

Plastic welding machine and tool: electrofusion welding machine

塑料焊接机具 电熔焊机

1 Scope

This standard specifies terms and definitions, product descriptions, requirements, test methods, inspection rules, marking, packaging, transportation and storage of electrofusion welding machine used for welding plastic pipes and plates to be heated by resistance thread.

This standard is applicable to electrofusion welding machine used for welding polyethylene (PE), polypropylene (PP), polyvinylidene fluoride (PVDF), and polyamide (PA) plastic material pipes, fittings and/or plates.

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 reference, the latest edition of the referenced document (including any amendments) applies.

GB/T 2423.5, *Environmental testing of electric and electronic products — Part 2: Test methods Test Ea and guidance: Shock*

GB/T 2423.10, *Environmental testing for electric and electronic products — part 10: Test methods Test Fc: Vibration (sinusoidal)*

GB 2894, *Safety signs and guideline for the use*

GB 4208, *Degrees of protection provided by enclosure (IP code)*

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

GB/T 5013.6, *Rubber insulated cables of rated voltages up to and including 450/750 V — Part 6: Arc welding electrode cables*

GB/T 11918.1, *Plugs, socket-outlets and couplers for industrial purposes — Part 1: General requirements*

GB 19212.9, *Safety of power transformers, power supply units and similar devices — Part 9: Particular requirements for bell and chime transformers*

ISO 12176-3, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems Part 3: Operator's badge*

ISO 12176-4, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 4: Traceability coding*

ISO 13950, *Plastics pipes and fittings — Automatic recognition systems for electrofusion joints*

3 Terms and definitions

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

3.1

Operator

A person qualified to operate the electrofusion welding machine.

3.2

Electrofusion welding machine

A welding machine that can control the parameters such as output voltage, current, time and energy etc. to accomplish the fusion cycle of plastic fittings

3.3

Control cycle

t

A fixed period of time, composed of an on-load period t_1 and an off-load period t_2 . $t = t_1 + t_2$.

3.4

Duty cycle

t_d

Proportion of on-load period t_1 and control cycle t , expressed by percentage (%), i. e. $t_d = t_1 / t \times 100$.

3.5

Output voltage

Output voltage value of electrofusion welding machine expressed by the available root mean square (RMS) value (instead of peak value)

3.6

Reference output voltage

75% of maximum output voltage value of electrofusion welding machine.

3.7

Soft start

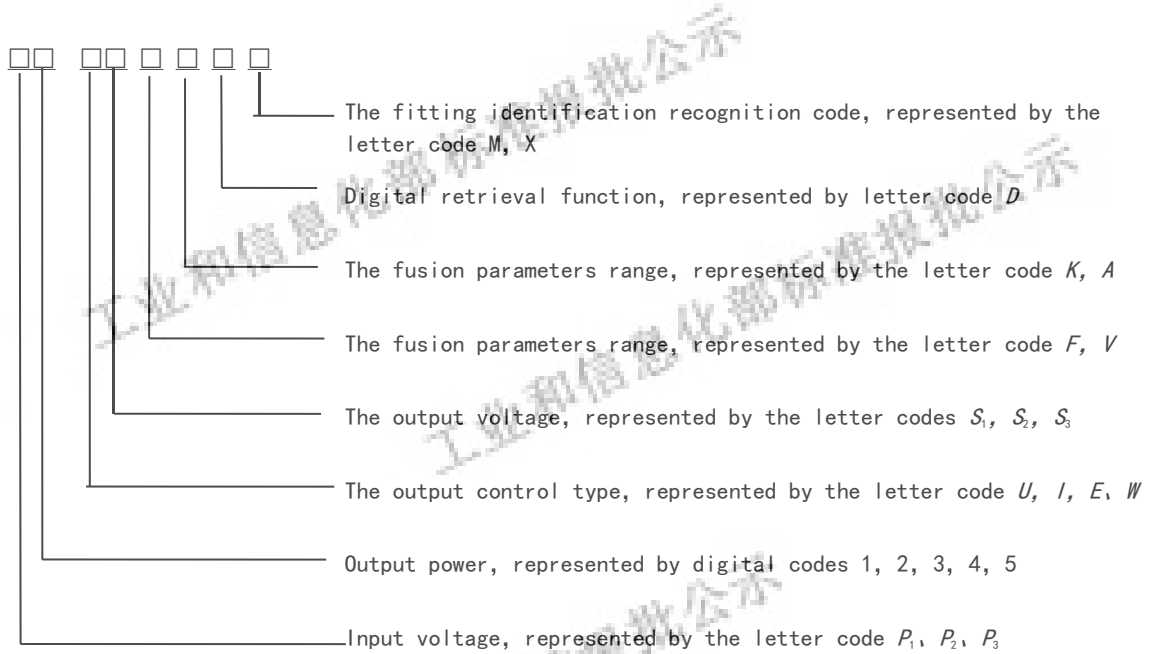
A process that the output raises to the given value after start-up of welding machine.

