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# The general specification for arc welding machines

电弧焊机通用技术条件

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# Table of Contents

# The general specification for arc welding machines

## 1 Scope

This standard specifies general technical requirements, inspection methods, acceptance rules for arc welding machines.

This standard applies to arc welding machines (hereinafter referred to as welding machines), which are designed for industrial and professional use, AND are powered by a voltage not exceeding the voltage specified in Table 1 of the GB/T 156 standard OR driven by mechanical equipment.

This standard does not apply to manual arc welding power sources with limited load, which are used by non-professionals.

If there are special requirements for various types of welding machines, they can be supplemented, on the basis of this standard.

## 2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 156 Standard voltage (GB/T 156-2007, IEC 60038:2002, MOD)

GB/T 2423.3 Environmental testing for electric and electronic products - Part 2: Testing method test Cab: Damp heat Steady state (GB/T 2423.3-2006, IEC 60068-2-78:2001, IDT)

GB/T 2900.22 Electrotechnical terminology - Electric welding machine

GB 5226.1 Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements (GB 5226.1-2008, IEC 60204-1:2005, IDT)

GB/T 13165 Methods of measurement on noise emitted by arc welding machine

GB 15579.1 Arc welding equipment - Part 1: Welding power sources (GB

### 6.4 Efficiency

The efficiency of the welding machine shall meet the requirements of the relevant energy efficiency standards for electric welding machines.

### 6.5 Power factor

The input power quality indicators, such as the power factor of the welding machine, shall comply with the relevant energy efficiency standards for electric welding machines.

### 6.6 No-load current

In the rated state, the no-load current of the manual arc welding machine shall not be greater than 10% of the rated input current; the no-load current limit of other welding machines is stipulated by the product standard.

### 6.7 Welding adaptability

The welding machine shall have good static and dynamic characteristics; in the entire adjustment range, it shall be able to ensure easy arc ignition and stable arc.

### 6.8 Cooling system

For welders with liquid cooling, the coolant shall meet the corresponding standards. If water cooling is used, the quality of the cooling water shall meet the water quality standards for industrial water. The cooling system shall be able to work normally, under the specified inlet pressure; there shall be no water leakage or water seepage.

### 6.9 Pneumatic system

The pneumatic system of the welding machine shall be able to work normally, under the specified intake pressure; there shall be no air leakage.

### 6.10 Traction force of wire feeder

The traction force of the wire feeder shall ensure uniform wire feeding; the traction force is specified by the product standard.

### 6.11 Control system

The control system of automatic and semi-automatic welding machines shall be able to ensure the setting and adjustment of welding machine working parameters; have the necessary procedures and actions for the welding machine to work normally. The welding parameter indicators shall be easy to observe.

### 6.18 Complete set of welding machine

The complete set of the welding machine is stipulated by each product standard.

### 6.19 Welding power source

The safety requirements of the welding power source of the welding machine shall meet the requirements of GB 15579.1.

### 6.20 Wire feeder

It shall meet the requirements of GB/T 15579.5.

### 6.21 Welding torch (gun)

It shall meet the requirements of GB/T 15579.7.

### 6.22 Welding tongs

It shall meet the requirements of GB 15579.11.

### 6.23 Welding cable coupling device

It shall meet the requirements of GB 15579.12.

### 6.24 Packing, storage, transportation of welding machine

It is stipulated by each product standard.

### 6.25 Instructions for use and marking

It shall meet the relevant requirements of GB 15579.1.

## 7 Inspection method

### 7.1 Inspection conditions

See the relevant requirements of GB 15579.1.

### 7.2 General visual inspection

The assembly quality of the welding machine shall be checked before the test, such as whether the screws, bolts, nuts used for fastening are tightened; whether the cooling fan, various adjustment devices, push rollers can rotate flexibly; whether various signs meet the drawing requirements; whether the data on the nameplates is complete and correct; whether the connection of the protective conductor terminal is reliable.

$\Delta U_2$ - The rate of change of welding voltage.

### 7.5 Change rate of wire feeding speed

**7.5.1** The rate of change of wire feeding speed is carried out without welding. The hose, between the wire feeder and the welding torch (gun), remains straight.

**7.5.2** For this test, measure the following two states, respectively, in the three cases where the power supply voltage is 90%, 100%, 110% of the rated value.

a) Maximum wire feeding speed and minimum welding wire diameter;

b) Minimum wire feeding speed and maximum wire diameter.

