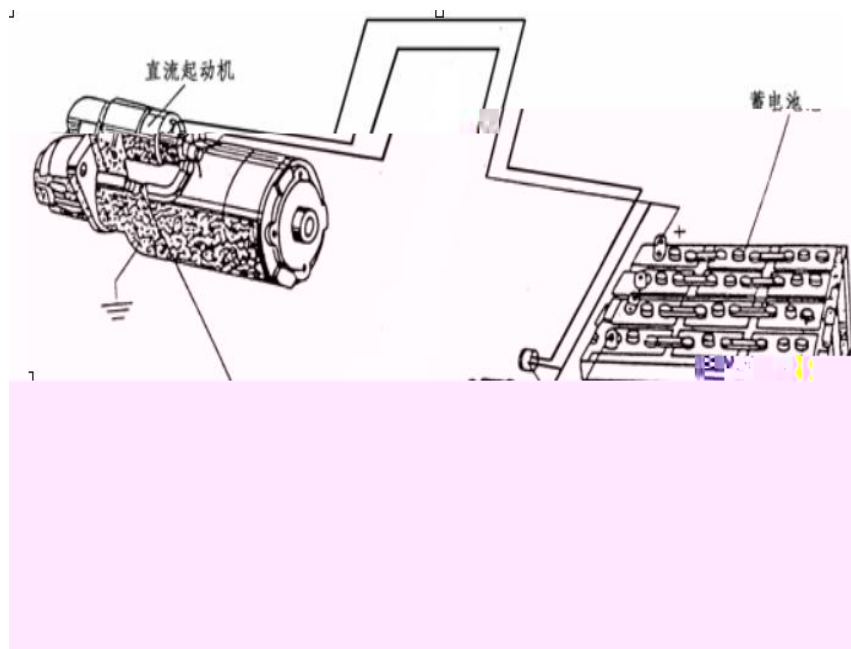
4

“0”



1      2 “0”      3      4

### 3.11



1.      2.      3.      4.

3.11.1

1

28V

1000W

2

10 15mm

3

“ 0 ”

4

5

30000km

.

.

.

1 3

3.11.2



•

•

•

•

•

1

3

10

“ 0 ”

3.12

1

2

3

3.12.1

1)

1300 /

2)

3)

4)

5)

3.12.2

1)

4000-5000km

2)