4 Product description

4.1 Product classification

The electrofusion welding machine is classified by electrical characteristics and working characteristic in control process, and its characteristic code

representation is as follows.



For example 1:

Low voltage input (50 V-250 V)-3 kW- voltage and energy control-super low voltage output (8 V-84 V)-variable fusion parameters-automatic data input-equipped with data retrieval system-multipurpose, the characteristic code is:

P₂3UES₂VADX

For example 2:

Safety, very low voltage input (0-50 V)-3 kW- voltage control- safety- very low voltage out-put (8V-42V)-variable fusion parameters-automatic data input-equipped with data retrieval system-multipurpose, the characteristic code is:

P₁3US₁VADX

The code classification of electrical characteristics and working characteristic of the electrofusion welding machine is shown in Table 1.

Table 1 — The classification table of electrical characteristics and working characteristic of the electrofusion welding machine

1st		2nd		3rd		4th		5th		6th		7th		8th	
Code	Input voltage	Code	Output power	Code	Output control type	Code	Output voltage	Code	Fusion parameters	Code	Data input	Code	Data retrieval	Code	Fitting identification recognition number
P ₁	SVLV: safe very low voltage (≤50 V)	1	≥0 kW and ≤1 kW	U	Voltage control	S ₁	SVLV: safe super-low volatage (8 V to 42 V)	F	Fixed fusion parameters	K	Manual data input	D	Equipped with data retrieval system	M	Singlepurpose (one identification)
P ₂	LV: low voltage (50 V-250 V)	2	>1 kW and ≤2 kW	I	Current control	S ₂	VLV: Super-low volatage (8 V to 84 V)	V	Variable fusion parameters	A	Automatic data input			X	Multipurpose (several identification)
P ₃	HV: high voltage (250V-400 V)	3	>2 kW and ≤3 kW	E	Energy control	S ₃	LV: low volatage (8 V to 250 V)								
		4	>3 kW and ≤4 kW	W	Power control										
		5	P>4 kW												

Note 1: Output power is defined as the power value when the voltage is at 60% of duty cycle.

Note 2: Code selection instructions:

The first code is selected from any one of P₁, P₂ and P₃.

The second code is selected from any one of 1, 2, 3, 4 and 5.

The third code is selected from any one of U, I, E and W or any one of UE, UW, IE and IW.

The fourth code is selected from any one of S₁, S₂ and S₃.

The fifth code is selected from any one or both of F and V.

The sixth code is selected from any one or both of K and A.

The seventh code is selected from D or not.

The eighth code is selected from any one of M and X.

4.2 Product structure

The electrofusion welding machine consists of an input circuit, a transformer, an output circuit, and a control system.

The input circuit includes the input cable connector, the input cable and other circuit elements, and shall at least have an overload protection device used to prevent the influence of input voltage fluctuations on the performance of electrofusion welding machine.

The output circuit includes output cables, output connector and other circuit components.

The control system includes at least ambient temperature measurement devices, parameters input devices, resistance measurement devices, display screens, data transmission interfaces, controllers, and memory. By means of program, the controller and memory realize the control, monitoring and alarm of the output parameters performance and the fusion process of electrofusion welding machine.

5 Requirements

5.1 Appearance

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

Control panel (such as keyboard and display) shall have protection against collision damage.

5.2 Safety requirements

5.2.1 The shell protection level of electrofusion welding machine shall be not lower than the IP54 specified in GB 4208.

5.2.2 The input cable connector shall meet the requirements of GB/T 11918.1.

5.2.3 The transformer shall meet the safety isolation transformer requirements of GB 19212.9. No-loaded output voltage, rated output power and dielectric strength test shall meet the requirements of GB 19212.9.

