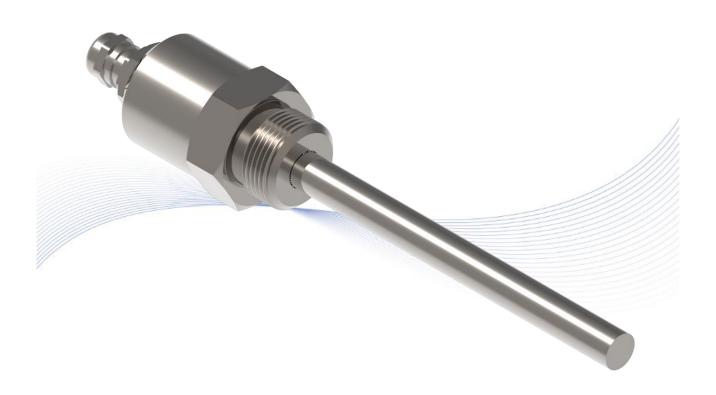


HTL SERIES

(HTL02A/HTL04A)

ENGINE OIL HEATER

USER MANUAL



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SmartGen Registered trademark

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Table 1 Software Version

| Date | Version | Content | | |
|------------|---------|---|--|--|
| 2021-01-27 | 1.0 | Original release. | | |
| 2023-02-20 | 1.1 | Updated the Logo of SmartGen. | | |
| 2024-03-19 | 1.2 | Updated the figure of case and installation dimensions; added calculation instructions of heating time. | | |
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1 OVERVIEW

During cranking, if the outside temperature is lower than 4°C, engine lubricant may lose its lubricating properties, which can damage the engine. Engine oil heater should be installed to ensure normal starting and running of the engine when the outside temperature is lower than 4 °C.

HTL series engine oil heater adopt cast stainless steel inner pipes and end closure with high corrosion resistance.

This product is suitable for various engines with (2~110)L engine oil volume.

2 PERFORMANCE AND CHARACTERISTICS

- a) Stainless steel inner pipes and end closure with high corrosion resistance and solid features;
- b) The inner pipes have long service life with the benefit of the low power of the unit areas.
- c) All-in-one design, compact structure and small volume.

3 SPECIFICATION

Table 2 Standard Model Parameters

| ModelHTL02A-□HTL04A-□Rated Power238W400WRated VoltageAC 240VRated Current1A1.67AEngine Oil Volume2~50L50~110LDefault ThermostatOff: 50°COn: 35°CInsulating Resistance≥50MΩElectrical StrengthAC 1.5kV 1minLeakage Current≤2.5mAInstallation DimensionsThread outer diameter range see Table 3Max. Pressure0.5MPaProtection LevelIP655 ~ 8 Hz: 17mm8 ~100 Hz: a=4gVibration Resistance100-500 Hz: a=2gIEC 60068-2-61EC 60068-2-6Shock Resistance50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test.IEC 60068-2-2725 g, 16 ms, Half-sine WaveIEC 60255-21-2195mm×43mm×43mm255mm×43mm×43mm | Table 2 Standard Model Parameters | | | | | |
|--|-----------------------------------|--|-----------------|--|--|--|
| Rated Voltage Rated Current Rated Current 1A 1.67A Engine Oil Volume 2~50L Default Thermostat Insulating Resistance Electrical Strength AC 1.5kV 1min Leakage Current≤2.5mA Installation Dimensions Max. Pressure Protection Level 1P65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 Shock Resistance Shock Resistance Collision Collision AC 1.5kV 1min Leakage Current≤2.5mA Installation Dimensions AC 1.5kV 1min Leakage Current≤2.5mA Installation Dimensions AC 1.5kV 1min Leakage Current≤2.5mA Installation Dimensions IP65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g IEC 60068-2-6 So g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | Model | HTL02A-□ | HTL04A-□ | | | |
| Rated Current Engine Oil Volume 2~50L Default Thermostat Insulating Resistance Electrical Strength Installation Dimensions Max. Pressure Protection Level Vibration Resistance Shock Resistance Shock Resistance Collision Rated Current 1A 1.67A | Rated Power | 238W | 400W | | | |
| Engine Oil Volume Default Thermostat Default Thermostat Off: 50°C Insulating Resistance Electrical Strength AC 1.5kV 1min Leakage Current≤2.5mA Installation Dimensions Max. Pressure Protection Level IP65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 Shock Resistance Shock Resistance Collision Collision Thread outer diameter range see Table 3 1.5mPa | Rated Voltage | AC 240V | | | | |
| Default Thermostat Off: 50°C On: 35°C Insulating Resistance ≥50MΩ Electrical Strength AC 1.5kV 1min Leakage Current≤2.5mA Installation Dimensions Thread outer diameter range see Table 3 Max. Pressure 0.5MPa Protection Level IP65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 Shock Resistance 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 25 g, 16 ms, Half-sine Wave Collision IEC 60255-21-2 | Rated Current | 1A | 1.67A | | | |
| Insulating Resistance Electrical Strength AC 1.5kV 1min Leakage Current≤2.5mA Installation Dimensions Thread outer diameter range see Table 3 Max. Pressure 0.5MPa Protection Level IP65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 Shock Resistance Shock Resistance 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 Collision Collision 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | Engine Oil Volume | 2~50L | 50~110L | | | |
| Electrical StrengthAC 1.5kV 1minLeakage Current≤2.5mAInstallation DimensionsThread outer diameter range see Table 3Max. Pressure0.5MPaProtection LevelIP655 ~ 8 Hz: 17mm 8 ~100 Hz: a=4gVibration Resistance100-500 Hz: a=2gIEC 60068-2-6Shock Resistance50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test.IEC 60068-2-27Collision25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | Default Thermostat | Off: 50°C | On: 35°C | | | |
| Installation Dimensions Max. Pressure Protection Level IP65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 Shock Resistance Shock Resistance Collision Thread outer diameter range see Table 3 0.5MPa 1P65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-27 25 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | Insulating Resistance | 2 | :50ΜΩ | | | |
| Max. Pressure Protection Level IP65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 Shock Resistance 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 Collision Collision Collision O.5MPa 1P65 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=2g IEC 60068-2-6 1EC 60068-2-6 Shock Resistance 1EC 60068-2-12 | Electrical Strength | AC 1.5kV 1min Leakage Current≤2.5mA | | | | |
| Protection Level Shock Resistance IP65 | Installation Dimensions | Thread outer diameter range see Table 3 | | | | |
| Vibration Resistance 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 Collision 5 ~ 8 Hz: 17mm 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 | Max. Pressure | 0.5MPa | | | | |
| Vibration Resistance 8 ~100 Hz: a=4g 100-500 Hz: a=2g IEC 60068-2-6 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 Collision 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | Protection Level | IP65 | | | | |
| Vibration Resistance 100-500 Hz: a=2g IEC 60068-2-6 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | | 5 ~ 8 Hz: 17mm | | | | |
| 100-500 Hz: a=2g IEC 60068-2-6 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 Collision 100-500 Hz: a=2g IEC 60068-2-6 50 g, 11 ms, Half-sine Wave, complete shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 | Vibratian Pagiatanas | 8 ~100 Hz: a=4g | | | | |
| Shock Resistance Shock Resistance Graph of the directions of the shock tests from three directions, with a total of 18 shocks per test. IEC 60068-2-27 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | Vibration Resistance | 100-500 Hz: a=2g | | | | |
| Shock Resistance directions, with a total of 18 shocks per test. IEC 60068-2-27 Collision 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | | IEC 60068-2-6 | | | | |
| TEC 60068-2-27 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | | 50 g, 11 ms, Half-sine Wave, complete shock tests from three | | | | |
| Collision 25 g, 16 ms, Half-sine Wave IEC 60255-21-2 | Shock Resistance | directions, with a total of 18 shocks per test. | | | | |
| IEC 60255-21-2 | | IEC 60068-2-27 | | | | |
| IEC 60255-21-2 | 0 11: : | 25 g, 16 ms, Half-sine Wave | | | | |
| Case Dimensions 195mm×43mm×43mm 255mm×43mm×43mm | Collision | - | | | | |
| | Case Dimensions | 195mm×43mm×43mm | 255mm×43mm×43mm | | | |
| Weight 550g 590g | Weight | 550g | 590g | | | |



