
UAV engine EFI components Specifications Manual

-In miniature sizes

- For 20cc to 300cc engines

V1.0

COPY RIGHTS HAE LLC
ALL RIGHTS RESERVED

<http://www.uavenginesystem.com/>

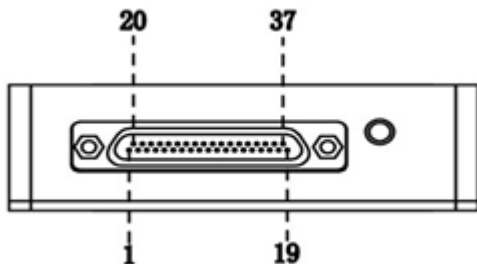
1. ECU

1.1 ECU Technical Parameters

Voltage	9~16V DC
Current	≤60mA
Storage Temperature	-40~125℃
Working Temperature	-40~125℃
Time before Overhaul (TBO)	≥10000h
Weight	≤120g

1.2 ECU Pin Definition and Description

ECU Connector View:



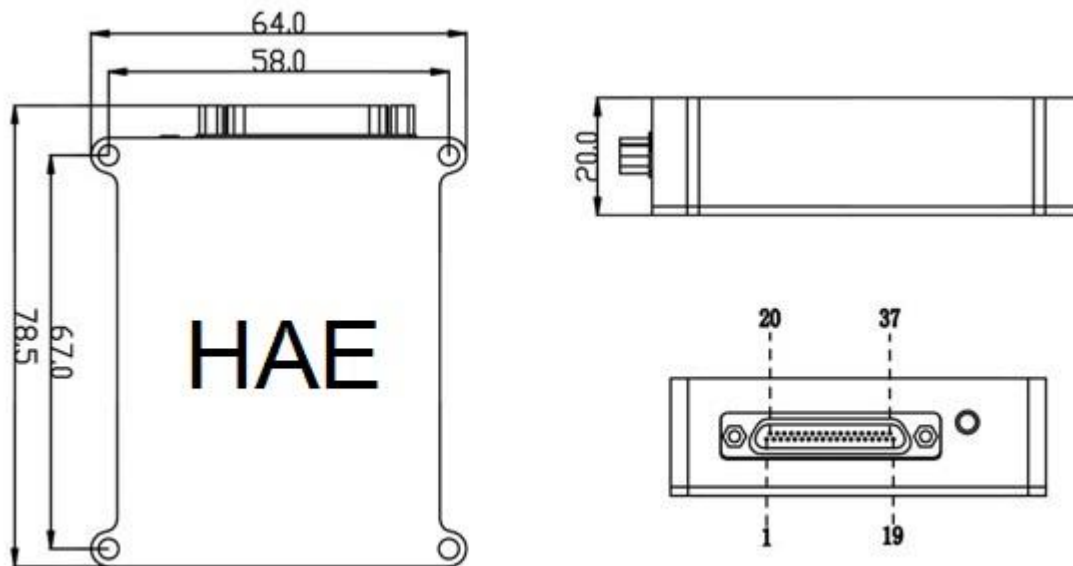
Definition of pins:

Number	Define	Color	instructions
1	INJ1	White	Fuel injector # 1 low side driver output
2	KEYSW	Blue	Fuel injector # 1 power output
3	GND	Black	Power ground
4	GND	Black	Power ground
5	ROUT	White	Relay low side driver output
6	KEYSW	Blue	Relay power output
7	GND	Green	CKP(pick-up) sensor ground
8	CKP	White	Crank Position sensor input (Pickup)
9	VCC	Yellow	Power of Hall sensor
10	CANL	Green	CANL

