

## Technical presentation of Ignitability equipment

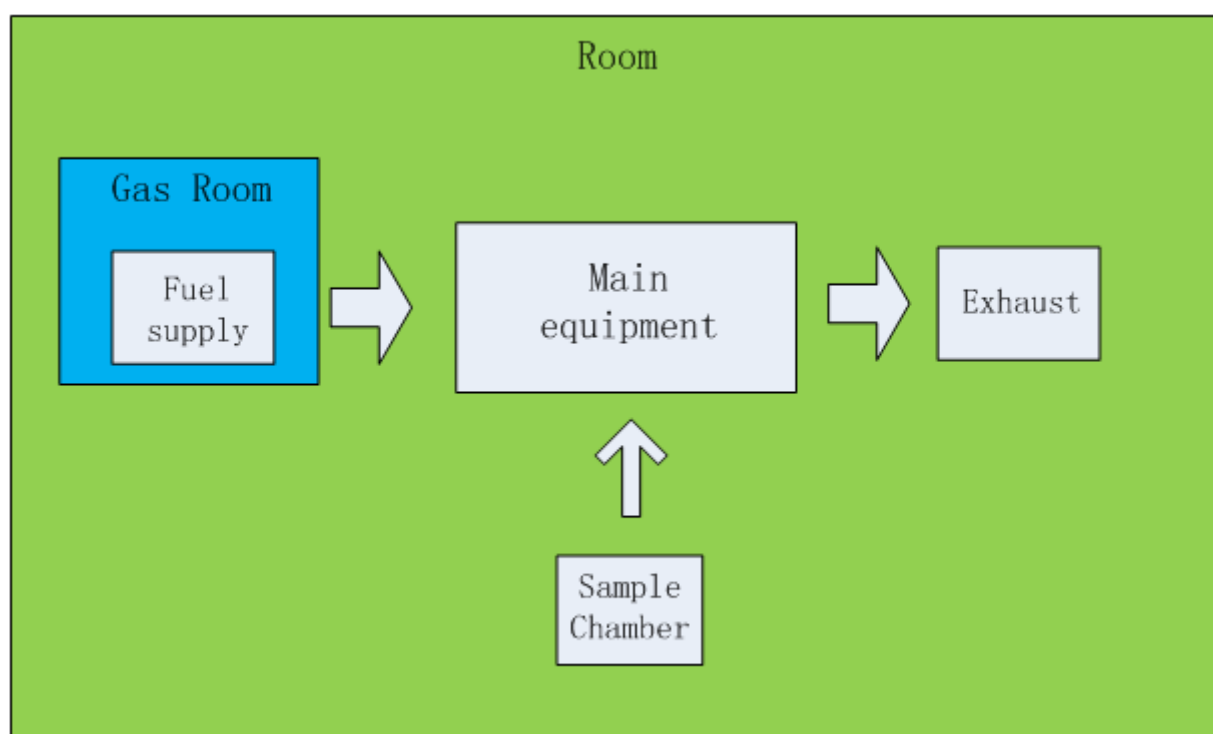
### 1. Introduction

This test determines the ignitability of PV modules by direct small flame impingement under zero impressed irradiance by external heat sources using vertically oriented test specimens. The test does not replace a fire test; it assesses ignitability, not flammability of outer surfaces of a module. The test method is based on ISO 11925-2.

The equipment confirm to IEC 61730:2016 (Part 1&2, MST24) and referenced by ISO 11925-2 standards.

### 2. Component

The system could be showed as follow figure 1:



**Figure 1**

The system constructed with Main equipment, Fuel supply, Gas room, Exhaust, Sample Chamber, Control system and Room.

#### 2.1 Main equipment

**Note: The requirement for the client is high light.**

Main equipment could be represented in the table 1.

Table 1

S. No	Component	Function	Parameter
1	Burner	Produce flame	<ul style="list-style-type: none"> <li>✓ complying with 4.3 of ISO 11925-2:2010 shall be employed, which can be used vertically or tilted at 45° to the vertical axis</li> <li>✓ the burner shall be rotatable around its vertical axis so that the test flame can be applied to concealed specimen components</li> </ul>