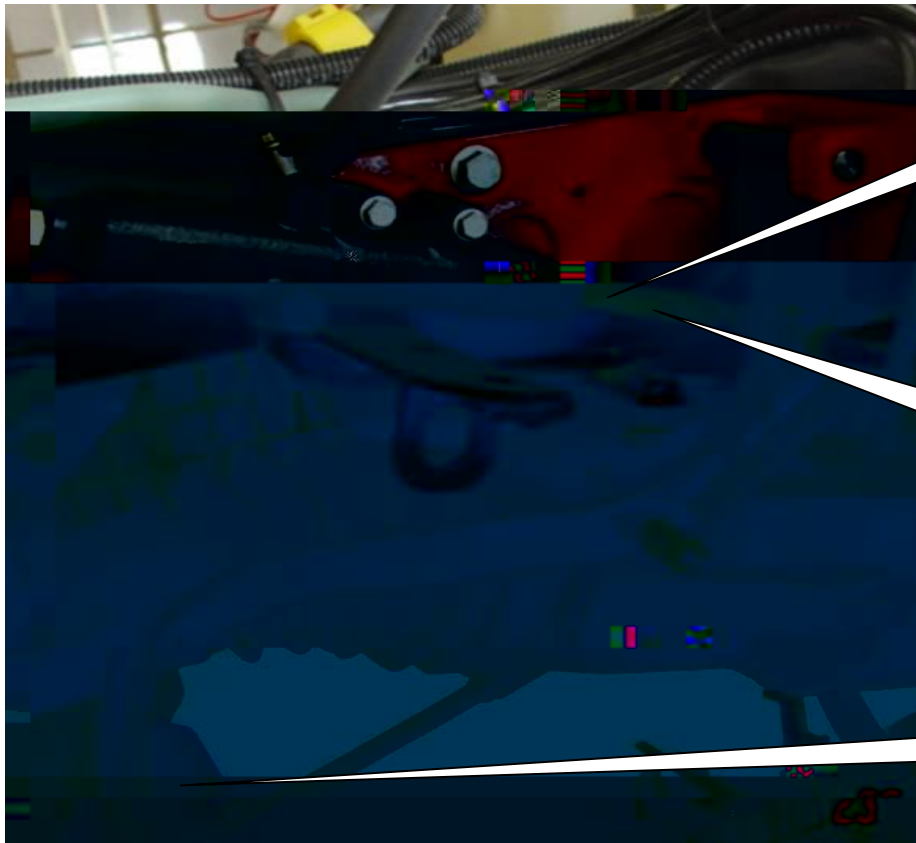
3 6

20 45

3)

0.5 1

0.5






5 7

3 5

3.5




4)

1.2

500

$\phi$  300

1

3.2

$\phi$  300

1.8

100

2



$\leq 20\text{kPa}$ 

3

2000mm

4

4.1

## 4.2

5

## 5.1

### 5.1.1

●

●

●

●



●

●

### 5.1.2

10 ;

1 ;

•

•

•

•

0.1Mpa

•

“ ”

### 5.1.3

60

45

0.1Mpa

2500

60

65%

5.1.4

3 5

2 3

5

-30

5.1.5

30

5.2

1



2



1100r/min

1000-1100 /

200 ,

10

(1)

,

| ECI  | CNG   | :               |                            |
|------|-------|-----------------|----------------------------|
|      |       |                 |                            |
| 108  | MAP   |                 | MAP high pressure          |
| 107  | MAP   |                 | MAP low voltage            |
| 238  | TIP — |                 | TIP high voltage           |
| 237  | TIP — |                 | TIP low voltage            |
| 183  |       | FT              | FT gasoline high           |
| 182  |       |                 | FT gasoline low            |
| 1131 | —     | WGP             | WGP high voltage           |
| 1132 | —     |                 | WGP low voltage            |
| 234  |       |                 | TIP control overboost      |
| 299  |       |                 | TIP control underboost     |
| 118  |       | ECT             | ECT / CHT high voltage     |
| 117  |       |                 | ECT / CHT low voltage      |
| 116  |       |                 | ECT higher than expected 1 |
| 217  |       |                 | ECT higher than expected 2 |
| 1521 |       |                 | CHT higher than expected 1 |
| 1522 |       |                 | CHT higher than expected 2 |
| 113  |       | IAT             | IAT high voltage           |
| 112  |       |                 | IAT low voltage            |
| 111  |       |                 | IAT higher than expected 1 |
| 127  |       |                 | IAT higher than expected 2 |
| 563  |       | Battery Voltage | Voltage high               |

|      |      |                |                     |
|------|------|----------------|---------------------|
| 562  |      |                | Voltage low         |
| 643  | 1#5V |                | 5VE1 high voltage   |
| 642  | 1#5V |                | 5VE1 low voltage    |
| 653  | 2#5V | 5V External 5V | 5VE2 high voltage   |
| 652  | 2#5V |                | 5VE2 low voltage    |
|      |      |                | 5VE1/2 simultaneous |
| 1611 |      |                | out-of-range        |
| 123  |      |                | TPS1 high voltage   |
| 122  |      |                | TPS1 low voltage    |
| 223  |      |                | TPS2 high voltage   |
| 222  |      |                | TPS2 low voltage    |
|      |      | TPS            |                     |
| 221  |      |                |                     |