11	CANH	Yellow	CANH
12	MAP	White	Intake manifold pressure sensor (Optional)
13	RXD	White	Goes to RXD of RS232
14	TXD	Yellow	Goes to TXD of RS232
15	GND	Green	RS232 ground
16	PWMIN	White	Servo motor PWM input
17	PWMOUT	White	Servo motor control PWM output (Optional)
18	GND	Green	Servo motor ground
19	VCCM	Yellow	Power of servo motor (Optional)
20	NULL	----	-----
21	NULL	----	-----
22	GNDP	Blue	Power ground
23	GNDP	Red	Power ground
24	KEYSW	Blue	Power of Mil-Lamp
25	Mil-lamp	White	Mil-Lamp
26	12V+	Blue	ECU power input
27	12V+	White	ECU power input
28	CHT	White	Cylinder head temp sensor input
29	GND	Green	CHT ground
30	GND	Green	IAT ground
31	IAT	White	Intake air temp sensor input
32	VCC	Yellow	+5V Power of Throttle position sensor
33	TPS	White	Throttle position sensor signal
34	GND	Green	Ground of throttle position sensor
35	Per_SW	White	Performance switch
36	GND	Green	Ground
37	CDI-PG	White	Control signal of CDI

1.3 ECU Mechanical CAD drawing and dimensions

All dimensions are in “mm”, or millimeters.



2. EFI Harness



Harness Picture and Weight

Harness Weight: <280g (depending on the final length and EFI parts, with CHT and IAT sensor), 0.5 meter long.

Time before Overhaul (TBO): $\geq 10000\text{h}$.

The example harness is for rotary fuel pump with Relay, CHT and IAT sensor.

3. Throttle Body

3.1 Throttle body with servo assembled

Note:

The throttle body is 60g;

The servo motor is 30g;

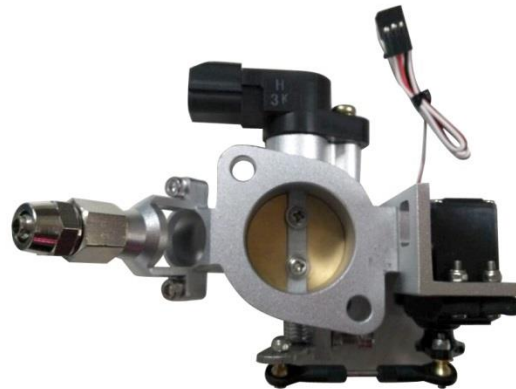
The total assemble is 100g;

Time before Overhaul (TBO) of throttle body is $\geq 20000\text{h}$;



