Cleveland Open Cup
Automatic Flash Point Tester
Model ACO-7
Asphalt Version with Data Memory
Instruction Manual
Rev.5.1 100414

IMPORTANT:
*This Manual contains important technical information as well as safety information.
*Read this Manual thoroughly before use, and keep it for later use.

TANAKA SCIENTIFIC LIMITED
CAUTION

Handling for Fire Containment Lid of ACO-7

When Fire Containment Lid is not set in the proper place, it does not operate correctly.

1. To set it correctly, please push the Reset Knob which is located on the right side.
2. How to check Correct position & Wrong position

**Correct position**
- Slit can be seen
- Hook is positioned inside of the catch

**Wrong position**
- Slit cannot be seen
- Hook is positioned out of the catch
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FOREWORD
Thank you for purchasing model ACO-7.
This Instruction Manual includes necessary information for the installation/operation of ACO-7. Please read this Manual thoroughly to understand the contents before installation and operation. While all our products have been adjusted and inspected to our specification prior to shipment, should any quality or specification concern arise, please contact Tanaka or its authorized distributor.

INTENDED READER OF THIS MANUAL
This Manual has been intended to be read and understood by all those who operate ACO-7. Also, it is assumed that the user have knowledge of handling of dangerous goods as well as related industrial standard such as ASTM.

REVISIONS
The contents of this Manual may be subject to change without prior notice.

SAFE OPERATION
The following nomenclature to indicate the safety precaution have been used in this Manual.

WARNING : Indicates a potentially hazardous situation which, if not avoided, could result in death or serious bodily injury.

CAUTION : Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate bodily injury and/or property damages.

And also the WARNING LABELS are put on the body of ACO-7. The meaning of these labels is as follows.

⚠️ : GENERAL WARNING
⚠️ : HOT
**WARNING**

**Installation Site:**
Install the Tester on a solid horizontal work bench with a provision of ventilation nearby or inside a fume hood. The Tester needs to be placed at least 20cm away from other objects. Ambient temperature to be 10-30°C and humidity to be less than 90% (no condensation).

**Power Source Voltage:**
Supply a specified power source voltage. Turn the power on after all electric connection are made.

**Alteration:**
Do not make any modification to the Tester, in whole or a part, or add any unauthorized accessories to the Tester without prior consent by Tanaka Scientific Limited (hereinafter referred to as Tanaka).
We can not take any responsibilities for damages, including but not limited to property and/or bodily damages, associated with the alteration of Tester.

**Maintenance:**
Any repair on the Tester should be made by an authorized service technician appointed by Tanaka.
For consumable, use only Tanaka genuine parts.

**Use of This Tester for Other Purposes:**
Use this Tester solely for its intended use of performing determination of the flash point of petroleum products subscribed in such test standard as ISO 2592, ASTM D92 and IP 36.

**Unattended Operation:**
The specimen may catch a fire and blaze up. For the safety, it is essential that at least one trained personnel be present in your test room, lab, etc. when testing.

**In Case of abnormality:**
Should any abnormality including abnormal noise or movement be observed, turn the power off and contact Tanaka or its authorized distributor.
1. Overview of Model ACO-7 Asphalt Version

Fig. 1 External View of Model ACO-7 Asphalt Version
MAIN Switch:
Used for switching power source to the Tester.

Panel Sheet Switch:
Consists of START, COOL, RESET switches as well as switches for changing test parameters.

Display:
Displays test status and result as well as test parameters.

Flash Detector Rings:
Detects flash by ionization current between each rings.

Temperature Sensor:
Senses specimen temperature.

Needle Valve for Test Flame:
Adjusts test flame size.

Test Flame Nozzle:
Swings in a plane above the cup.

Arm:
Lift this arm up and hold the handle when you set the test cup.

Heater Output Indicator:
Blinks when the heater is turned on.

Dual Electric Pilots:
Igniter tops (nichrom filaments) turn on as a test starts to ignite the gas flame.

Stove Section:
Houses the electric heater assembly for specimen heating inside.