			<ul style="list-style-type: none"> <li>✓ The burner shall be mounted so that it can be moved towards and away from the specimen jerk free</li> <li>✓ There should be provision to control this movement from the outside with the distance of travel being pre-set by simply adjusting the positioning of the external collar.</li> <li>✓ The flame shall be able to apply at least 40 mm above the bottom edge of the specimen.</li> <li>✓ The flame shall be applied to the bottom edge of the specimen.</li> <li>✓ The flame application point is located 1,5 mm behind the leading edge.</li> </ul>
2	Combustion Chamber	Input the sample	<ul style="list-style-type: none"> <li>✓ Maximum size of module: 2.5 m x 1.4 m x 0.05 m</li> <li>✓ The combustion chamber shall be typically made of an enclosure, constructed from stainless steel sheets/any other better material, with heat resistant glazed doors for observation in the front and right side</li> <li>✓ Leakage current Protection against leakage current &gt; 5mA</li> <li>✓ A suitable Stabilizer of the required capacity has to be supplied</li> <li>✓ suitably ventilated hood to make the air flow velocity should be (<math>&lt; 0.2</math>) m·s<sup>-1</sup> in vertical direction &amp; <math>&lt; 0.1</math> m/s, measured at 50 mm from the surface of the specimen.</li> </ul>
3	Specimen Holder	Hold the Specimen	<ul style="list-style-type: none"> <li>✓ The specimen holder shall be constructed such that it allows the specimen to be safely fixed in a vertical position.</li> <li>✓ The bottom side of the specimen shall have an exposed width of at least 30 cm for flame impingement.</li> <li>✓ The specimen shall be placed so that the flame impingement can be determined reliably.</li> <li>✓ The specimen holder shall be able to accommodate specimens of Various sizes in both, lengthwise and crosswise</li> </ul>



			<p>orientation (Maximum size of module is 2.5 m x 1.4 m x 0.05 m).</p> <ul style="list-style-type: none"> <li>✓ The specimen consists of a double U-shaped frame constructed in stainless steel, of Sufficient wide to accommodate DUT of (5 ± 1) cm thick.</li> <li>✓ The specimen holder should enable the specimen to be rotated through 90° when using the smaller specimen holder.</li> <li>✓ A secondary specimen holder shall also be supplied for conducting tests on other materials. Works as a standby</li> </ul>
4	Gas Pipe	Input fuel	<ul style="list-style-type: none"> <li>✓ A suitable Gas hose shall be provided along with Flashback arrestor</li> <li>✓ The burner shall be fitted with a fine adjustment needle valve to enable accurate control of the flame height</li> <li>✓ Could be connected to the laboratory propane supply</li> <li>✓ There should be provision for indicating the pressure at fuel inlet up to 100k Pa.</li> </ul>
5	Metal tray	Collect the drip	<ul style="list-style-type: none"> <li>✓ A metal tray, made from Aluminum foil, with the DUT dimensions is positioned beneath the specimen holder.</li> </ul>
6	Control system	<b>Display and Control the test</b>	<ul style="list-style-type: none"> <li>✓ Using a stopwatch with 1/100 s divisions to time of all events shall be recorded.</li> <li>✓ LCD touch screen preferably showing set and actual values of temperature.</li> <li>✓ With over temperature limiters to adjust over temperature cut-out Shall be provided</li> <li>✓ An acoustic visible and audible alarm of Low fuel &amp; Over level cut-out is provided.</li> <li>✓ Smoke detecting Alarm(Visual &amp; Audio).</li> <li>✓ Propane Gas leakage detection</li> <li>✓ Emergency Stop to stop the inlet gas.</li> </ul>
7	Anemometer	measured at 50 mm from the surface of the specimen	<ul style="list-style-type: none"> <li>✓ Velocity measurement range: (0 to 15) m/s</li> <li>✓ Resolution: 0.01 m/s</li> <li>✓ Accuracy: ± 0.1 m/s</li> </ul>

## 2.2 Fuel supply

Fuel supply could be represented in the table 2.

Table 2

Shanghai Zealwe Technology Co., Ltd.

Add: No.60, Zhonghui Road, Minhang District, Shanghai, China

Tell: +86-21-5432 2103 / 5432 2105

E-mail: info@zealwe.cn

S. No	Component	Function	Parameter
1	Steel cylinder(offered by the customer) 1pcs	Store the Propane (95% minimum purity)	✓ About 40L(just suggest);
2	Gas room(offered by the customer)	Separate the gas supply with the burning place.	✓ The Propane room is at least 1m*1m*3m(L*W*H); ✓ The Propane room is well-ventilated at least 1m <sup>3</sup> /min; ✓ The distance between vaporizer room and nozzle burner is less than 3m;

### 2.3 Exhaust

Exhaust could be represented in the table 3.