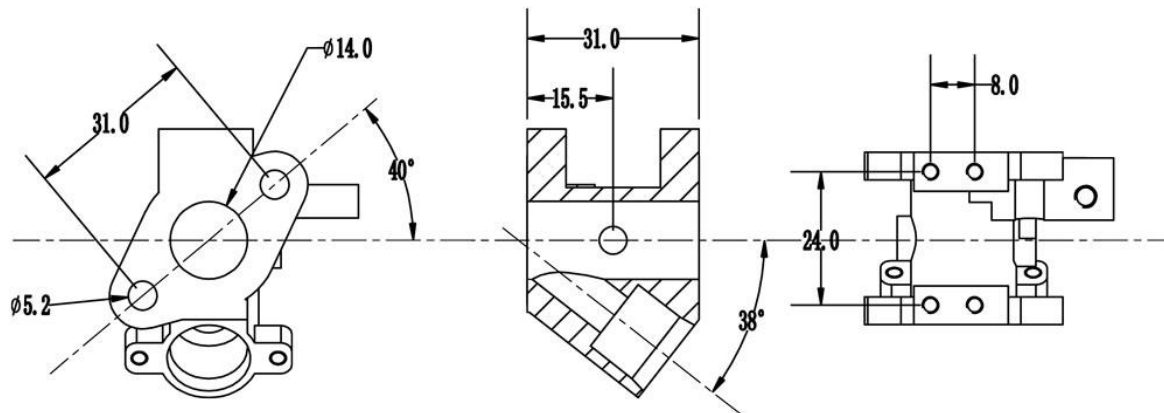
14mm Throttle Body

18mm Throttle Body

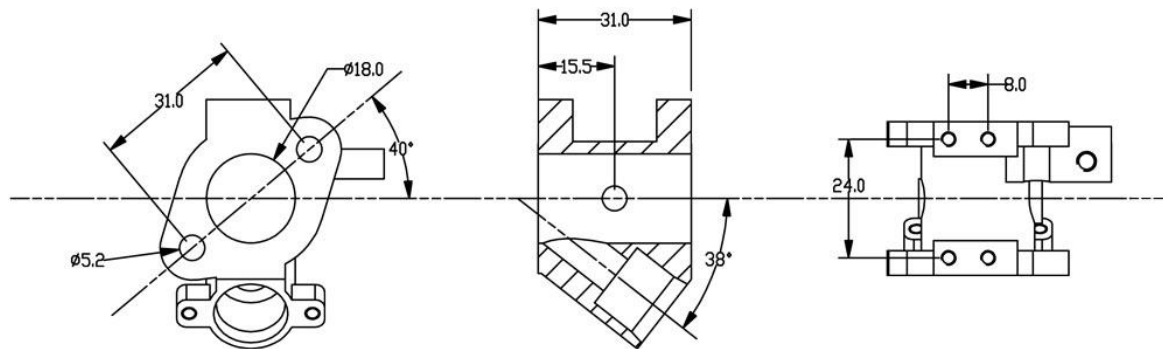
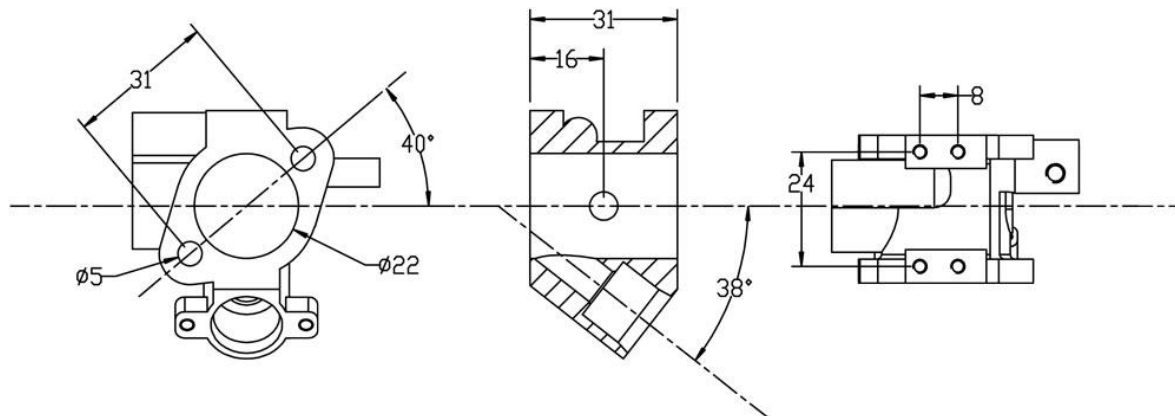
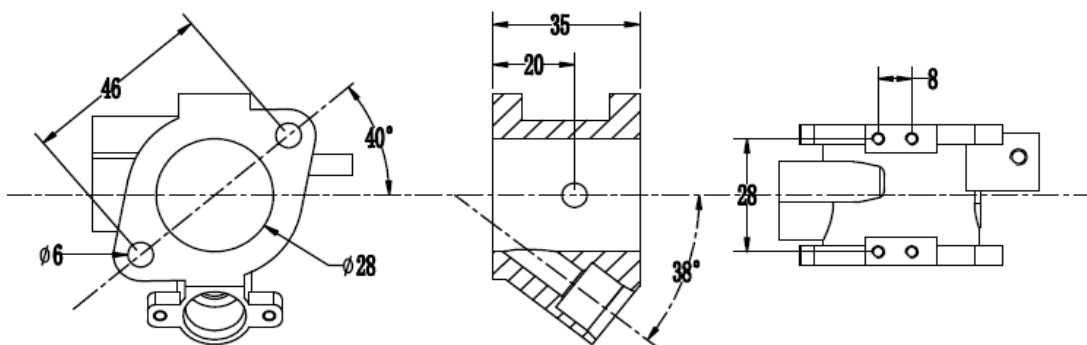
**22mm Throttle Body****28mm Throttle Body**

3.2 Mechanical CAD drawing

14mm TB CAD drawing:



18mm TB CAD drawing:

**22mm TB CAD drawing:****28mm TB CAD drawing:**

4. Fuel supply system

1) Picture of Fuel pump



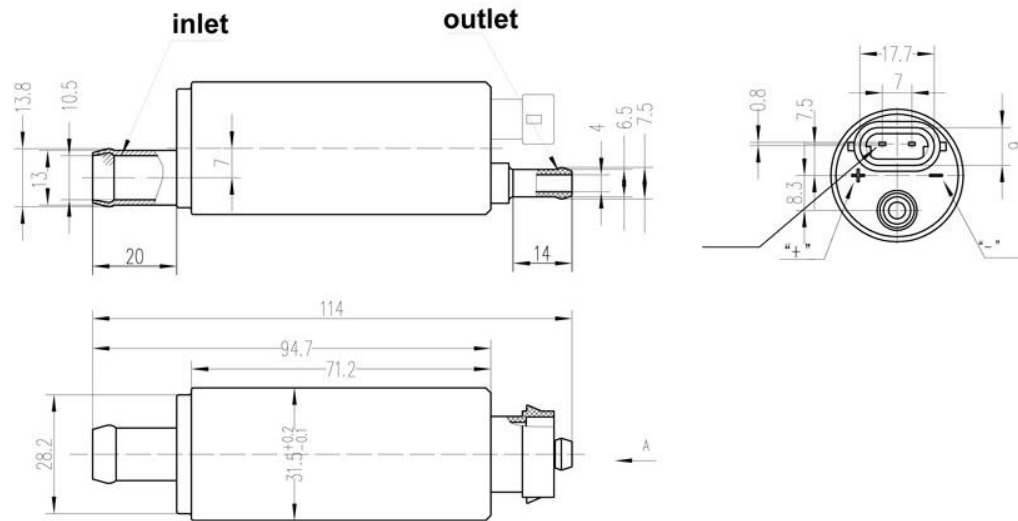
Rotor Pump

2) Basic characteristics

	Rotor Pump
Supply voltage	12VDC
Working current	$\leq 2A$
Flow	25L/h
Weight	185g
Installation Style	External
Working temperature	-40~80 ° C
Fuel type	Gasoline Gasoline with $\leq 20\%$ ethanol
Storage	
Storage Temp Range	-30 ° C~60 ° C
Humidity	$\leq 60\%$
Time before Overhaul (TBO)	$\geq 2000h$
Storage period	≤ 2 years

3) Mechanical Dimensions of the fuel pump:

Rotor Pump



4.1 Fuel pressure regulator

1) Basic characteristics

Pressure.....	300kPa
Flow rate.....	25L/h
Time before Overhaul (TBO).....	>3000h
Installation Style.....	External
Working temperature.....	-40...80 °C
Weight	90g

Fuel:

.....	Gasoline
.....	Gasoline with <=20% ethanol

Storage:

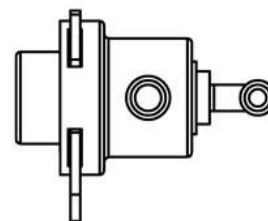
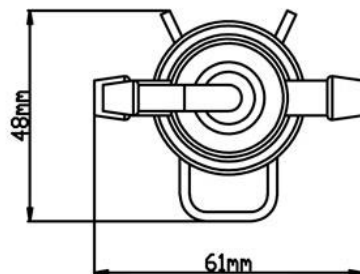
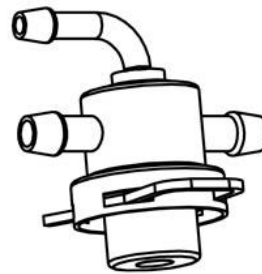
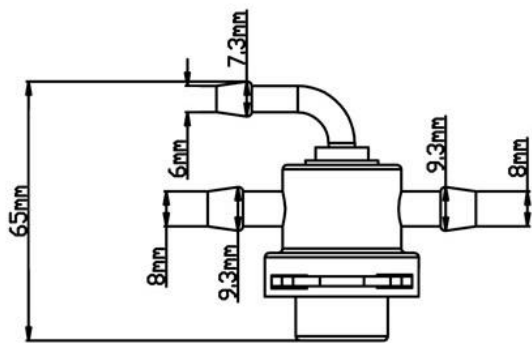
Storage Temp Range	-30 °C ...60 °C
Humidity.....	<=60%
Storage period.....	<=2 years