|      |      |              |                                                   |
|------|------|--------------|---------------------------------------------------|
|      |      |              |                                                   |
| 1515 |      |              | AUX analog PD1 high                               |
| 1516 |      |              | AUX analog PD1 low                                |
| 1511 | EPR  | EPR          | AUX analog PU1 high                               |
| 1512 | EPR  |              | AUX analog PU1 low                                |
| 1513 |      |              | AUX analog PU2 high                               |
| 1514 |      |              | AUX analog PU2 low                                |
| 219  |      | Engine Speed | Max govern speed override                         |
| 1111 |      |              | Fuel rev limit                                    |
| 1112 |      |              | Spark rev limit                                   |
| 1161 | LPG  |              | AL high LPG                                       |
| 1162 | LPG  |              | AL low LPG                                        |
| 1163 | NG   |              | AL high NG                                        |
| 1164 | NG   |              | AL low NG                                         |
| 1151 | LPG  |              | CL high LPG                                       |
| 1152 | LPG  |              | CL low LPG                                        |
| 1153 | NG   |              | CL high NG                                        |
| 1154 | NG   |              | CL low NG                                         |
| 134  | EGO  | EGO Sensors  | EGO open / lazy pre-cat 1                         |
| 160  | UEGO |              | EGO open / lazy post-cat 2                        |
| 686  |      | Power Relay  | Relay control ground short                        |
| 685  |      |              | Relay coil open                                   |
| 687  |      |              | Relay coil short to power                         |
| 1644 | MIL  | MIL          | MIL control ground short                          |
| 650  | MIL  |              | MIL open                                          |
| 1645 | MIL  |              | MIL control short to power                        |
| 1171 |      | Megajector   | MegaJector delivery pressure higher than expected |
| 1172 |      |              | MegaJector delivery pressure 'lower than expected |
| 1173 |      |              | MegaJector comm lost                              |
| 1174 |      |              | MegaJector voltage supply high                    |
| 1175 |      |              | MegaJector voltage supply low                     |

|      |     |             |                                               |
|------|-----|-------------|-----------------------------------------------|
| 1176 |     |             | MegaJector internal actuator fault detection  |
| 1177 |     |             | MegaJector internal circuitry fault detection |
| 1178 |     |             | MegaJector internal comm 'fault detection     |
| 1183 |     |             | MegaJector autozero / lockoff failed          |
| 342  |     | Cam / Crank | Cam loss                                      |
| 337  |     |             | Crank loss                                    |
| 341  |     |             | Cam sync noise                                |
| 336  |     |             | Crank sync noise                              |
| 16   |     |             | Never crank synced at start                   |
| 1626 | CAN | J1939 CAN   | CAN Tx failure                                |
| 1627 | CAN |             | CAN Rx failure                                |
| 1628 | CAN |             | CAN address conflict failure                  |

ECI

:LPG    NG

4

|      |     |
|------|-----|
|      |     |
| 1161 | LPG |
| 1162 | LPG |
| 1151 | LPG |
| 1152 | LPG |

CFV

:

|   |       |                                              |     | SPN  | FMI |
|---|-------|----------------------------------------------|-----|------|-----|
| 0 | P0108 | MAP pressure high                            | 108 | 106  | 16  |
| 1 | P0107 | MAP voltage low                              | 107 | 106  | 4   |
| 2 | P0238 | TIP/TOP high voltage                         | 238 | 102  | 3   |
| 3 | P0237 | TIP/TOP low voltage                          | 237 | 102  | 4   |
| 4 | P0236 | TIP/TOP active                               | 236 | 102  | 2   |
| 5 | P0183 | FT high voltage                              | 183 | 174  | 3   |
| 6 | P0182 | FT low voltage                               | 182 | 174  | 4   |
| 7 | P0188 | Gaseous fuel temperature sender high voltage | 188 | 3468 | 3   |
| 8 | P0187 | Gaseous fuel temperature sender low voltage  | 187 | 3468 | 4   |