5.2.4 The output connector shall meet the requirements of GB 4208.

5.2.5 Insulation resistance requirements of electrofusion welding machine are that the input circuit shall not be less than 5 M Ω to the welding circuit, and each exposed conductive parts of the control circuit shall not be less than 2.5 M Ω to all circuits.

5.2.6 The safety sign of the electrofusion welding machine shall meet the requirements of GB 2894.

5.3 Input and output cables

Input cable shall meet the requirements of GB/T 5013.4. The length of the fixed input cable shall not be less than 3 m. The output cable shall meet the requirements of GB/T 5013.6, and its length shall not be less than 2.5 m.

5.4 Output connector

The output connector shall match the input electrode of electrofusion fittings.

5.5 Ambient temperature measurement device

The electrofusion welding machine shall be equipped with an ambient temperature measurement device with an accuracy of ± 1 °C. Its temperature sensor shall not be affected by the heat generated itself. If the ambient temperature exceeds the machine's operating range, it shall give alarm.

5.6 Data input device

The electrofusion welding machine shall be equipped with a manual keyboard input device or an automatic system input device (such as terminal sensor, barcode or magnetic card) for inputting external data and can display the relevant information on the screen. The input data include welding parameters code, operator code and traceability code.

The encoding of terminal sensor, barcode, and magnetic card shall meet the requirements of ISO 12176-3 and ISO 12176-4. The decoder of the electrofusion welding machine can decode the read data in accordance with ISO 13950.

5.7 Resistance value measuring device

The electrofusion welding machine shall be equipped with a resistance value measurement device with an accuracy of $\pm 5\%$.

5.8 Displays

All displays shall be clearly visible both in bright and soft light conditions.

5.9 Data transmission interfaces

Interfaces for data retrieval storage devices shall adopt remote transmitters or standard connectors (such as PCMCIA, serial ports, and/or parallel ports).

5.10 Output voltage, output current, output energy and time

During the fusion process, electrofusion welding machine shall control the voltage or the current to produce the required energy by the following methods.

a) Voltage control: The allowable deviation of output voltage shall be controlled within $\pm 1.5\%$ of the set voltage, but shall not exceed ± 0.5 V. The transient current of electrofusion welding machine should not exceed 100 A. The soft start time shall be less than 1% the total fusion time, rounded up to the nearest whole second;

b) Current control: The allowable deviation of output current shall be controlled within $\pm 1.5\%$ of the set current. The soft start time shall be less than 1% of the total fusion time;

c) Energy control: The total amount of energy supplied to the fitting by the electrofusion welding machine shall be controlled within $\pm 5\%$ of the energy range given by the working conditions, and shall be compensated by ambient temperature;

d) Fusion time: Control accuracy of the fusion time shall be $\pm 1\%$;

e) Power overload: When the output power of electrofusion welding machine exceeds 10% of the rated output power (see annex A), it is allowed to operate normally for 1 min, and it shall terminate the welding process within not more than 1 s if output power exceeds 1 min.

5.11 Ambient temperature automatic compensation function

The electrofusion welding machine shall have the ambient temperature automatic compensation function, that automatically adjusts the fusion time according to the ambient temperature. When the ambient temperature reduces, the fusion time shall be extended, and vice versa.

5.12 Process control

5.12.1 Output circuit on/ off check

Before start of fusion, the on/ off check shall be done on the output circuit of electrofusion welding machine. In the check, the check voltage shall not exceed 24 V and the current generated in the output circuit shall not cause the resistance wire temperature to rise. If the output circuit is in path, it shows the output circuit resistance value, and the fusion process is permissible to proceed normally; if the output circuit is in break, it does not start welding and gives an indication of output circuit in break.

5.12.2 It is monitored that data can not be entered or modified once the fusion process begins.

5.12.3 All information relating to welding voltage, weld joint serial number, fusion time and energy shall be displayed during the fusion process.

5.12.4 Electrofusion welding machine shall store at least 250 welding data.

5.13 Monitoring alarm

At any step in the fusion process, if electrofusion welding machine detects that the fusion parameters exceed the range or an abnormal error occurs, the fusion process shall be interrupted and the information shall be recorded, showing the type of failure, with an audible and/or visual alarm signal. It shall have at least the following alarm functions.

5.13.1 Input parameters error

When the external parameters format of the parameters reading device is wrong, it shall be able to detect the error and give an alarm, such as a barcode error.