Table 3

S. No	Component	Function	Parameter
1	Exhausted gas analysis system(offered by the customer)	Inspect the gas component	✓ According to the local law(CO and CO <sub>2</sub> are detected and CO could be ignored.
2	Toxic gas treatment system(offered by the customer)	Treat Toxic gas	✓ According to the local law
3	Extraction Blower(offered by the customer)	Extract out the gas from the room	✓ Decide by the room(referenced 20m <sup>3</sup> /min for figure 1 room size).

### 2.4 Condition chamber

Specimens chamber could be represented in the table 4.

Table 4

S. No	Component	Function	Parameter
1	Condition Chamber	Conditioning the specimens	✓ Temperature range: 15℃~+45℃ ✓ Temperature stability: ≤±0.5℃ ✓ Humidity range: 20 - 90%RH ✓ Humidity stability: ≤±5.0%RH. ✓ Temperature uniformity: ≤2.0℃ ✓ Humidity uniformity: ±5.0%RH ✓ Inner dimension (W*H*D cm) : 170*280*75(for 4pcs module) ✓ The specimens shall be arranged within the conditioning environment in such a way that air can circulate around each individual specimen.

### 2.5 Room (figure 1 as reference)

Room for the test could be represented in the table 5

Table 5

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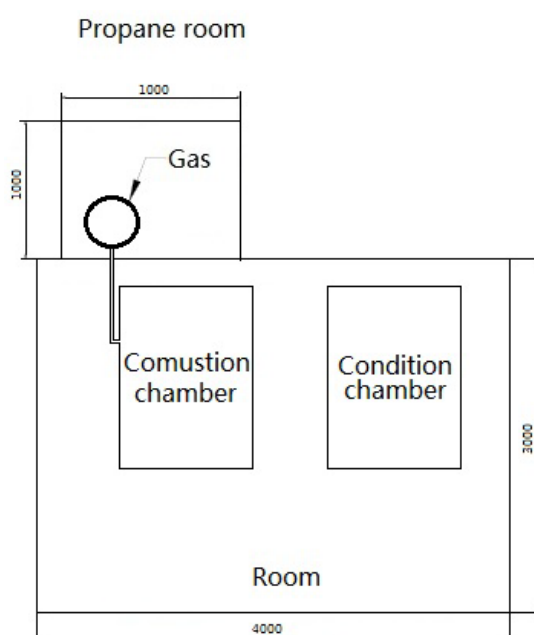
S. No	Component	Parameter
1	Wall of the Room	✓ Tiles on all wall of room and floor of room with necessary fire protection arrangement.
2	Structure	✓ The combustor room is at least 4m*3m*4m(L*W*H); ✓ The room is well-ventilated at least 20m <sup>3</sup> /min; ✓ Tiles on all wall of room and floor of room with necessary fire protection arrangement.
3	Electrical Power	✓ 3-ph AC: 400V±10%, 50Hz±5% 10KW
4	Condition	✓ Temperature: (10 to 50) ±5°C ✓ Humidity: (10 to 90%)±5% RH (non-condensing)