|    |       |                                            |      | SPN  | FMI |
|----|-------|--------------------------------------------|------|------|-----|
| 9  | P1131 | WGP voltage high                           | 1131 | 1192 | 3   |
| 10 | P1132 | WGP voltage low                            | 1132 | 1192 | 4   |
| 11 | P0234 | Boost control over-boost failure           | 234  | 102  | 0   |
| 12 | P0299 | Boost control under-boost failure          | 299  | 102  | 1   |
| 13 | P0118 | ECT voltage high                           | 118  | 110  | 3   |
| 14 | P0117 | ECT voltage low                            | 117  | 110  | 4   |
| 15 | P0116 | ECT higher than expected stage 1           | 116  | 110  | 15  |
| 16 | P0217 | ECT higher than expected stage 2           | 217  | 110  | 0   |
| 17 | P0113 | IAT voltage high                           | 113  | 105  | 3   |
| 18 | P0112 | IAT voltage low                            | 112  | 105  | 4   |
| 19 | P0111 | IAT higher than expected stage 1           | 111  | 105  | 15  |
| 20 | P0127 | IAT higher than expected stage 2           | 127  | 105  | 0   |
| 21 | P2428 | EGT temperature high                       | 2428 | 173  | 0   |
| 22 | P2229 | BP high pressure                           | 2229 | 108  | 0   |
| 23 | P0129 | BP low pressure                            | 129  | 108  | 1   |
| 24 | P0563 | Vbat voltage high                          | 563  | 168  | 15  |
| 25 | P0562 | Vbat voltage low                           | 562  | 168  | 17  |
| 26 | P0643 | Sensor supply voltage 1 high               | 643  | 1079 | 3   |
| 27 | P0642 | Sensor supply voltage 1 low                | 642  | 1079 | 4   |
| 28 | P0653 | Sensor supply voltage 2 high               | 653  | 1080 | 3   |
| 29 | P0652 | Sensor supply voltage 2 low                | 652  | 1080 | 4   |
| 30 | P1611 | Sensor supply voltage 1 and 2 out-of-range | 1611 | 1079 | 31  |
| 31 | P0123 | TPS1 voltage high                          | 123  | 51   | 3   |
| 32 | P0122 | TPS1 voltage low                           | 122  | 51   | 4   |
| 33 | P0223 | TPS2 voltage high                          | 223  | 3673 | 3   |
| 34 | P0222 | TPS2 voltage low                           | 222  | 3673 | 4   |
| 35 | P0221 | TPS1-2 higher than expected                | 221  | 51   | 0   |
| 36 | P0121 | TPS1-2 lower than expected                 | 121  | 51   | 1   |
| 37 | P2112 | Unable to reach higher TPS                 | 2112 | 51   | 7   |
| 38 | P2111 | Unable to reach lower TPS                  | 2111 | 51   | 7   |
| 39 | P2135 | TPS1/2 simultaneous voltages out-of-range  | 2135 | 51   | 31  |
| 40 | P2122 | FPP1 voltage high                          | 2122 | 91   | 3   |
| 41 | P2123 | FPP1 voltage low                           | 2123 | 91   | 4   |
| 42 | P2128 | FPP2 voltage high                          | 2128 | 29   | 3   |