2) Pictures and Mechanical CAD Drawing

Metal-shell-fuel pressure regulator



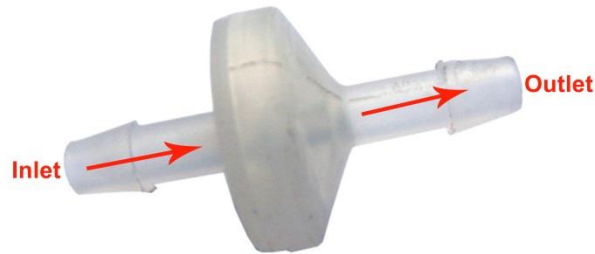
3) CAD drawing



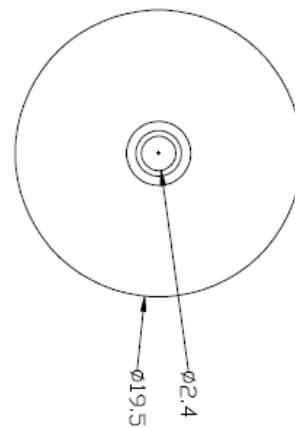
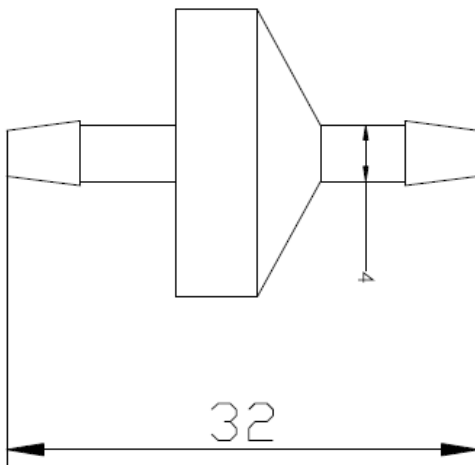
4.2 Check value

Note: Check value is only used with gear fuel pump (weight <1g)

Working pressure: 3Bar (Gauge pressure)



CAD drawing:



4.3 Fuel injector

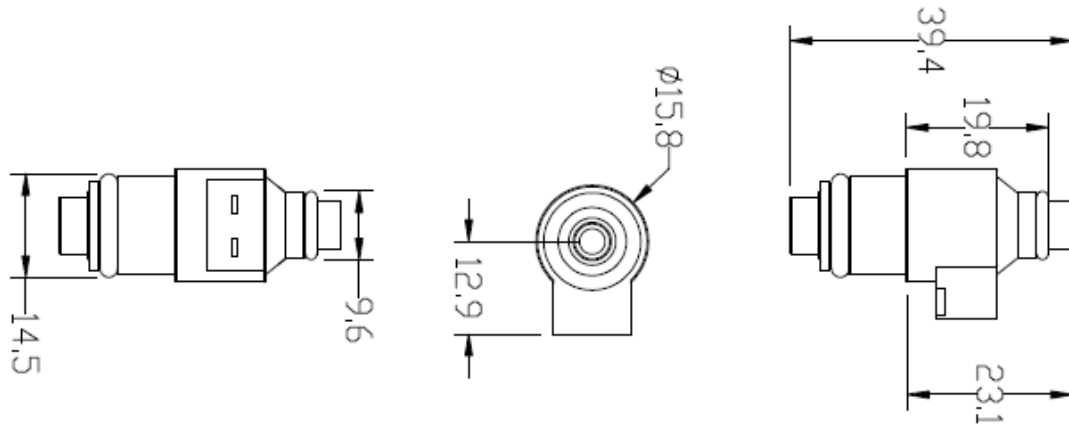
1) Picture of Fuel injector, the weight is 20g.