Measure the length of the welding wire, through the wire feeder, in no less than 10 s.

**7.5.3** The rate of change of wire feeding speed is calculated as follows:

$$\Delta V_0 = \frac{V_0 - V_{0N}}{V_{0N}} \times 100\%$$

The calculation result shall be the larger of the absolute value.

Where:

$V_{0N}$ - The wire feeding speed at rated voltage;

$V_0$ - The wire feeding speed when the supply voltage is 90% and 110% of the rated value;

$\Delta V_0$ - The rate of change of wire feeding speed.

Wire feeding speed $V_0 = L/T$

Where:

L - The length of the welding wire sent out, in meters (m);

T - Time, in seconds (s).

### 7.6 Change rate of welding speed

**7.6.1** The rate of change of welding speed is carried out without welding. The guide rail of the walking mechanism of the welding machine shall be level or in actual use.

**7.6.2** The test is carried out under the three conditions of the power supply voltage, which is 90%, 100%, 110% of the rated value. Measure the distance,

The dynamic characteristics measurement conditions are as follows:

a) During the measurement, the input shall be kept at the rated voltage and rated frequency.

b) The measurement shall be carried out at two points: the rated welding current and 20% of the rated welding current. At this time, the load voltage shall be in accordance with the relevant requirements of GB 15579.1. When the rated welding current is 300 A and below, the dynamic characteristic measurement conditions are stipulated by the product standard.

c) After the output terminal of the welding machine is connected to the cable, a contactor of sufficient capacity shall be directly short-circuited; the resistance of the external circuit shall be 0.008 ~ 0.01 Ω. If it is necessary to compare the dynamic characteristics of two or more welding machines, it shall be carried out under the same external resistance.

d) The measurement shall be carried out under hot conditions.

e) The oscillogram shall include three lines of voltage, current, time scale, as well as the corresponding calibration values.

**7.10.3 Welding test**

The test methods and specifications of the welding test are stipulated by the product standard.

**7.11 Tightness test of cooling system**

Pass the coolant, at a pressure of 0.5 MPa, to the cooling system, for a duration of 1 min. Observe whether there is any leakage of coolant. The test is carried out, when the outlet hole of the coolant is blocked.

**7.12 Air path tightness test**

Pass the compressed air into the air path, to make the pressure reach 0.5 MPa, for a duration of 1min; observe whether there is any air leakage. The test shall be carried out with the air outlet blocked.

**7.13 Determination of the traction force of wire feeder**

**7.13.1** With the wire feeding hose removed, the traction force of the wire feeding device is measured, through the maximum wire diameter and the minimum wire feeding speed.

**7.13.2** When measuring with the method of raising the static load by the wire feeding wheel, connect an ammeter to the armature circuit of the wire feeding

motor. When the armature current does not exceed its rated value, if the wire feeding wheel is lifted evenly AND there is no slipping, then the load weight at this time is the traction force of the wire feeder of the welding machine.

### 7.14 Current and voltage adjustment range, level difference and indication accuracy measurement

**7.14.1** The input terminal of the welding power source shall maintain the rated voltage and rated frequency; the corresponding load voltage shall be in accordance with the relevant requirements of GB 15579.1.

During the type inspection, the welding power source shall be carried out in a hot state. During routine inspection, it can be carried out in a cold state.

**7.14.2** For the current and voltage adjustment range, it shall measure the maximum output and minimum output of the welding power source; record the welding current and load voltage, at the same time.

**7.14.3** When the current and voltage are adjusted in stages, the level difference, between the two adjacent stages, shall be measured and calculated as follows:

$$\text{Level difference} = [(\text{Value at higher stage} - \text{Value at lower stage}) / \text{Value at higher stage}] \times 100\%$$

**7.14.4** The accuracy of the current and voltage's scale indication values is calculated as follows:

$$\text{Indication accuracy} = [(\text{Indication value} - \text{measured value}) / \text{Indication value}] \times 100\%$$

The calculation result shall be the larger of the absolute value.

### 7.15 Noise test

The noise test method of the welding machine shall be carried out, in accordance with the provisions of GB/T 13165.

### 7.16 Damp heat test

The test is carried out in accordance with the provisions of GB/T 2423.3; the following detailed rules are stipulated;

a) The welding machine shall pass the insulation resistance and dielectric strength tests, which are required by this standard, before the test;

b) The welding machine is not packaged or powered; it is placed according to normal use conditions;

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