|    |       |                                        |      | SPN | FMI |
|----|-------|----------------------------------------|------|-----|-----|
| 43 | P2127 | FPP2 voltage low                       | 2127 | 29  | 4   |
| 44 | P2115 | FPP1 higher than IVS                   | 2115 | 91  | 0   |
| 45 | P2139 | FPP1 lower than IVS                    | 2139 | 91  | 1   |
| 46 | P2116 | FPP2 higher than IVS                   | 2116 | 29  | 0   |
| 47 | P2140 | FPP2 lower than IVS                    | 2140 | 29  | 1   |
| 48 | P2126 | FPP1-2 higher than expected            | 2126 | 91  | 16  |
| 49 | P2121 | FPP1-2 lower than expected             | 2121 | 91  | 18  |
| 50 | P2130 | IVS stuck at-idle, FPP1/2 match        | 2130 | 558 | 5   |
| 51 | P2131 | IVS stuck off-idle, FPP1/2 match       | 2131 | 558 | 6   |
| 52 | P1531 | Gov1/2/3 interlock failure             | 1531 | 0   | 31  |
| 53 | P1515 | AUX analog Pull-Down 1 high voltage    | 1515 | 710 | 3   |
| 54 | P1516 | AUX analog Pull-Down 1 low voltage     | 1516 | 710 | 4   |
| 55 | P1561 | AUX analog Pull-Down 2 high voltage    | 1561 | 711 | 3   |
| 56 | P1562 | AUX analog Pull-Down 2 low voltage     | 1562 | 711 | 4   |
| 57 | P1563 | AUX analog Pull-Down 3 high voltage    | 1563 | 712 | 3   |
| 58 | P1564 | AUX analog Pull-Down 3 low voltage     | 1564 | 712 | 4   |
| 59 | P1511 | AUX analog Pull-Up 1 high voltage      | 1511 | 701 | 3   |
| 60 | P1512 | AUX analog Pull-Up 1 low voltage       | 1512 | 701 | 4   |
| 61 | P1513 | AUX analog Pull-Up 2 high voltage      | 1513 | 702 | 3   |
| 62 | P1514 | AUX analog Pull-Up 2 low voltage       | 1514 | 702 | 4   |
| 63 | P1517 | AUX analog Pull-Up 3 high voltage      | 1517 | 703 | 3   |
| 64 | P1518 | AUX analog Pull-Up 3 low voltage       | 1518 | 703 | 4   |
| 65 | P1541 | AUX analog Pull-Up/Down 1 high voltage | 1541 | 704 | 3   |
| 66 | P1542 | AUX analog Pull-Up/Down 1 low voltage  | 1542 | 704 | 4   |
| 67 | P1543 | AUX analog Pull-Up/Down 2 high voltage | 1543 | 705 | 3   |
| 68 | P1544 | AUX analog Pull-Up/Down 2 low voltage  | 1544 | 705 | 4   |
| 69 | P1545 | AUX analog Pull-Up/Down 3 high voltage | 1545 | 706 | 3   |
| 70 | P1546 | AUX analog Pull-Up/Down 3 low voltage  | 1546 | 706 | 4   |
| 71 | P1547 | AUX analog Pull-Up/Down 4 high voltage | 1547 | 713 | 3   |
| 72 | P1548 | AUX analog Pull-Up/Down 4 low voltage  | 1548 | 713 | 4   |
| 73 | P1551 | AUX digital 1 high voltage             | 1551 | 707 | 3   |
| 74 | P1552 | AUX digital 1 low voltage              | 1552 | 707 | 4   |
| 75 | P1553 | AUX digital 2 high voltage             | 1553 | 708 | 3   |
| 76 | P1554 | AUX digital 2 low voltage              | 1554 | 708 | 4   |

|    |       |                                          |      | SP   | FMI |
|----|-------|------------------------------------------|------|------|-----|
| 77 | P055  | Oil pressure sender high pressure        | 55   | 109  | 3   |
| 78 | P056  | Oil pressure sender low pressure         | 56   | 7    | 4   |
| 79 | P0219 | RPM higher than max allowed govern speed | 219  | 515  | 15  |
| 80 | P0134 | ORPM above fuel rev limit level          | 111  | 515  | 16  |
| 81 | P1112 | RPM above spark rev limit level          | 112  | 515  | 0   |
| 82 | P0524 | Oil pressure sender low pressure stage 2 | 524  | 100  | 1   |
| 83 | P0521 | Oil pressure sender high pressure        | 521  | 100  | 0   |
| 84 | P0523 | Oil pressure sender high voltage         | 523  | 100  | 3   |
| 85 | P0522 | Oil pressure sender low voltage          | 522  | 100  | 4   |
| 86 | P0520 | Oil pressure sender low pressure stage 1 | 520  | 100  | 18  |
| 87 | P1161 | Adaptive-learn LPG high                  | 1161 | 4237 | 0   |
| 88 | P1162 | Adaptive-learn LPG low                   | 1162 | 4237 | 1   |
| 89 | P1163 | Adaptive-learn NG high                   | 1163 | 4237 | 0   |
| 90 | P1164 | Adaptive-learn NG low                    | 1164 | 4237 | 1   |
| 91 | P1151 |                                          | 1151 | 4236 | 0   |
| 92 | P1152 | Closed-loop LPG low                      | 1152 | 4236 | 1   |
| 93 | P1153 | Closed-loop NG high                      | 1153 | 4236 | 0   |
| 94 | P1154 | Closed-loop NG low                       | 1154 | 4236 | 1   |
| 95 | P1165 | Catalyst inactive on LPG                 | 1165 | 3050 | 11  |
| 96 | P1166 | Catalyst inactive on NG                  | 1166 | 3050 | 11  |
| 97 | P0133 | EG01 open / lazy / active                | 133  |      |     |