5.13.2 Ambient working temperature exceeding range

When the ambient temperature exceeds the working temperature ($-5\text{ }^{\circ}\text{C}$ – $45\text{ }^{\circ}\text{C}$), the welding machine shall be able to give an alarm and stop the operation.

5.13.3 Too long time for output voltage or output current value exceeding range

If the output voltage or output current value exceeds $\pm 2\%$ of the set value and the duration exceeds 5% of the given fusion time with a maximum of 3 s, the fusion process shall be interrupted (not applicable to energy control type of electrofusion welding machines).

5.13.4 Break in output circuit

When the connected resistance value is more than $200\ \Omega$, the electrofusion welding machine shall stop working. During the whole fusion process, it shall always monitor the circuit continuity at the fitting or in the transition plug. If a break (open

circuit) occurs in the output circuit, it shall cut off the output within 1s and display an error message.

5.13.5 Short circuit of output circuit

When there is a short circuit in the output circuit, the fusion cycle shall be interrupted. For example, if the current increase exceeds 10% of the set current in any 4s, the electrofusion welding machine shall stop working and display error message.

5.13.6 Input power interrupted during fusion

During the fusion process, when the input circuit power is interrupted for any reason, the fusion process shall be interrupted immediately and an error message shall be displayed at the next starting on.

5.13.7 Too long time for input voltage and power frequencies exceeding range

If the input voltage exceeds the allowed range of the electrofusion welding machine more than 5 s, the fusion process shall be interrupted. If the power frequency exceeds the allowed range more than 5 s, the fusion process shall be interrupted.

5.13.8 Memory capacity limit

When the welding data information item stored by the electrofusion welding machine reaches the capacity limit, it shall give the memory capacity limit indication and alarm, indicate to download the data. If the welding information is deleted automatically, the earliest one shall be deleted.

5.14 Input power

The electrofusion welding machine shall be able to work properly within the normal fluctuation range of the input power. The fluctuation range is $\pm 15\%$ of the input rated voltage and $\pm 2\%$ of the input rated frequency.

5.15 Duty cycle test

After continuous working for 1 h at $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 60% duty cycle, the electrofusion welding machine shall meet the requirements of 5.8 and 5.10.

5.16 Mechanical properties

5.16.1 Impact performance

The electrofusion welding machine and its frame (if any) shall be able to work properly after the impact test with a peak acceleration of 50 g.

5.16.2 Vibration performance

The electrofusion welding machine and its frame (if any) shall be able to work properly after vibration test with a vibration grade of 2.186 RMS (average acceleration).

6 Test methods

6.1 Test temperature

All tests shall be conducted at ambient temperatures of 15 °C—35 °C unless otherwise specified.

6.2 Appearance inspection

The appearance may be inspected by visual inspection.

6.3 Safety requirements inspection

6.3.1 The shell protection level of electrofusion welding machine shall be tested in accordance with GB 4208.

6.3.2 The input cable connector shall be tested in accordance with GB/T 11918.1.

6.3.3 The no-load output voltage, rated output power and dielectric strength test of the transformer shall be tested in accordance with GB 19212.9.

6.3.4 The output connector shall be tested in accordance with GB 4208.

6.3.5 Insulation resistance inspection of electrofusion welding machine shall be tested including insulation resistance between the input circuit and the output circuit, insulation resistance between each exposed conductive part of the control circuit and the input circuit, and insulation resistance between each exposed conductive part of the control circuit and the output circuit.

6.3.6 The safety signs of the electrofusion welding machine shall be inspected in accordance with GB 2894.

6.4 Input and output cable inspection

Measure the cable length with a tape measure with an accuracy of not less than 1 cm.

6.5 Output connector inspection

Measure the diameter of the output connector jack with a vernier caliper with an accuracy of 0.02 mm.

6.6 Ambient temperature measuring device inspection

The ambient temperature value is measured and recorded by a temperature sensor with a temperature measuring instrument with an accuracy of 0.1 °C, and it is compared with the value showed by control system.

6.7 Parameters input device inspection

Read a set of barcodes set with known parameters using a scanner of electrofusion welding machine, to compare if the value displayed on the screen is consistent with the known set parameters.