Thermofuse:
Detects blaze up of specimen.

Flame Size Comparison Bead:
Adjust the test flame to the size of this bead.

Fire Containment Lid:
Activates automatically to help putting out fire when Tester detects a fire point or specimen is burning up heavily.

Reset Knob
Push this knob when resetting the fire containment lid.

Manual Fire Containment Switch (See 6.3):
Push this switch when operator wants to activate fire containment lid manually.
Fig. 2 Operation Panel and Display of Control Unit

(1) Fluorescent Display:
   Displays test mode, specimen temperature, flash point (when blinking), expected flash point, trouble message, etc..

(2) RUN Lamp:
   Illuminates when a test process is in progress.

(3) COOL Lamp:
   Illuminates when cooling.

(4) MODE Switch:
   Changes the test mode.

(5) START Switch:
   Starts a test.

(6) COOL/WARM Switch:
   This key have only function of cool, used for manual cooling.

(7) RESET Switch:
   Used for stopping a test, stopping a cooling and changing parameters.

(8) CHECK Switch:
   Used for manually applying the ignition source or for checking fire containment lid function.

(9) Left-Right Keys:
   Used for moving cursor.

(10) Up-Down Keys:
   Used for increasing/decreasing numeric figures.

(11) FUNCTION Key:
   Used for changing screen.
2. Installation

2.1 Installation Site
Install the Tester on a draft-free, level and stable table. The Tester needs to be placed at least 20cm away from other objects.

The following locations should be avoided as the installation site:
- An area with high temperature and/or high humidity
- An area exposed to direct the sun
- An area with poor ventilation and/or dusty air
- An area subject to rapid changes in ambient temperature

2.2 Electric Connections (Fig. 3)

| WARNING | To prevent electric shock hazard, be sure the grounding wire is connected. Do not ground to gas pipe; fire or explosion may result. The grounding wire may be connected to one of the following: - The ground terminal of the power outlet - Copper wire buried at least 65cm deep in the earth - Metallic water pipe line appropriate for use as electric grounding |

(1) Confirm the voltage of the serial number label located left side of Control Unit and your electric source.
(2) Connect the Control Unit and the Test Unit with Signal Connecting Cable.
(3) Connect the power connecting cable of Control Unit to the Test Unit.
(4) Plug in the AC power code of the Control Unit to an electric outlet. Be sure to get grounding to prevent an accident.

2.3 Gas Connection

| WARNING | The maximum gas pressure should be lower than 9.8 kPa. |

Using the rubber hose supplied for gas, connect the gas source (LP gas or Natural gas) and the gas inlet nipple on the rear panel of the Test Unit. Then fasten both ends with hose bands. See Fig. 3.
Fig. 3 Rear View and Electric Connection
3. Operation

3.1 Power ON
Turn the MAIN switch ON. A message screen as illustrated in Fig. 4 appears on the control Unit display.

![Fig. 4 Main Screen](image)

3.2 Confirming a Barometric Pressure Value
ACO-7 is capable of making automatic correction for barometric pressure by built-in barometric pressure sensor. Confirm the barometric pressure every morning as follows:
(1) Press FUNCTION key, The display shows Baro set screen as illustrated in Fig. 5 appears.
(2) If the barometric pressure is not matched to calibrated barometer, calibrate barometric pressure sensor. Refer ACO-7 Maintenance Manual for the calibration.

![Fig. 5 Barometric Pressure Entering Screen](image)

*Fire Containment Lid function can be tested by pressing CHECK switch.
3.3 Select Test Mode
ACO-7 Asphalt version has 2 kinds of test method and 5 kinds of test mode. Each ASTM and ISO method has each Normal mode, Special mode (Fast Search), Fire mode, Skim mode and User’s Custom mode. Fire mode and User’s Custom mode are invalid when shipping. The test method (ASTM or ISO) is selectable by changing DIP switch on the MAIN board. See Maintenance Manual for ACO-7.

Press the **MODE** switch to select test mode.

