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Plastic welding machine and tool:  
extrusion welding gun

塑料焊接机具 挤出焊枪

(English Translation)

(报批稿)

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## Foreword

SAC/TC 162 is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

This standard was proposed by China Petroleum and Chemical Industry Federation.

This standard was prepared by National Technical Committee 162 on Non-metallic Chemical Equipment of Standardization Administration of China.

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# Plastic welding machine and tool: extrusion welding gun

## 塑料焊接机具 挤出焊枪

### 1 Scope

This standard specifies terms and definitions, product descriptions, requirements, test methods, inspection rules, marking, packaging, transportation and storage of plastic welding machinery and tools: extrusion welding gun.

This standard is applicable to manual extrusion welding gun (hereinafter referred to as welding guns) used for welding thermoplastic products such as polypropylene (PP), polyethylene (PE), polyvinyl chloride (PVC), and polyvinylidene fluoride (PVDF).

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB 2894, *Safety signs and guidelines for the use.*

GB 3883.1, *Safety of hand-held motor-operated electric tools—Part 1: General requirements*

GB/T 4583, *Measurement of noise emitted by electric tools—Engineering method*

GB/T 5013.4, *Rubber insulated cables of rated voltages up to and including 450/750V—Part 4: Cords and flexible cables*

GB 5226.1, *Electrical safety of machinery—Electrical equipment of machines—Part 1: General requirements*

GB/T 11918, *Plugs, socket-outlets and couplers for industrial purposes—Part 1: General requirements*

### 3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

#### 3.1

Welding shoe

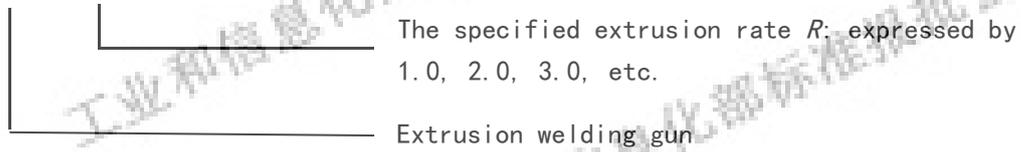
Components mounted on the front end of welding gun to form different weld shapes typically, which are made of polytetrafluoroethylene (PTFE).

### 4 Product description

#### 4.1 The type of welding gun

The type of welding gun should be compiled according to the following provisions.

EWG - □

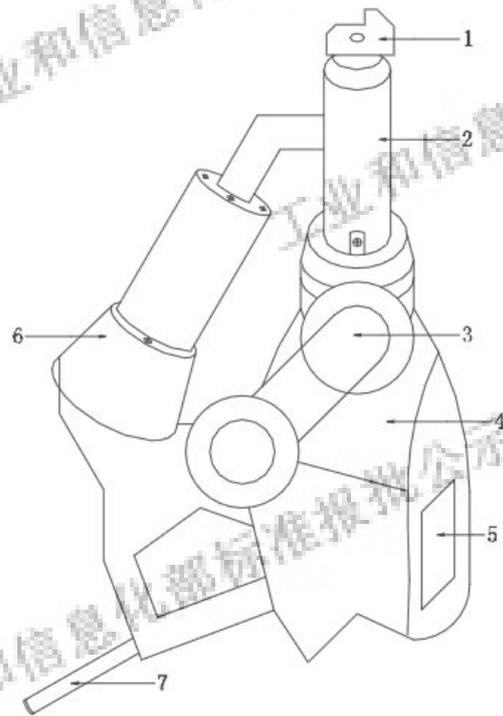


For example:

EWG-2.0, means a type of extrusion gun with a extrusion capacity of 2.0.

#### 4.2 Product structure

The welding gun is provided with welding shoe made of PTFE material at the front end to form different weld shapes (such as v-shaped weld and fillet weld). The structure of welding gun see Figure 1.



Description:

- 1 Welding shoe;
- 2 Plasticizing extrusion system;
- 3 Handle;
- 4 Drive system;
- 5 Display;
- 6 Hot air system;
- 7 Power cable.

Figure 1 — Schematic diagram of extrusion welding gun structure

## 5 Requirements

### 5.1 Safety requirements

5.1.1 The structure and basic parameters of power plug and socket of welding gun in accordance with GB/T 11918.

5.1.2 The performance of the cords or flexible cables which connecting welding gun and power supply in accordance with GB/T 5013.4.