6.8 Resistance value measuring device inspection

6.8.1 Check if the electrofusion welding machine has a resistance value measurement function.

6.8.2 The inspection method for accuracy of measuring the resistance value is as follows.

- a) Three resistors of 0.5 Ω , 5.0 Ω and 10 Ω are selected as standard resistors for testing;
- b) Measure the above resistors using a resistance measuring instrument with an accuracy of 0.01 Ω , and record the measured value as R_0 ;
- c) Measure the above resistors for 5 times respectively using an electrofusion welding machine, and record the maximum value R_{\max} and the minimum value R_{\min} among the 5 measured values;
- d) Calculate the percentage error between R_{\max} , R_{\min} and R_0 of the same resistor.

6.9 Display inspection

Observe the display screen under bright and soft light to check if it is clearly visible, and if it supports Chinese display, and how about the response speed.

6.10 Data transmission interface inspection

Connect the electrofusion welding machine to the memory or other electronic device through the interface to check the consistency between the downloaded data and the actual data.

6.11 Output voltage, output current, output energy and time inspection

6.11.1 Energy output inspection of voltage controlled electrofusion welding machine shall be carried out as follows:

Connect the electrofusion welding machine with the testing equipment and tools see Figure 1:

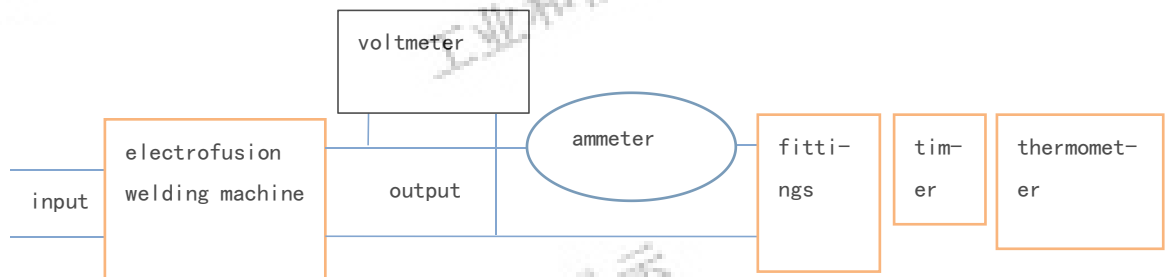


Figure 1 — Energy output inspection connection diagram of electrofusion welding machine

- 1) Using standard resistive load, the load resistance shall be 0.25 Ω , 3.0 Ω , and 15.0 Ω , 3 values;
- 2) For each resistive load, set three voltage values (selected from 12V, 24V, 36V, 42V, small values for small resistors, large values for large resistors) to measure and record the measured voltage values.

Note: When the single voltage output electrofusion welding machine performs this test, its output voltage is used as the set voltage.

a) The operation method is as follows:

- 1) Turn on the machine, set the output voltage, and read the measured voltage value;

- 2) The output voltage signal shall be collected from the pipe or adapter;
- 3) Use an oscilloscope to monitor the output voltage rising waveform and read the time required for the output voltage to rise to a stable state.

6.11.2 Fusion time inspection

The fusion time is measured with a stopwatch with an accuracy of not less than 0.01 s.

6.11.3 Actual total energy supplied to standard resistance inspection

The electrofusion welding machine is connected as shown in Figure 1, measure and calculate the actual total energy value supplied to standard resistance.

6.11.4 Power overload protection inspection

Monitor the welding process, overload the power by 10% through simulation, and check if the electrofusion welding machine can work for not less than 1 min.

6.12 Ambient temperature automatic compensation function inspection

At an ambient temperature of 15 °C, an electrofusion welding machine reads the parameters barcode with temperature compensation coefficient, record the set fusion time, make the welding on the resistance box with the read parameters, after the welding, record the actual fusion time. Check if the actual fusion time is longer than the set fusion time. Manually input the welding parameters and then perform the welding process to check if there is automatic temperature compensation function under the manual input parameters.

6.13 Process control inspection

6.13.1 On-off test of the output circuit: Confirm if the electrofusion welding machine has the function of output circuit continuity check before the welding process starts. When adjusting the electrofusion welding machine to the ready state for the welding process, disconnect the electrofusion fitting at the output and press the start button to check this function.

6.13.2 Operate the panel buttons during the welding process to check if the welding parameters can be input or modified.

6.13.3 Check if its interface displays relevant information during the welding process: welding voltage, weld interface serial number, fusion time, energy, etc.

6.13.4 Check the number of weld data that can be stored in the electrofusion welding machine at most.

6.14 Monitoring alarm inspection

6.14.1 Input parameters error inspection

Use the parameters reading device to read the wrong barcode, check if the electrofusion welding machine gives an error and alarm.