<table>
<thead>
<tr>
<th>Display</th>
<th>Method &amp; Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM</td>
<td>ASTM Normal mode (Flash point only)</td>
</tr>
<tr>
<td>ASTM</td>
<td>ASTM Special mode (Flash point only)</td>
</tr>
<tr>
<td>SPE</td>
<td></td>
</tr>
<tr>
<td>ASTM</td>
<td>ASTM Fire mode (Flash &amp; Fire Point)</td>
</tr>
<tr>
<td>Fire</td>
<td></td>
</tr>
<tr>
<td>ASTM</td>
<td>ASTM Skim mode mode</td>
</tr>
<tr>
<td>SKIM</td>
<td></td>
</tr>
<tr>
<td>ASTM</td>
<td>ASTM User’s Custom mode</td>
</tr>
<tr>
<td>User</td>
<td></td>
</tr>
<tr>
<td>ISO</td>
<td>ISO Normal mode (Flash point only)</td>
</tr>
<tr>
<td>SPE</td>
<td>ISO Special mode (Flash point only)</td>
</tr>
<tr>
<td>Fire</td>
<td>ISO Fire mode (Flash &amp; Fire Point)</td>
</tr>
<tr>
<td>SKIM</td>
<td>ISO Skim mode</td>
</tr>
<tr>
<td>ISO</td>
<td></td>
</tr>
<tr>
<td>User</td>
<td>ISO User’s Custom mode</td>
</tr>
</tbody>
</table>

3.3.1 Normal Mode
In this mode, the test proceeds until flash detection in accordance with ASTM D92 or ISO 2592 (IP36).

3.3.2 Special Mode
This mode is used for measuring the approximate flash point of a sample of unknown expected flash point. The Special mode starts the test flame application at the every 2 ℃ (5 ℉) from the test start, and thus it is different from the Normal mode.

3.3.3 Fire Mode
In this mode, the test proceeds until fire point after flash detection in accordance with ASTM D92 or ISO 2592 (IP36).

3.3.4 Skim Mode
This mode is used for measuring the flash point of bitumen which forms surface film.
Automatic surface film skimmer works to attain the right test result when the setting temperature is reached. For the starting temperature and interval setting of skimmer, see 3.7.

3.3.5 User’s Custom Mode
In this mode, heating rate, stirring speed, application interval and its start temperature can be changed by operator.

3.4 Test Procedure in Normal Mode
3.4.1 Setting of Expected Flash Point

| WARNING | The sample may catch a fire, if an erroneous expected flash point was set. |

The expected flash point is displayed in a three-digit figure below the EXP. F. P on the right end of the display. When altering the expected flash point, press the Right-Left key to move the cursor, and after that, operate the Up-Down keys. No numeric figures above 400 (760 in °F) can be set.

3.4.2 Preparation of Test Cup and Sample
(1) Wash the test cup with the cleaning solvent to remove any test specimen or traces of gum or residue remaining from a previous test. When the upper side of cup’s flange is covered with carbon deposit, the flash detector cannot operate normally. Also when conductive material adheres to the insulator of electrode ring (outer ring), bad insulation can cause mis-detection of flash. Therefore, keep the parts cleanly.
(2) When testing samples of very viscous materials and containing dissolved or free water, follow Sampling section of ASTM D92.
(3) Fill the test cup with the sample so that the top of the meniscus of the test specimen is exactly at the filling mark
(4) Push up the arm handle and place the test cup on the center of the heater
(5) Lower the arm gently until stopper is touching the flange of the cup.

Now you have completed the preparation for the test.

3.4.3 Test Start

| WARNING | Toxic gas may generate as a result of decomposition of specimen in the course of heating. Provide adequate ventilation. Specimen may catch fire in the course of a test. Place a fire extinguisher near the Tester. Also, do not leave the Tester unattended. |

Press the START switch; RUN lamp illuminates, and the test starts. The expected flash point (*1) is displayed for 5 seconds, dual electric pilots light up and specimen heating starts. Test flame is ignited by electric pilots automatically. Adjust the test flame to 4mm in diameter (the flame size comparison bead size) by needle valve.