|     |       |                                               |      | SPN  | FMI |
|-----|-------|-----------------------------------------------|------|------|-----|
| 111 | P8911 | UEGO sense cell voltage low                   | 8911 | 3217 | 4   |
| 112 | P8912 | UEGO pump voltage at high drive limit         | 8912 | 3225 | 3   |
| 113 | P8913 | UEGO pump voltage at low drive limit          | 8913 | 3225 | 4   |
| 114 | P8914 | UEGO sense cell slow to warm up               | 8914 | 3222 | 10  |
| 115 | P8915 | UEGO pump cell slow to warm up                | 8915 | 3225 | 10  |
| 116 | P8916 | UEGO sense cell impedance high                | 8916 | 3222 | 0   |
| 117 | P8917 | UEGO pump cell impedance high                 | 8917 | 3225 | 0   |
| 118 | P8918 | UEGO pump cell impedance low                  | 8918 | 3225 | 1   |
| 119 | P2300 | Spark coil 1 primary open or short to ground  | 2300 | 1268 | 5   |
| 120 | P2303 | Spark coil 2 primary open or short to ground  | 2303 | 1269 | 5   |
| 121 | P2306 | Spark coil 3 primary open or short to ground  | 2306 | 1270 | 5   |
| 122 | P2309 | Spark coil 4 primary open or short to ground  | 2309 | 1271 | 5   |
| 123 | P2312 | Spark coil 5 primary open or short to ground  | 2312 | 1272 | 5   |
| 124 | P2315 | Spark coil 6 primary open or short to ground  | 2315 | 1273 | 5   |
| 125 | P2318 | Spark coil 7 primary open or short to ground  | 2318 | 1274 | 5   |
| 126 | P2321 | Spark coil 8 primary open or short to ground  | 2321 | 1275 | 5   |
| 127 | P2324 | Spark coil 9 primary open or short to ground  | 2324 | 1276 | 5   |
| 128 | P2327 | Spark coil 10 primary open or short to ground | 2327 | 1277 | 5   |
| 129 | P2301 | Spark coil 1 primary shorted                  | 2301 | 1268 | 6   |
| 130 | P2304 | Spark coil 2 primary shorted                  | 2304 | 1269 | 6   |
| 131 | P2307 | Spark coil 3 primary shorted                  | 2307 | 1270 | 6   |
| 132 | P2310 | Spark coil 4 primary shorted                  | 2310 | 1271 | 6   |
| 133 | P2313 | Spark coil 5 primary shorted                  | 2313 | 1272 | 6   |
| 134 | P2316 | Spark coil 6 primary shorted                  | 2316 | 1273 | 6   |
| 135 | P2319 | Spark coil 7 primary shorted                  | 2319 | 1274 | 6   |
| 136 | P2322 | Spark coil 8 primary shorted                  | 2322 | 1275 | 6   |
| 137 | P2325 | Spark coil 9 primary shorted                  | 2325 | 1276 | 6   |
| 138 | P2328 | Spark coil 10 primary shorted                 | 2328 | 1277 | 6   |
| 139 | P0686 | Power relay ground short                      | 686  | 1485 | 4   |
| 140 | P0685 | Power relay coil open                         | 685  | 1485 | 5   |
| 141 | P0687 | Power relay coil short to power               | 687  | 1485 | 3   |
| 142 | P0616 | Start relay ground short                      | 616  | 1321 | 4   |
| 143 | P0615 | Start relay coil open                         | 615  | 1321 | 5   |
| 144 | P0617 | Start relay coil short to power               | 617  | 1321 | 3   |