5.1.3 The electrical strength of welding gun in accordance with GB 3883.1.

5.1.4 The overcurrent safeguard of welding gun in accordance with GB 5226.1.

5.1.5 The protection of electriferous parts of welding gun in accordance with GB 3883.1.

5.1.6 In normal welding process, no matter how long it lasts, the temperature of the position held by operator shall not exceed 40 °C or the ambient temperature. The temperature of the protection tube of the heating system of the welding gun shall not exceed 80 °C.

5.1.7 The safety sign of welding gun in accordance with GB 2894.

### 5.2 Preheating time

The time for welding gun to reach the specified temperature and keep stable shall not be more than 10 min.

### 5.3 Heating temperature

#### 5.3.1 Maximum and minimum temperatures

The hot air temperature of welding gun should be in the range of 40 °C–600 °C, and the temperature may be adjusted.

#### 5.3.2 Working hot air temperature

In normal working state, the fluctuation value of the outlet hot air temperature of welding guns shall not exceed 10 °C, and the deviation between the actual temperature and the set temperature shall not exceed  $\pm 10$  °C.

#### 5.3.3 Melt temperature

In normal working state, the fluctuation value of the outlet melt temperature of welding gun shall not exceed 10 °C, and the deviation between the actual temperature and the set temperature shall not exceed  $\pm 10$  °C.

### 5.4 Extrusion quantity

The corresponding relationship between the specified extrusion rate and the actual extrusion capacity of the welding gun see Table 1.

Table 1 — The corresponding relationship between the specified extrusion rate and the actual extrusion capacity

The specified extrusion rate $R$	the actual extrusion capacity $Q$ / (kg/h)
1.0	$Q \leq 1.5$
2.0	$1.5 < Q \leq 2.5$
3.0	$2.5 < Q \leq 3.5$
4.0	$3.5 < Q \leq 4.5$
5.0	$4.5 < Q \leq 5.5$
6.0	$5.5 < Q \leq 6.5$

### 5.5 Air output

The air output of welding gun shall not be less than 300 L/min.

### 5.6 Noise

The average sound pressure level (A weighted) of working noise measured at the 1 m radius sphere with the welding gun as the center shall not be no more than 65 dB.

### 5.7 Appearance

The outer surface of the welding gun shall be even and uniform, and there shall be no irregularity, holiday wrinkles or other defects.

## 6 Test methods

### 6.1 Safety characteristics

6.1.1 The structure and basic parameters of plug and socket-outlet of welding gun shall be tested in accordance with GB/T 11918.

6.1.2 The performance of the cords and flexible cables connecting the gun to the power shall be tested in accordance with GB/T 5013.4.

6.1.3 The electric strength of welding gun shall be tested in accordance with GB 3883.1.

6.1.4 The over-current limiter of welding gun shall be tested in accordance with GB 5226.1.

6.1.5 The protection of electriferous parts of welding gun shall be tested in accordance with GB 3883.1.

6.1.6 The temperature may be tested by a digital temperature detector.

6.1.7 Safety signs shall be checked in accordance with GB 2894.

### 6.2 Preheating time

Preheating time may be tested by stopwatch or other timers.

### 6.3 Heating temperature

#### 6.3.1 Measurement of the maximum and minimum temperatures:

- a) Heating for 10 minutes at maximum power;
- b) Insert the thermocouple of the digital temperature detector into the air out-let at a depth of 5 mm, and adjust the temperature to the highest set value;
- c) Shake the thermocouple at a depth of 5 mm and read out the maximum temperature displayed by the digital temperature detector;
- d) Turn off the heating function and keep the fan running for 10 minutes;
- e) Insert the thermocouple of the digital temperature detector into the air out-let at a depth of 5 mm, and adjust the temperature to the lowest set value;
- f) Shake the thermocouple at a depth of 5 mm and read out the lowest temperature displayed by the digital temperature detector.

#### 6.3.2 Temperature measurement of working hot air:

- a) As welding gun in normal working state, adjust the temperature of welding gun to the settings manually;
- b) Heating for 10 minutes, insert the thermocouple of digital temperature detector into the air outlet at a depth of 5 mm, and read out the temperature displayed by the detector;
- c) Test continuously for 5 minutes, record the temperature values every half minute;
- d) Calculate the difference between the maximum value and the minimum value of all recorded values, which is the fluctuation value;
- e) Calculate the differences between all recorded values and the set values, which are the deviation values.

#### 6.3.3 Measurement of the melt temperature:

- a) Keeping the welding gun in normal working state, then adjust the temperature to the specified value manually;
- b) When the welding rod is extruded regularly, the thermocouple of the digital temperature instrument shall be inserted into the melt and the temperature displayed by the instrument shall be read out;
- c) Test continuously for 5 minutes, record temperature values every half minute;
- d) Calculate the differences between the maximum value and the minimum value of all recorded values, which are the fluctuation values;
- e) Calculate the differences between all recorded values and set values, which are the deviation values.