The test proceeds automatically hereafter.
*1: The setting of the expected flash point is changeable even during the test. After changing in accordance with Section 3.4.1, re-press the START switch. Also in this case, the newly set expected flash point appears in the center of the display for 5 seconds.

3.4.4 Start of Ignition Source Application
After the test starts, the specimen temperature rises at a rate of 14 to 17 °C/min (25 to 30 °F/min). When the temperature reaches 56 °C (100 °F) below the expected flash point, the heating rate is decreased so that the rate of temperature increase during the last 28 °C (50 °F) before the expected flash point is 5 to 6 °C (9 to 11 °F). When the temperature of the test specimen is 28 °C (50 °F) below the expected flash point, the test flame begins to apply. After that, the application operation is repeated at each 2 °C (5 °F).

3.4.5 Flash Detection
(1) When the flash is detected, the observed flash point is corrected by barometric pressure and rounded (*2, recorded flash point) and then starts flashing. See Fig. 6. At the same time buzzer beeps intermittently for 8 seconds. Furthermore, the solenoid valve for gas is closed, the test flame goes out and electric pilots go off and the stove section starts cooling down. (The COOL lamp lights up.)

\[
\text{**2: The corrected flash point} \ (F_c) \text{ is computed automatically by using the following formula, rounded to the nearest 1 °C (2 °F) when ASTM is selected as a test method, rounded to the nearest 2 °C when ISO is selected as a test method and then displayed. For the selecting test method (ASTM or ISO), refer ACO-7 Maintenance Manual.}
\]

\[
F_c = F + 0.025(1013 - P_1)
\]

where \(F_c\): Corrected flash point

\(F\) : Observed flash point

\(P_1\) : Entered (detected) barometric pressure value (hPa).

or

\[
F_c = F + 0.06(760 - P)
\]

where \(F_c\): Corrected flash point (°F)

\(F\) : Observed flash point (°F)

\(P\) : Entered (detected) barometric pressure value (mmHg).
Observed flash point can be seen by pressing **FUNCTION** key. In case a wrong pressure value has been entered, enter the right value and then press **FUNCTION** key; recalculated flash point will be shown.

(2) When ASTM is selected as a test method, and a flash point is detected at first application of the ignition source, **NG 1st** appears right side of flash point. See **Fig. 7**.

(3) When ISO is selected as a test method and the temperature at which the flash point is observed is less than 18 °C from the temperature of the first application of the test flame, **NG XX** (XX = observed flash point – first application) appears right side of flash point. See **Fig. 8**. In this case, alter the expected flash point and restart the test.

---

**Fig. 7** Flash Point is Detected at First Application (ASTM method)

<table>
<thead>
<tr>
<th>ACO</th>
<th>FLASH POINT</th>
<th>EXP. FP</th>
<th>CORRECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM</td>
<td>242.0 °C</td>
<td></td>
<td>270</td>
</tr>
</tbody>
</table>

**Fig. 8** Flash Point is Detected invalid temperature (ISO method)

<table>
<thead>
<tr>
<th>ACO</th>
<th>FLASH POINT</th>
<th>EXP. FP</th>
<th>CORRECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>254.0 °C</td>
<td></td>
<td>270</td>
</tr>
</tbody>
</table>

NG appears
Flashed at 1st application

NG appears
Observed flash point - First application = 12 °C
3.4.6 Completion of a Test

**WARNING** If test cup is still hot after cooling is finished, do not touch except arm handle without wearing gloves. Be careful when handling the hot specimen. It may flash or explode, if you disposed it to waste tank containing waste with low flash point.

The cooling fan stops (the COOL lamp goes off) in 10 minutes (*3) after the flame detection. One cycle of a test is completed at this moment and you can start the next test. When further cooling is required, press the COOL switch. Cooling is available for another 10 minutes (*3). The temperature display (flash point) is held until the RESET or START switch is pressed.

*3: Cooling time is adjustable. Also selectable (do cooling or not). For changing cooling time, consult Tanaka authorized distributor.