|     |       |                                                |      | SPN    | FMI |
|-----|-------|------------------------------------------------|------|--------|-----|
| 145 | P1644 | MIL control ground short                       | 1644 | 1213   | 4   |
| 146 | P0650 | MIL open                                       | 650  | 1213   | 5   |
| 147 | P1645 | MIL control short to power                     | 1645 | 1213   | 3   |
| 148 | P2618 | Tach output ground short                       | 2618 | 645    | 4   |
| 149 | P2619 | Tach output short to power                     | 2619 | 645    | 3   |
| 150 | P1171 | EPR/CFV delivery pressure higher than expected | 1171 | 520260 | 0   |
| 151 | P1172 | EPR/CFV delivery pressure lower than expected  | 1172 | 520260 | 1   |
| 152 | P1173 | EPR/CFV comm lost                              | 1173 | 520260 | 31  |
| 153 | P1174 | EPR/CFV voltage supply high                    | 1174 | 520260 | 3   |
| 154 | P1175 | EPR/CFV voltage supply low                     | 1175 | 520260 | 4   |
| 155 | P1176 | EPR/CFV internal actuator fault detection      | 1176 | 520260 | 12  |
| 156 | P1177 | EPR/CFV internal circuitry fault detection     | 1177 | 520260 | 12  |
| 157 | P1178 | EPR/CFV internal comm fault detection          | 1178 | 520260 | 12  |
| 158 | P1183 | EPR/CFV auto-zero / lock-off failure           | 1183 | 520803 | 31  |
| 159 | P0916 | Shift tactuator feedback out-of-range          | 916  | 520226 | 3   |
| 160 | P0919 | Shift unable to reach desired gear             | 919  | 520226 | 7   |
| 161 | P0920 | Shift actuator or drive circuit failed         | 920  | 520226 | 31  |
| 162 | P1631 | PWM1-Gauge1 open / ground short                | 1631 | 697    | 5   |
| 163 | P1632 | PWM1-Gauge1 short to power                     | 1632 | 697    | 3   |
| 164 | P1633 | PWM2-Gauge2 open / ground short                | 1633 | 698    | 5   |
| 165 | P1634 | PWM2-Gauge2 short to power                     | 1634 | 698    | 3   |
| 166 | P1635 | PWM3-Gauge3 open / ground short                | 1635 | 699    | 5   |
| 167 | P1636 | PWM3-Gauge3 short to power                     | 1636 | 699    | 3   |
| 168 | P1637 | PWM4 open / ground short                       | 1637 | 700    | 5   |
| 169 | P1638 | PWM4 short to power                            | 1638 | 700    | 3   |
| 170 | P1639 | PWM5 open / ground short                       | 1639 | 924    | 5   |
| 171 | P1640 | PWM5 short to power                            | 1640 | 924    | 3   |
| 172 | P1661 | PWM6 open / ground short                       | 1661 | 925    | 5   |
| 173 | P1662 | PWM6 short to power                            | 1662 | 925    | 3   |
| 174 | P1663 | PWM7 open / ground short                       | 1663 | 926    | 5   |
| 175 | P1664 | PWM7 short to power                            | 1664 | 926    | 3   |
| 176 | P1665 | PWM8 open / ground short                       | 1665 | 2646   | 5   |
| 177 | P1666 | PWM8 short to power                            | 1666 | 2646   | 3   |
| 178 | P1669 | PWM9 open / ground short                       | 1669 | 2647   | 5   |

