

JIS

JAPANESE INDUSTRIAL STANDARD

**Recommended practice
for friction welding
of carbon steel**

JIS Z 3607—1994

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Recommended practice for friction
welding of carbon steel

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1. Scope This Japanese Industrial Standard specifies the standard working procedures at the time of friction welding applied by means of braking method friction welding to the forged and rolled carbon steel of the carbon content not more than 0.50 %.

Remarks: The following standard is cited in this Standard:

JIS Z 3001 Welding terms

2. Definitions For the main terms used in this Standard, the definitions in JIS Z 3001 apply, and the rest of the terms are as follows:

- (1) base material connecting surface One surface making a joint and the surface of base material to which the joint is to be friction-welded. It is used to indicate the surface to be friction-welded.
- (2) upset timing Relation in terms of time between the brake starting signal and the upset force additional signal in the control of friction welding machine. The case where, making the brake starting signal the reference and after sending this signal, the upset force additional signal is sent, is indicated as the positive time.
- (3) sequence control The control system that sends the speed reduction starting signal when a specified time has lapsed from the time of contact of base material.
- (4) dimension control The system that controls the speed reduction starting signal by the change of length of base material.

Consisting of two systems of burn-off length control and total length control.

- (5) burn-off length control The control system that sends the speed reduction starting signal when the sum of preheated length (almost zero in usual) and burn-off length has come to the specified value.
- (6) total length control The control system that sends the speed reduction starting signal when the total length of both base materials has come to the specified length in the process of friction, without regard to the length of base materials.
- (7) burr The extrusion of base material arising at the zone of friction welding.

3. Friction welding machine The friction welding machine shall be as follows:

3.1 Rigidity of friction welding machine The friction welding machine shall have the rigidity enough to avoid the harmful bending deformation resulted from the load of pressure welding force in friction welding and the harmful torsional deformation and torsional vibration caused by the friction torque arising at the time of friction.

3.2 Grasping device of friction welding machine The grasping device of friction welding machine consisting of chuck (on the rotation side) and clamp (on the non-rotationary side) shall not make the grasped base material slip by the load of friction torque and pressure welding force in the device.

The grasping device is also required to be free from run-out of chuck, displacement between centers of chuck and clamp and bend of chuck center line and clamp center line likely to affect the items required for the joint.

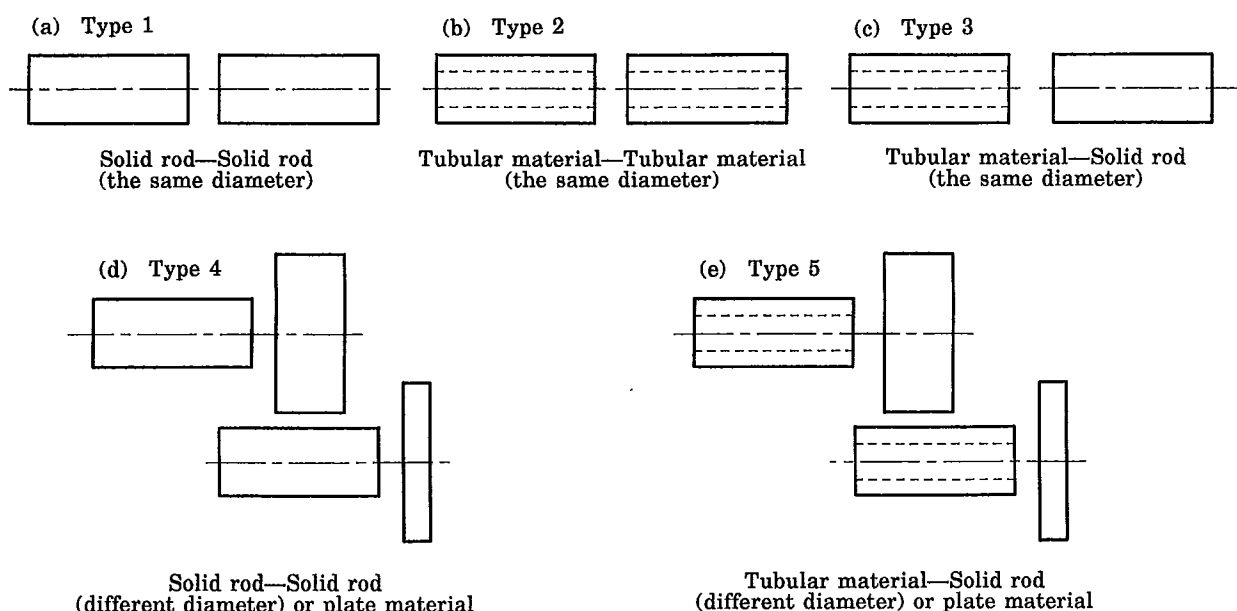
3.3 Thrust of friction welding machine The friction welding machine shall have the regulation range capable of realizing every thrusting force calculated in accordance with 5.1 (1) to (3).

Attention shall be paid to the thrust regulation methods different according to the friction welding machines.

4. Base materials

4.1 Types of joint The types of joint shall be divided into five kinds of basic types shown in Fig. 1.

Fig. 1. Basic joint types



4.2 State of base material connecting surface

4.2.1 Inclination of base material connecting surface The base material connecting surface, which is desirable to be perpendicular to the rotation axis, as a rule, is allowed to be inclined if the inclination of the connecting surface of base material in each type of joint is within the limit shown in Fig. 2.

Even if the inclination exceeds this extent, it is allowed to be as it is provided that the inclination like this can satisfy the items required for joint by the test friction welding.