6.14.2 Working temperature over range inspection

Set the working temperature range of electrofusion welding machine to a range of 5 °C– 45 °C, and heat locally the ambient temperature sensor with a heat source,

and gradually increase the temperature up to more than 45 °C, then check if it can give an alarm and stop the operation.

6.14.3 Output voltage or current value out of range for too long inspection

Simulate the fusion process, at the condition of the measured output voltage or current value exceeds the selected value by 2%, and the duration exceeds 5% of the rated fusion time, for a maximum of 3 s, the fusion process shall be interrupted (not applicable to energy-controlled electrofusion welding machines).

6.14.4 Output circuit interrupt inspection

Simulate the fusion process, connect a resistor with a resistance value of not less than 200 Ω, the electrofusion welding machine shall not operate. Simulate the fusion process, interrupt the output circuit, it shall be turned off within not more than 1 s and an error message is displayed.

6.14.5 Output circuit short circuit inspection

Simulate the fusion process, the output short circuit is performed under the condition of ensuring the safety of the human and machine, the fusion cycle shall be interrupted. For example, if the current increase value exceeds 10% of the set current within any 4 s, the electrofusion welding machine shall stop working.

6.14.6 Input power interrupt during fusion inspection

During the fusion process, if the input circuit power is interrupted for any reason, the fusion process shall be interrupted immediately and an error message will be displayed when the machine is turned on the next time. Simulate the fusion process, when the on/off switch is turned off and the fusion process shall be interrupted immediately.

6.14.7 Input voltage and power frequency exceeding range for too long inspection

Simulate the fusion process, when the input voltage exceeds the allowable range for not less than 5 s, the fusion process is interrupted immediately. Test with a generator, adjust the generator output frequency during the test, simulate the fusion process, when the power frequency exceeds the allowable range for not less than 5 s, the fusion process is interrupted immediately.

6.14.8 Memory capacity limit inspection

Check the instructions of the electrofusion welding machine and know how many pieces of information that it can store. Operate it to fill up the memory of the machine with data, check how many pieces of data are stored, and if the first piece of data is deleted when it continues to weld.

6.15 Input power inspection

Connected as shown in Figure 1, use a variable transformer to power the electrofusion welding machine, fed in 3 supply voltages 85%, 100% and 115% of the rated input voltage, measure the output voltage respectively in accordance with the method described in 6.11.1; Use a generator to power it, set the supply voltage in the rated input voltage, and fed in 2 input frequencies 98% and 102%, measure the output voltage respectively in accordance with the method described in 6.11.1.

6.16 Duty cycle inspection

Stand electrofusion welding machine at $23\text{ }^{\circ}\text{C}\pm 2\text{ }^{\circ}\text{C}$ ambient temperature for 1 h, and the electrofusion welding machine shall operate for 2 h at $23\text{ }^{\circ}\text{C}\pm 2\text{ }^{\circ}\text{C}$, with duty cycle 60%. After testing, check if the performance shall meet the requirements of 5.15.

6.17 Mechanical performance inspection

6.17.1 Impact test

Test shall be done in accordance with GB/T 2423.5. The test conditions are as follows:

- a) Peak acceleration: 50 g;
- b) Pulse duration time: 8 ms - 15 ms;
- c) Shock pulse waveform: half sinusoidal pulse;
- d) Number of impacts: 3 times in each direction along the X , $-X$, Y , $-Y$, Z , and $-Z$ axes (18 times in total).

6.17.2 Vibration test

Test shall be done in accordance with GB/T 2423.10. The test conditions are as follows:

- a) Vibration level: 2.186 RMS (average acceleration).
- b) Frequency range: 11.25 Hz-10 Hz, +20 dB/oct; 210 Hz-20 Hz, $0.1\text{ g}^2/\text{Hz}$; 320 Hz-500 Hz, -4.2 dB/oct.
- c) Duration time of endurance test: 10 min per axis (X , Y , Z).

7 Inspection rules

7.1 Inspection classification and inspection items

7.1.1 Inspection classification

Inspection kinds of electrofusion welding machine includes the ex-factory inspection and the type inspection.

7.1.2 Ex-factory inspection

Each electrofusion welding machine must be inspected by the manufacturer's test department according to the requirements shown in Table 2, and can leave the factory when it is qualified.