|     |       |                                                    |      | SPN  | FMI |
|-----|-------|----------------------------------------------------|------|------|-----|
| 179 | P1670 | PWM9 short to power                                | 1670 | 2647 | 3   |
| 180 | P502  | Roadspeed input loss of signal                     | 502  | 84   | 8   |
| 181 | P0342 | Loss of CAM input signal                           | 342  | 723  | 4   |
| 182 | P0341 | CAM input signal noise                             | 341  | 723  | 2   |
| 183 | P0336 | CRANK input signal noise                           | 336  | 636  | 2   |
| 184 | P0337 | Crank signal loss                                  | 337  | 636  | 4   |
| 185 | P0016 | rank and/or cam could not synchronize during start | 16   | 636  | 8   |
| 186 | P0606 | Microprocessor failure - COP                       | 606  | 629  | 31  |
| 187 | P1612 | Microprocessor failure - RTI 1                     | 1612 | 629  | 31  |
| 188 | P1613 | Microprocessor failure - RTI 2                     | 1613 | 629  | 31  |
| 189 | P1614 | Microprocessor failure - RTI 3                     | 1614 | 629  | 31  |
| 190 | P1615 | Microprocessor failure - A/D                       | 1615 | 629  | 31  |
| 191 | P1616 | Microprocessor failure - Interrupt                 | 1616 | 629  | 31  |
| 192 | P0601 | Microprocessor failure - FLASH                     | 601  | 628  | 13  |
| 193 | P0604 | Microprocessor failure - RAM                       | 604  | 630  | 12  |
| 194 | P1625 | J1939 shutdown request                             | 1625 | 1110 | 31  |
| 195 | P1626 | CAN-J1939 Tx fault                                 | 1626 | 639  | 12  |
| 196 | P1627 | CAN-J1939 Rx fault                                 | 1627 | 639  | 12  |
| 197 | P1628 | J1939 CAN address / engine-number conflict         | 1628 | 639  | 13  |
| 198 | P1629 | J1939 TSC1 message receipt loss                    | 1629 | 695  | 9   |
| 199 | P1630 | J1939 ETC message receipt loss                     | 1630 | 91   | 19  |
| 200 | P1651 | J1939 ETC message receipt loss while in-gear       | 1651 | 91   | 9   |

5.4

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5.4.1

3000 5000km

- 1 5
- 2
- 3 5
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- 7

5.4.2

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[illegible]



5.4.5

3000 5000 10000 15000 20000 30000

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|  |   | 3000 | 5000 | 10000 | 15000 | 20000 | 30000 | 50000 | 60000 | 100000 | 150000 |
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5.4.6

5.4.6.1

- 1)
- 2) 50000 55000km 800
- 3)
- 4) 2500km

5.4.6.2

5.4.6.2.1

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- 1) /
- 2)
- 3) ≤ 3bar
- 4)

5.4.6.2.2

18V 34V

22V 26V

5.4.6.2.3

5.4.6.3

- 1)
- 2)
- 3)10m
- 4)
- 5)

10m

- 6)
- 7)
- 8)

6

6.1

6.1.1

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6.1.2

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6.2

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6.3.3

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6.4

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6.4.2

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6.5

6.5.1

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6.5.2

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6.5.3

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6.6

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6.7

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|--|--|-------------------------------------------------------------------|---|
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|  |  | <div> <div>◇</div> <div>◇</div> <div>◇</div> </div> <div>5V</div> | ✓ |
|  |  |                                                                   | ✓ |

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|   | ✧ |   |   |   |
|   | ✧ |   |   |   |
|   | ✧ |   |   |   |
|   |   |   | ✓ |   |
|   | ✧ |   |   |   |
|   | ✧ | / | ✓ |   |
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|   | ✧ |   |   |   |
| 1 |   |   | ✓ |   |

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|--|---|-------|---|-----|
|  | ✧ |       | ✓ |     |
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|  | ✧ |       | ✓ |     |
|  |   | ECU / | ✓ |     |
|  | ✧ | ;     | ✓ | ECU |
|  | ✧ |       |   |     |
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|---|---|---------|--|--|
|   | , |         |  |  |
|   | ✧ | 1500rpm |  |  |
| 3 | ✧ |         |  |  |

1500 rpm

4

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✧  
✧  
✧  
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