2) Basic parameter

type		Parameters
General technical requirements	Working temperature	-30℃-+120 ℃
	Storage temperature	-40 ℃ -+75 ℃
	Working voltage	10v-16v
	Working fuel pressure	200Kpa-450kpa
Open time		0.9ms(no-load), 1ms(300Kpa load)
Close time		0.65ms
Difference between open and close time		≤2%(1000times operated at any linear pulse)
The static flow (300Kpa@60s fully open flow)		30g/min, 38g/min , 60, 80, 128g/min etc.
Weight		≤20g
Time before Overhaul (TBO)		≥1600h
Coil resistance		12Ω~14.5Ω
Uniformity of the static and dynamic flow		<±3%
The offset of the spraying flow		<±3%
Dynamic flow linear error		<±3%
Required operating voltage	The minimum voltage for operating	<7v
	The required overload operating voltage	after24@60s: the offset of dynamic flow<±4%
Seal leakage		<0.3cc/min(400kpa)
Atomized particle (50% SMD)		70
Low temperature test		Dynamic flow<±3% Seal leakage <0.3cc/min(400kpa)
High temperature test		
Thermal shock test		
Physical performance test		
Durability test for 0.6billion		
Socket performance test of injectors		In accordance with QC/T417
Noise performance test of injectors		<70db(A)
Salt performance test of injectors		No corrosion marks on the injectors Offset of dynamic flow <±3%,

3) Mechanical CAD Drawing



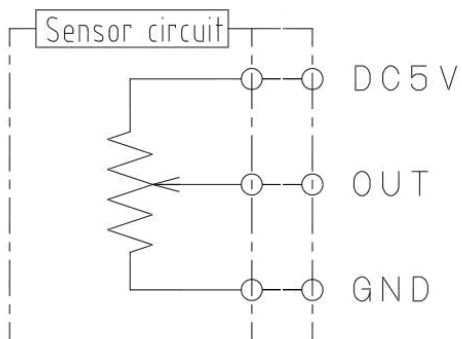
5. TPS sensor (optional for 60cc or bigger engines)

We usually provide the TPS sensor for 60cc or bigger engines. The TPS sensor is mounted on the throttle body.

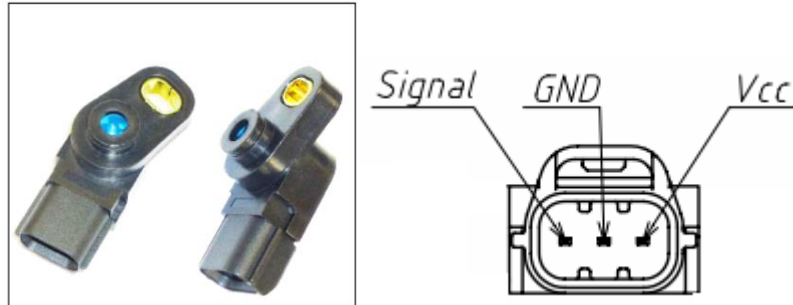
For 20cc to 40cc engines, ECU uses servo motor signal as equivalent TPS signal.



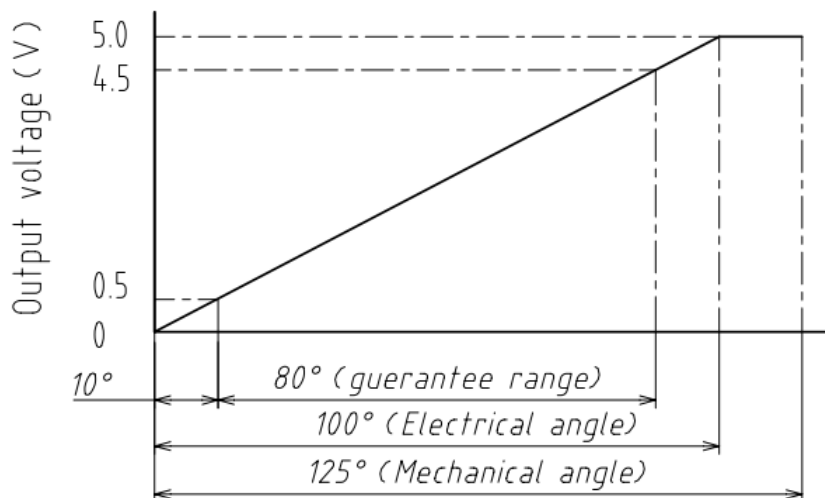
5.1 Circuit diagram of TPS



5.2 Electrical connection



5.3 Output characteristics



5.4 Sensor specifications

1) Basic specifications

NO.	Item	Criteria
1	Electrical rotation angle	100°
2	Mechanical rotation angle	125°
3	supply voltage	DC +5V
4	Storage temperature	-40 °C --120 °C
5	Operating temperature	-40 °C --120 °C