Table 2 — Inspection items

Serial number	Inspection items	Ex-factory inspection	Type inspection	Technical requirements chapter number	Test method chapter number	
1	Appearance	√	√	5.1	6.2	
2	Safety requirements	Shell protection class	—	√	5.2.1	6.3.1
3		Input cable connector	—	√	5.2.2	6.3.2
4		Transformer	√	√	5.2.3	6.3.3
5		Output connectors	√	√	5.2.4	6.3.4
6		Insulation resistance	√	√	5.2.5	6.3.5
7		Safety sign	√	√	5.2.6	6.3.6
8	Input and output cables	—	√	5.3	6.4	
9	Output connectors	√	√	5.4	6.5	
10	Ambient temperature measurement device	√	√	5.5	6.6	
11	Parameters input device	√	√	5.6	6.7	
12	Resistance value measurement device	√	√	5.7	6.8	
13	Display screen	√	√	5.8	6.9	
14	Data transmission interface	√	√	5.9	6.10	
15	Output voltage, current	√	√	5.10	6.11.1	
16	Soft start time	√	√	5.10	6.11.1	
17	Fusion time	√	√	5.10	6.11.2	
18	Output energy	—	—	5.10	6.11.3	
19	Power overload protection	—	√	5.10	6.11.4	
20	Ambient temperature automatic compensation function	√	√	5.11	6.12	
21	Process control	Output circuit on-off check	√	√	5.12.1	6.13.1
22		Fusion process parameters input, modification	—	√	5.12.2	6.13.2

Table 2 (continued)

Serial number	Inspection items		Ex-factory inspection	Type inspection	Technical requirements chapter number	Test method chapter number
23	Process control	Interface display	-		5.12.3	6.13.3
24		Memory capacity	-	√	5.12.4	6.13.4
25	Monitoring alarm	Input parameters error	-	√	5.13.1	6.14.1
26		Ambient operating temperature overrange	√	√	5.13.2	6.14.2
27		Output voltage or current value is out of range for too long	-	√	5.13.3	6.14.3
28		Output circuit interrupt	-	√	5.13.4	6.14.4
29		Output circuit short circuit	-	√	5.13.5	6.14.5
30		Input power interrupt during welding	-	√	5.13.6	6.14.6
31		Input voltage and power supply frequency are out of range for too long	-	√	5.13.7	6.14.7
32		Memory capacity limit	-		5.13.8	6.14.8
33	Input power		√	√	5.14	6.15
34	Sophisticated test		√	√	5.15	6.16
35	Mechanical behavior	Impact performance	-	√	5.16.1	6.17.1
36		Vibration performance	-	√	5.16.2	6.17.2

Note: √ in the table indicates the mandatory item, - indicates the optional item.

7.1.3 Type Inspection

7.1.3.1 Type inspection item

Items of type inspection are specified in Table 2.

After the product is put into production, type inspection must be carried out within half a year.

Type inspection shall be still carried out in case of any of the following cases:

- a) Trial-produce stereotyping identification when a new or an old products manufactured by another factories;
- b) After running normally, under the condition of some factors affecting the performance of the product, such as the product structure, material and process;
- c) A product needs to be recovery after it shut down for a long time;
- d) When there is a big difference between the ex-factory inspection results and the last stereotyping inspection results;
- e) When the state quality supervision authority puts forward the requirements for type inspection;
- f) When the user requests a type inspection.

7.1.3.2 Type inspection judgment

Product samples and additional provided components shall be judged according to the requirements shown in Clause 5. If one of the items does not meet the requirements, a double quantity products or components shall be random check from the same type of products, and the same inspection shall be inspected once again. If the item is still unqualified, the type inspection is judged unqualified.

7.2 Sampling

Except for the test on the relevant items that need to be done on the additional provided components, the other test items shall be carried out on the same prototype and pass the requirements of all test items. If the prototype need to be disassembled to do the relevant test, another prototype can be supplied.

8 Sign, packaging, transportation and storage

8.1 Sign

8.1.1 The electrofusion welding machine shall mark and provide the necessary information technology documents.

8.1.2 The electrofusion welding machine shall clearly mark the following identification information in the appropriate position:

- a) The name and/or trademark of the manufacturer;
- b) Electrofusion welding machine type;

- c) Electrofusion welding machine number;
- d) Production time;
- e) Level;
- f) Input voltage;
- g) Input frequency;
- h) Output power (single value);
- i) Monitor the alarm table.