3.5 Test by Special (Fast Search) Mode

This mode is used for measuring an approximate flash point of a specimen of unknown expected flash point. The mode starts the ignition source application (at each 2 °C(5 °F)) from the test start. Other than the test flame application, all the rest of the test procedure is the same as the Normal mode. The following shows only differences from Normal mode. See Section 3.4.1 to 3.4.6 also.
3.6 Test by Fire Mode

| WARNING | Fire Containment Lid and pivot shaft be kept clean to function properly. Do the damper check before testing by fire mode. As some fire may not be extinguished completely by the Fire Containment Lid, the operator may have to extinguish the fire manually. Prepare fire-resistant gloves and other necessary objects to protect against burns. Use knob when resetting the fire containment lid. |

The following shows only differences from Normal mode. See Section 3.4.1 to 3.4.6 also.

1. When the flash point is detected, the buzzer beeps and the RUN lamp flashes. At this point, test flame application at the 2 °C (5 °F) interval is suspended to prevent accidental fire. Pressing the START switch while the RUN lamp is flashing will stop the buzzer, and the test is continued until the fire point detection. If the START switch is not pressed within one minute, the test is terminated and the cool down cycle is initiated.

2. Once flash detector detects 5 seconds of continuous burning (or press START switch by visual determination), the fire containment lid activates automatically to help putting out fire. The flash point and fire point is displayed (flashing alternately every 5 seconds), thus concluding the test cycle.

3. The operator must confirm that the fire containment lid has extinguished burning inside the cup.

4. The operator press COOL switch to start the sample cooling process.

5. The operator carefully reset the fire containment lid after cooling is finished. Please use caution resetting the fire containment lid as it possibility may be hot to touch. To reset, push the knob straight back until latches and turn lid up.

3.7 Test by Skim Mode

The following shows only differences from Normal mode. See Section 3.4.1 to 3.4.6 also.

1. To change start temperature and interval of skimmer, press the FUNCTION switch to change the screen, then press the Right-Left key to move the cursor, and after that, operate the Up-Down keys.

2. Press the RESET switch to return the main screen after setting of skimmer.

3. Attach a paddle to skimmer shaft.

4. Automatic surface film skimmer works to when the setting temperature is reached.

<table>
<thead>
<tr>
<th>ACO</th>
<th>Baro (hPa)</th>
<th>SKIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1013</td>
<td>Start</td>
<td>Interval</td>
</tr>
<tr>
<td>300</td>
<td>°C</td>
<td>10 °C</td>
</tr>
<tr>
<td>Prev. FP</td>
<td>137.0</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 10 Skimmer Setting Screen

Skimmer can be worked not only automatically but also manually by pressing MODE key during a test.
4. Data Storage Function (use this function with optional Built-in Clock Board)
ACO-7 has a data storage function. Up to 50 successive data can be memorized. (*4)
After ACO-7 detects a flash point, the data will be stored automatically.
If Built-in Clock Board is not installed, actual date will not be memorized in DATE column.
The recalling procedure is as follows.

Press the MODE switch and RESET switch, then consecutively release the RESET switch and then the MODE switch. The following screen will appear:

```
<table>
<thead>
<tr>
<th>ACO DATA</th>
<th>SAMPLE ID</th>
<th>FLASH. P</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>03/14 09</td>
<td>LUBE 01</td>
</tr>
<tr>
<td>02</td>
<td>03/13 18</td>
<td>ST-AS</td>
</tr>
<tr>
<td>03</td>
<td>03/13 17</td>
<td>BL-AS</td>
</tr>
</tbody>
</table>
```

*Fig. 10 Data Recall Screen*

By pressing Up-Down key, the screen will be scrolled.
If needed, press FUNCTION key to print out all data. (when optional printer is connected)

*4: Following data will not be stored.
- used fire mode, special mode and user custom mode
- flash is detected at first application
- flash is detected by manual application
-
5. In Case of Abnormal Operation or Trouble

⚠️ **CAUTION** If even a “minor” abnormality is detected, stop using the Tester immediately and consult Tanaka authorized distributor.