6	Total resistance	3kΩ±20%
7	Output Linearity	±2%
8	Installation torque	49.03 mN.m(MAX)
9	Weight	15g

2) Durability:

Rotation life cycles:	5 million, Cycle
Time before Overhaul (TBO)	≥5000h
Vibration durability:	50~2000Hz, Max 25G
Thermal shock:	-40 °C ~120 °C,
Water resistance	JIS D0203
Oil resistance:	Gasoline, Oil, 24Hr

6. Servo motor

6.1 Servo motor Picture

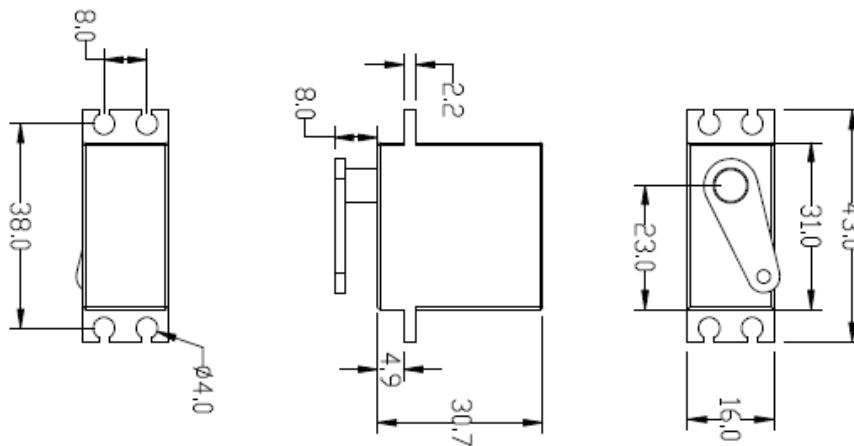


6.2 Servo motor electrical characteristics

Type	Analog Servo
Torque	4.8V: 47.0 oz-in(3.38kg-cm) 6.0V: 58.0oz-in(4.18kg-cm)
Speed	4.8V: 0.25 sec/60

	6.0V: 0.25 sec/60
Weight	1.20 oz(34.0 g)
Size	length: 1.22 in(31.0 mm) width: 0.63 in(16.0 mm) height:1.21 in(30.7mm)
Time before Overhaul(TBO)	≥ime

6.3 Mechanical CAD Drawing



7. Temperature sensors

7.1 Intake air temperature sensor (IAT)

1) Sensor Picture

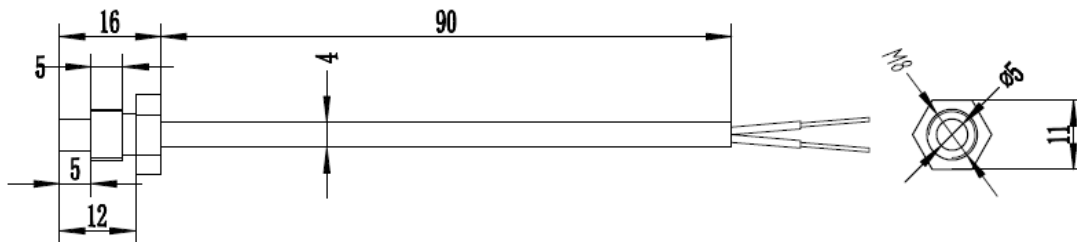


IAT sensor installation: it can be inserted into the air filter or installed in the air inlet of manifold.