Table 3 Thread Outer Diameter Selection

| Thread Specification | Thread Code |
|----------------------|---|
| Metric Thread | M20、M22、M24、M26、M27、M30、M33 |
| G Thread | G1/2"、G5/8"G3/4"、G1" |
| | NPT 1/2 |
| NPT Thread | NPT 3/4 |
| | NPT 1 |
| Others | Thread outer diameter range Φ22-Φ33.5mm |

Example: HTL04A-M27×1.5 indicates that the installed thread of 400W engine oil heater is M27×1.5.

4 CONNECTIONS

--- After open the back cover, please connect the wire according to the label **ENL** on the terminal, E: earth line, N: null line, L: live line.

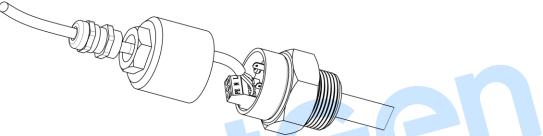


Fig.1 - Internal Wiring Example

- ---- Heat resisting power line is strongly recommended, outer diameter range 4~8mm, and the nominal cross-sectional area 1 mm².
- --- Earth line must be soundly connected to earth.

5 CALCULATION OF HEATING TIME

The heating time is equal to the total heating divided by the amount of the heat can be provided per unit time.

t = Q/P

Q = cm (T1-T0)

P: heater power, Unit: W;

Q: Total Heat, Unit: J;

C: Specific Heat Capacity, Unit: J/kg. °C;

M: Mass, Unit: kg;

t: Heating Time, Unit: s;

T0: Start Heating Temperature, Unit: °C;

T1: Stop Heating Temperature, Unit: °C;

Take the example of a 40kg lubricating oil to be heated from 20 °C to 50 °C by 400W heater, the time required is illustrated as follows:

Q = cm (T1-T0)

$$=1.87 \times 10^3 \times 40 \times (50-20)$$

Heating time = $2.244 \times 10^6 \div 400$

=5610s

≈94 min

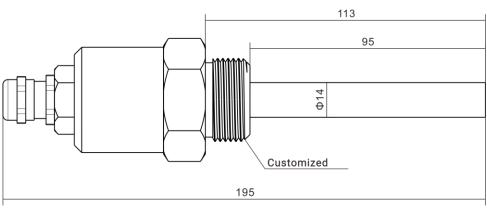
The real heating time: ≈94×20%=113 min

Remark: the above is theoretical calculation time, the heating tube efficiency, heat transfer efficiency



and heat loss factors are not considered, so the real heating time can be increased by 20% on basis of theoretical time

6 CASE AND INSTALLATION DIMENSIONS



43

Unit: mm

Fig.2 - HTL02A Case and Installation Dimensions

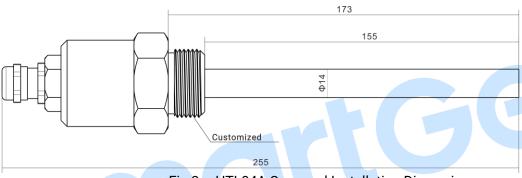




Fig.3 - HTL04A Case and Installation Dimensions