### 6.4 Extrusion capacity

6.4.1 The welding gun shall be set in the maximum extrusion state and extruded continuously for three to five minutes. The welding gun extrusion amount per minute is measured by stopwatch and electronic scale, and the unit of the amount shall be converted to kg/h, which is the actual extrusion capacity  $Q$ .

6.4.2 Compare the actual extrusion capacity  $Q$  with Table 1, the specified extrusion rate  $R$  can be found.

#### 6.5 Air output

Set the welding gun to the maximum air outlet state, and read out the air volume by air flow meter.

#### 6.6 Noise

The operating noise of welding gun shall be tested in accordance with GB/T 4583.

#### 6.7 Appearance

The appearance may be inspected by visually examination and sensory evaluation.

### 7 Inspection rules

#### 7.1 Inspection classification

The inspection of welding gun includes the ex-factory inspection and the type inspection.

#### 7.2 Ex-factory inspection

Items of ex-factory inspection are specified in Table 2. Each welding gun shall be inspected according to the items listed in Table 2 before it leaves the factory. If any one of the items is unqualified, the welding gun is not acceptable.

#### 7.3 Type inspection

##### 7.3.1 Items of type inspection

The type inspection items shall include all the items in Table 2. In case of the following cases, type inspection shall be conducted:

- a) When a new or an old products manufactured by another factories;
- b) After running normally, under the condition of some factors affecting the characteristics of the product, such as the structure, material and process;
- c) In regular producing, periodic inspection shall be carried out when the cycle time is reached or the yield accumulated sufficiently, usually once every four years;
- d) A product needs to be recovery after it shut down for a long time;
- e) When there is a big difference between the factory inspection results and the last type inspection;

- f) The State Quality Supervision Authority puts forward the requirements for type inspection;
- g) User requests a type inspection.

Table 2 — Items of inspection

Serial number	Inspection items	Ex-factory inspection	Type inspection	Technical requirements clauses number	Clause number of test method	
1	Safety requirements	Plug and socket-outlet	√	√	5.1.1	6.1.1
2		Cords and flexible cables	√	√	5.1.2	6.1.2
3		Electrical strength	√	√	5.1.3	6.1.3
4		overcurrent safeguard	√	√	5.1.4	6.1.4
5		electriferous part	√	√	5.1.5	6.1.5
6		Holding position of welding gun and temperature of anti-scalding sleeve	√	√	5.1.6	6.1.6
7		Safety sign of welding gun	√	√	5.1.7	6.1.7
8	Preheating time	√	√	5.2	6.2	
9	Heating temperature	Max. temp. and Min. temp.	√	√	5.3.1	6.3.1
10		Working hot air temperature	√	√	5.3.2	6.3.2
11		Melt temperature	√	√	5.3.3	6.3.3
12	extrusion quantity	—	√	5.4	6.4	
13	Air volume	—	√	5.5	6.5	
14	Noise	—	√	5.6	6.6	
15	Appearance	√	√	5.7	6.7	

Note: — means no inspection, √ means inspection

### 7.3.2 Type inspection Judgment

Products shall be judged according to the requirements shown in Clause 5. If one of the items does not meet the requirements, a double quantity shall be random check

from the same type of products, and the same inspection shall be inspected once again. If the item is unacceptable, it is judged unqualified.

## 8 Sign, Packaging, Transportation and Storage

### 8.1 Sign

8.1.1 Sign shall be fixed in an obvious position on each welding gun.

8.1.2 The welding gun label shall include the following contents:

- a) Product name;
- b) Model;
- c) Power requirements (rated voltage, rated power) ;
- d) The name or trademark of the manufacturer;
- e) Serial number or product number.

8.1.3 The following contents shall be included outside the packing case:

- a) Product name and model number;
- b) Gross weight, shape and size;
- c) Graphic signs for packaging, storage and transportation.

### 8.2 Packaging

8.2.1 The inner packing of welding gun should keep the fixed firmly, and the outer packing can be made of plastic or metal materials.

8.2.2 The following documents shall be attached to the packing box:

- a) Product certificates;
- b) Products instructions;
- c) Packing list;
- d) List of spare parts and accessories.

### 8.3 Transportation

In the course of transportation, products shall not be subjected to severe impact and heavy heap, and throwing is strictly prohibited during loading and unloading.

### 8.4 Storage

Welding guns shall be stored on ventilated, dry, no erosion gas indoor benches.

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