2) Sensor electrical characteristics

Zero power resistance	$R_{25}=2K\Omega \pm 1\%$	25 °C
B-value	$B_{25/50}=3470k \pm 1\%$	
Thermal time constant	7s max	in static air
Dissipation constant	0.6mW/°C ~0.95mW/°C	in static air
Power rating	3mW	
Operating temperature range	-40 °C ~150 °C	
Storage temperature range	0~120 °C	
Time before Overhaul (TBO)	$\geq 43800h$	
Weight	$\leq 7g$	

3) Mechanical CAD Drawing



7.2 Engine temperature sensor

1) Cylinder Head Temperature Sensor Picture

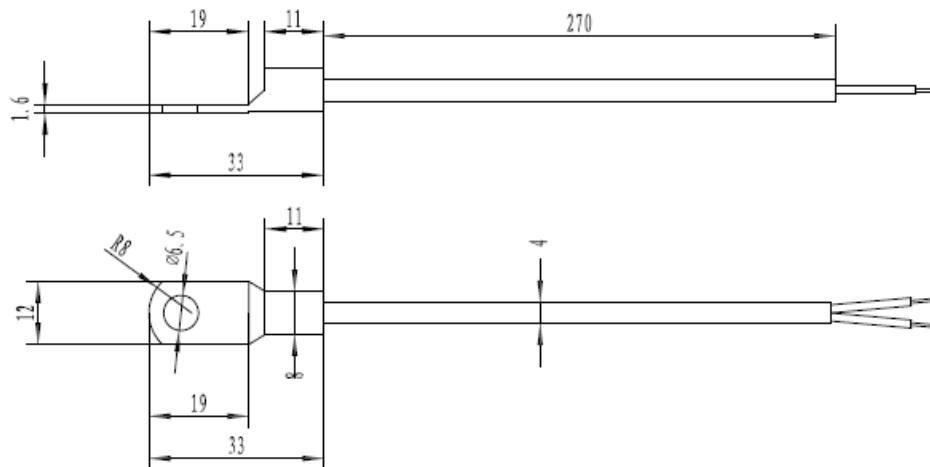


CHT sensor is PT100 type temperature sensor. It can be bolted on to the engine cylinder head with any existing bolt.

2) Sensor electrical characteristics

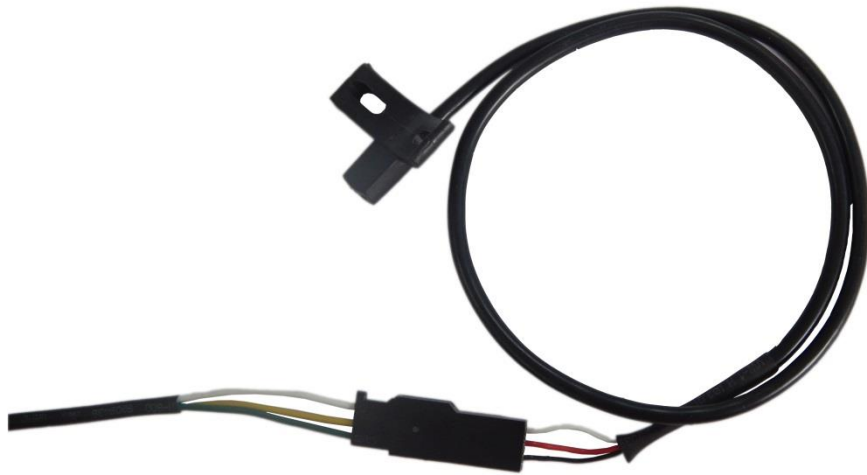
Measuring range	-40 °C ~ + 250 °C
Allow deviation delta $\Delta^{\circ}\text{C}$	A#: $\pm(0.15+0.002 t)$; B#: $\pm(0.30+0.005 t)$
The thermal response time	< 30 s
Minimum in depth	≥ 200 mm
Allow electricity	$\leq 5\text{mA}$
Advantages	Resistance to vibration, Stability is good, High accuracy, Resistance to high pressure etc.
Time before Overhaul (TBO)	$\geq 43800\text{h}$
Weight	$\leq 10\text{g}$

3) Mechanical CAD Drawing



8. Hall sensor

8.1 Hall sensor Picture



8.2 Hall sensor Parameters

Electrical Characteristics

Supply voltage.....	(+4.5~30)VDC
Supply Current (MAX).....	10mA
Current output.....	<300mA
Operating temperature.....	..(-25~+70) ° C
Voltage output (MAX).....	40V
Current output (MAX).....	20mA
Output type.....	OC (OPEN COLLECTOR)

Mechanical Dimensions