### 3. Others

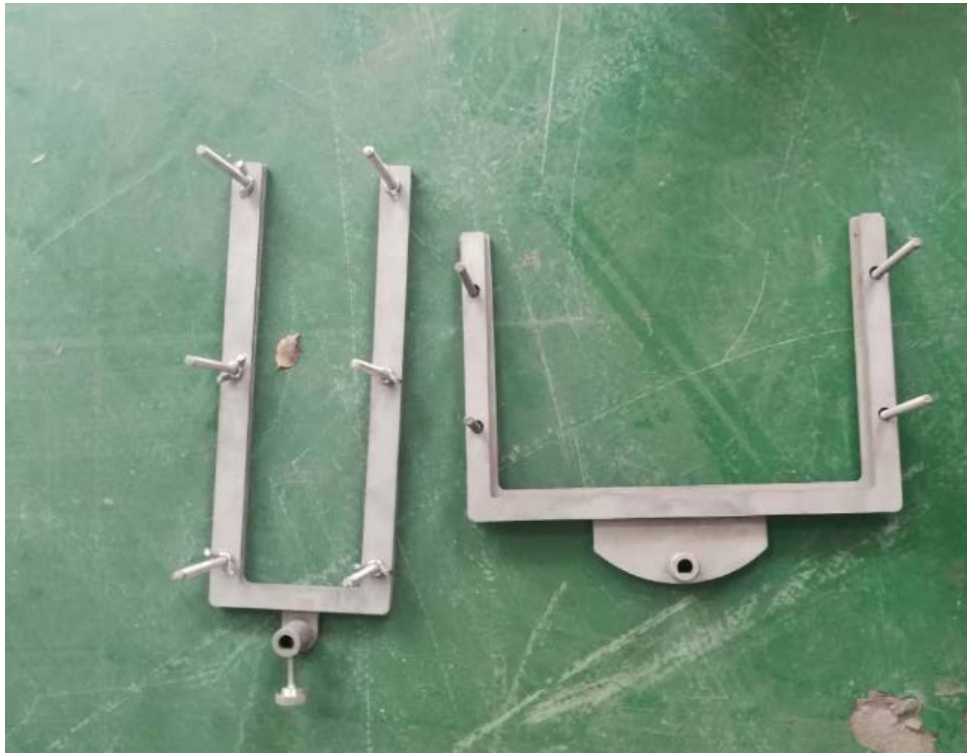
Others are present in table 6

**Table 6**

S. No	Items	Presentation
1	<b>Personnel protective Equipment</b>	✓ Fire Resistant Apron, Helmet and shoes along with the portable Breathable Oxygen Mask oxygen mask shall be supplied.
2	Fire Extinguisher( <b>offered by the customer</b> )	✓ Specialized for propane
3	Drawings/ Documents	✓ Provide for all related drawings / Bill of material for test building and utilities.
4	Safety device( <b>offered by the customer</b> )	✓ Provide necessary arrangement to stop the fire in device under test according to the local law.



**Figure 1****4. Reference picture****Combustion Chamber**



**Module holder**

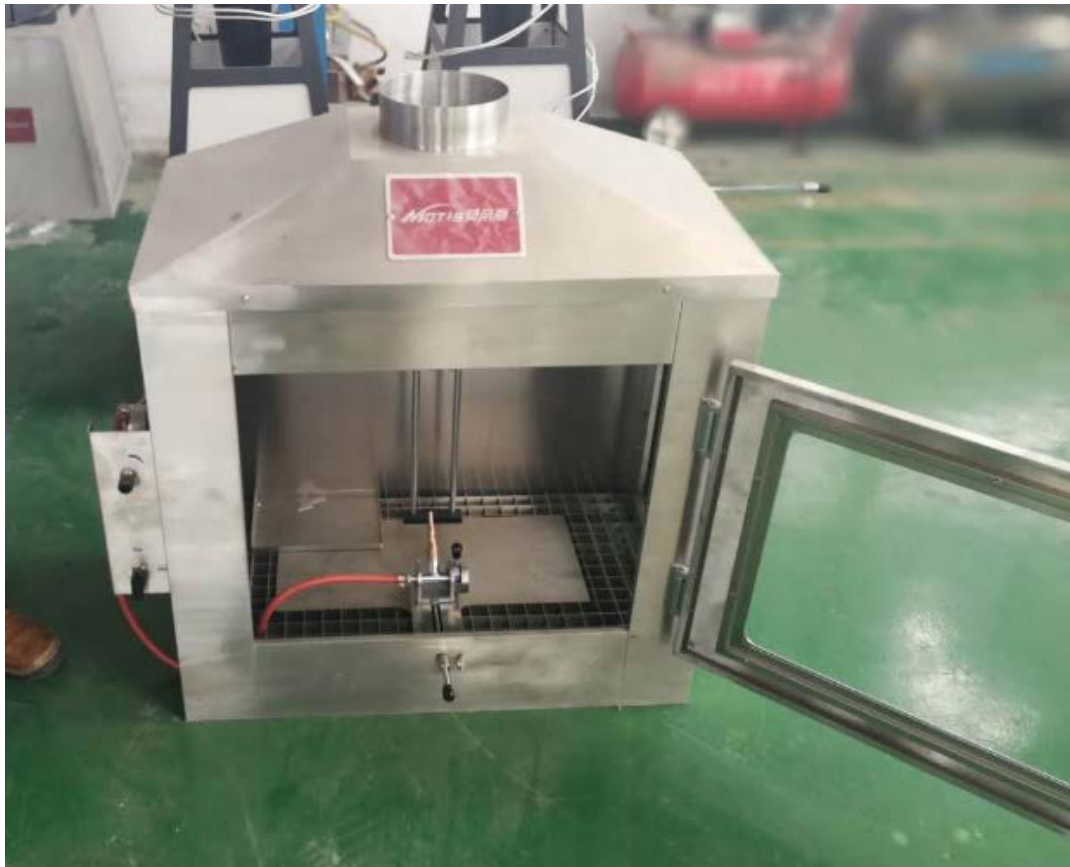


**Control panel**



**Anemometer****Gas pipe**



**Burner****Condition Chamber**