8.1.3 The manufacturer shall provide technical documentation including the following information:

- a) The level of the electrofusion welding machine;
- b) At the rated voltage with the load duty cycle of 100 %, 60 % and 30 %, load duty cycle - output power relationship graph (see Annex A);
- c) Soft start time;
- d) Ambient temperature compensation;
- e) Description of the fusion data recording device.

8.2 Packaging

8.2.1 The electrofusion welding machine may be packaged in wooden boxes, which shall be able to keep it firmly fixed and prevent damage during transportation.

8.2.2 Documents to be attached to the packing case: product certificate, product instructions, packing list, and list of spare parts and accessories.

8.3 Transportation

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

The electrofusion welding machine shall be easy to calibrate and maintain. It shall be suitable for field safety construction and minimize as far as possible the corrosion and mechanical damage during field transportation or convey to avoid damaging the performance of electrofusion welding machine.

The control panel of the electrofusion welding machine (such as buttons and display panels) shall be protected from collision damage during transportation.

8.4 Storage

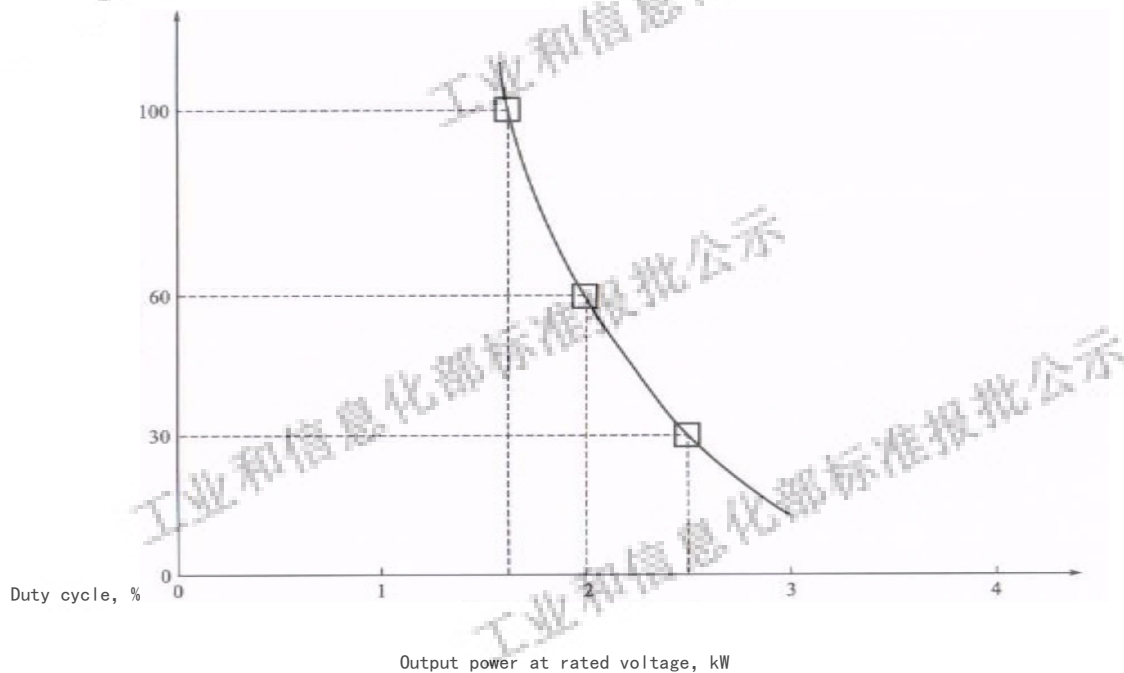
The electrofusion welding machine shall be stored indoors with a ventilated, dry, no erosion gas atmosphere.

Annex A

(Informative annex)

Duty cycle

The duty cycle – output power relationship graph at rated voltage see in Figure A. 1.



Description:

Different output power and load duty cycle (output power curve corresponding to 30 %-100 % load duty cycle at rated output voltage) have the following relationship:

—For an electrofusion welding machine with an output power of not more than 2 kW, the control cycle is 10 min, the duty cycle is 60 %, and the load time t_1 is 6 min;

—For an electrofusion welding machine with an output power more than 2 kW, the control cycle is 15 minutes, the duty cycle is 60 %, and the load time t_1 is 9 min.

Figure A.1 — The duty cycle – output power relationship graph at rated voltage