When a problem occurs on the Tester, a buzzer will sound and one of the trouble messages in Tab. 1 will be shown. When one of these events occurs, all output will be shut off. For troubleshooting, consult Tanaka authorized distributor.

<table>
<thead>
<tr>
<th>Trouble Message on Display</th>
<th>Buzzer</th>
<th>Buzzer</th>
<th>Buzzer</th>
<th>Buzzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Beeps continuously</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROUBLE TEMP SENSOR</td>
<td>Beeps intermittently for eight (8) seconds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROUBLE FLASH DETECTOR</td>
<td>Beeps intermittently for eight (8) seconds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROUBLE FIRE? (by detector)</td>
<td>Beeps intermittently for eight (8) seconds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROUBLE REPLACE BATTERY</td>
<td>Beeps intermittently for eight (8) seconds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROUBLE ARM POSITION</td>
<td>Beeps intermittently for eight (8) seconds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROUBLE THERMOFUSE BLOWN</td>
<td>Beeps big sound continuously</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Safety

6.1 Gas Piping
Gas piping inside the Test Unit is made of nylon tube; outside, viton tube. Gas is very dangerous if it leaks. Consult the Tanaka authorized distributor for periodical gas leakage check. **THE TESTER IS NOT EQUIPPED WITH A GAS LEAKAGE DETECTOR.**

6.2 Prevention of Sample from Catching Fire
In case the temperature at which the first test flame application is made is above the flash point of the specimen, there is a danger: the specimen catches a fire to blaze up. So as to prevent such a danger in advance, for testing a sample of unknown flash point, use the Special mode in Section 3.5. Be sure to arrange at least one proper person in your test room, lab, etc., when testing, to cope with possible accidents.

6.3 Manual Fire Containment
In case the specimen catches a fire unexpectedly, push manual fire containment switch to extinguish a fire. Push once more to stop buzzer, and then push RESET key to return MAIN screen.
7. **Post-sales Servicing**  
For ordering consumable items or parts or to request servicing, please contact Tanaka authorized distributor. Please note that spare parts that are necessary to maintain/regain the function of this Tester is kept in inventory for a minimum of 5 years after the delivery of this Tester.

8. **Precaution in Case of Loss of Instruction Manual**  
The Instruction Manual is a part of this instrument. In case it is lost, please request a new copy to Tanaka authorized distributor. Also, it is highly recommended that the address and telephone number of Tanaka and/or its authorized distributor be kept separately from this Manual.

9. **Caution when Transferring This Tester**  
If this Tester is transferred or sold to a third party, please inform Tanaka or its authorized distributor. Wrong source voltage and/or AC frequency could cause damages or malfunctioning. In case of transferring this Tester, make sure to attach this Instruction Manual.

10. **Specifications**

(1) Conforming standard: ISO 2592, ASTM D92, IP 36
(2) Measuring Range: Ambient to 400 °C (760 °F)
(3) Test Modes: Normal, Flash + Fire, Special (Fast Search), Skim, User’s Custom
(4) Display: Fluorescent display tube (VFD module)
(5) Temperature Sensor: PT-100 in stainless steel sheath
(6) Flash Detector: Ionization Ring
(7) Heater: Nichrome Coil heater 800W@100V or 800W@220V
(8) Ignition Source: Gas ignition with automatic lighting
(9) Cooling Device: Forced air cooling by sirocco fan  
Barometric Correction: By built-in barometric pressure sensor
(10) Safety Mechanism: Automatically shuts off and the problem is reported by buzzer and display in case:
    (a) EFP+30 °C (60 °F) or 400 °C (760 °F) is reached,
    (b) temperature sensor is found defective,
    (c) flash detector is found defective,
    (d) thermofuse is blown (Also fire containment lid activates),
    (e) built-in battery has expired,
    (f) test cover is not set in place, or
    (g) control computer runs away (buzzer only)
(11) Dimensions & Weight: Control unit: 230W x 455D x 110H(mm), 6.0kg  
    Test Unit: 230W x 450D x 345H(mm), 14.5kg
(12) Installation Site: Ambient temperature: 10-30 °C (50-86 °F)  
    Humidity: less than 90%
(13) Utility: Power Supply: AC100/120V or 220/240V, 50/60Hz (set at the factory), 1.0kW (max.)  
    Gas Supply: LP gas or natural gas (Max. pressure<9.8kPa)
(14) Standard Accessories:

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Cup Assembly</td>
<td>1pc</td>
</tr>
<tr>
<td>Power Connecting Cable, 0.6m</td>
<td>1pc</td>
</tr>
<tr>
<td>Signal Connecting Cable, 0.6m</td>
<td>1pc</td>
</tr>
<tr>
<td>AC Power Cord, 2.5m (&gt;AC200V) or 3.0m (&lt;AC125V)</td>
<td>1pc</td>
</tr>
<tr>
<td>Thermal Insulation (Heating Plate)</td>
<td>1pc</td>
</tr>
<tr>
<td>Spare Thermofuse</td>
<td>3pcs</td>
</tr>
<tr>
<td>Insulation tube for Thermofuse, 0.1m</td>
<td>1pc</td>
</tr>
<tr>
<td>Spare Paddle</td>
<td>4pcs</td>
</tr>
<tr>
<td>Gas Hose 9 x 16 x 1500mm</td>
<td>1pc</td>
</tr>
<tr>
<td>Gas Hose Band</td>
<td>2pcs</td>
</tr>
<tr>
<td>Instruction Manual</td>
<td>1copy</td>
</tr>
</tbody>
</table>

(16) Optional Accessories:

- Power Connecting Cable, 3m
- Signal Connecting Cable, 3m
- Built-in Clock Board
- Printer, BS2-80TS (with connecting cable and AC adapter)
- Changeover Unit, Model: CHG-7
- Mercury Thermometer Holder for Calibration

(17) Suggested Spares for 2 years:

- Test Cup Assembly                                           | 1pc
- Igniter Top for Dual Pilots                                 | 2pcs
- Thermofuse (pack of 5, with insulating tube)                | 1pk
- Temperature Sensor                                          | 1pc
- Inner Detector Ring                                         | 1pc
- Outer Detector Ring                                         | 1pc
- Insulating Collar for Flash Detector                        | 2pcs
- Sweeping Paddle                                             | 5pcs
- Nichrome Heater Coil 800W@100V or 800W@220V                 | 1pc

Specifications subject to change without prior notice.
Product Warranty

1. This product has passed a quality assurance inspection to the standards of Tanaka Scientific Limited.
2. This product will be warranted for a period of one year from the date of delivery. To avoid later confusion, be sure to enter the date of delivery in warranty ticket below.
3. If any faults occur due to normal use within the warranty, the product will be repaired free of charge.
4. Be sure to notify Tanaka Scientific Limited when repairs being requested are covered under the warranty.
5. The following faults or damage are not covered by the warranty:
   • Any fault or damage arising from failure to adhere to all warnings and precaution as described in the instruction manual
   • Any fault or damage arising from misuse or carelessness
   • Any fault or damage arising from repairs or alterations unauthorized by Tanaka Scientific Limited
   • Any fault or damage arising from falls or accidents during transportation after the initial delivery
   • Any fault or damage arising from external causes, such as fire, act of God (earthquake, storm, or flood), environmental contamination, or power supply variations
6. All other repairs, consumables and accessories are chargeable. (Temperature Sensor, Detector Rings, Igniter Top, Heater Coil, etc.)

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Cleveland Open Cup Automated Flash Point Tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>ACO-7 Asphalt Version</td>
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<tr>
<td>Machine No.</td>
<td>ACO-7T No.</td>
</tr>
<tr>
<td>Warranty</td>
<td>One year from the date of delivery:</td>
</tr>
<tr>
<td>Period</td>
<td></td>
</tr>
<tr>
<td>Machine No.</td>
<td>FC-7 No.</td>
</tr>
</tbody>
</table>

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Distributor: