# INTERNATIONAL STANDARD

# ISO 669

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# Resistance welding — Resistance welding equipment — Mechanical and electrical requirements

*Soudage par résistance — Matériel de soudage par résistance — Exigences mécaniques et électriques*



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ISO 669:2000(E)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 669 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 6, *Resistance welding*.

This second edition cancels and replaces the first edition (ISO 669:1981), which has been technically revised.

Annex A forms a normative part of this International Standard. Annex B is for information only.

# Resistance welding — Resistance welding equipment — Mechanical and electrical requirements

## 1 Scope

This International Standard applies to resistance welding equipment, to guns with inbuilt transformers and to complete movable welding equipment.

The following types are included:

— single-phase equipment with alternating welding current;

— single-phase equipment with rectified welding current by rectification of the output of the welding transformer;

— single-phase equipment with inverter welding transformer;

— three-phase equipment with rectified welding current by rectification of the output of the welding transformer;

— three-phase equipment with a current rectification in the input of the welding transformer (sometimes called frequency convertor);

— three-phase equipment with inverter welding transformers.



This International Standard applies neither to welding transformers sold separately nor to safety requirements.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 865:1981, *Slots in platens for projection welding machines.*

ISO 5183-1:1998, *Resistance welding equipment — Electrode adaptors, male taper 1:10 — Part 1: Conical fixing, taper 1:10.*

ISO 5183-2:1988, *Resistance spot welding — Electrode adaptors, male taper 1:10 — Part 2: Parallel shank fixing for end-thrust electrodes*.

ISO 5184:1979, *Straight resistance spot welding electrodes.*

ISO 5821:1979, *Resistance spot welding electrode caps.*

ISO 5826:1999, *Electric resistance welding — Transformers — General specifications applicable to all transformers*.

ISO 5829:1984, *Resistance spot welding — Electrode adaptors, female taper 1:10*.

ISO 5830:1984, *Resistance spot welding — Male electrode caps*.

ISO 8430-1:1988, *Resistance spot welding — Electrode holders — Part 1: Taper fixing 1:10*.

ISO 8430-2:1988, *Resistance spot welding — Electrode holders — Part 2: Morse taper fixing*.

ISO 8430-3:1988, *Resistance spot welding — Electrode holders — Part 3: Parallel shank fixing for end thrust*.

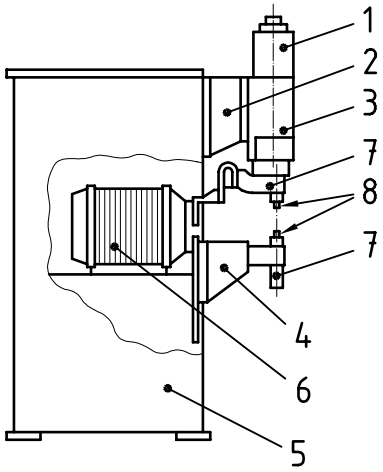
IEC 60051-2:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 2: Special requirements for amperemeters and voltmeters.*

IEC 60204-1:1992, *Electrical equipment of industrial machines — Part 1: General requirements.*

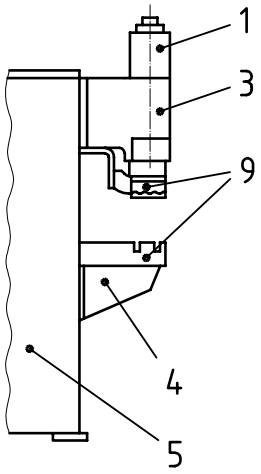
## 3 Terms and definitions

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

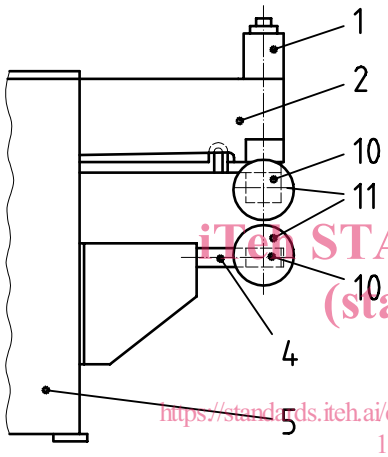
### 3.1 Mechanical parts of spot, projection and seam welding equipment



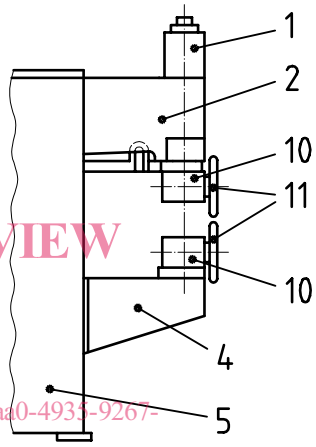

**a) spot welding equipment**




**b) projection welding equipment**




longitudinal seam welding equipment




transverse seam welding equipment

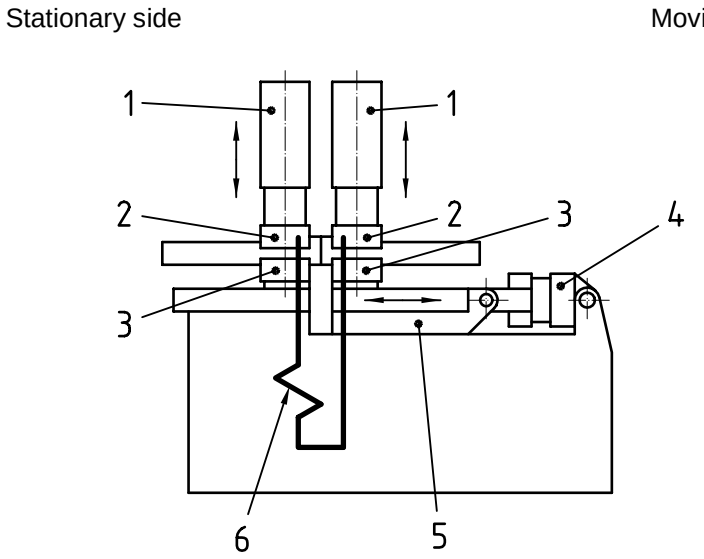
**c) seam welding equipment**



**Key**

| | | | | | |
|---|---|---|---|---|---|
| 1 | Force generation system | 5 | Frame | 9 | Platen |
| 2 | Upper arm | 6 | Transformer | 10 | Wheel head |
| 3 | Welding head | 7 | Electrode holder | 11 | Electrode wheel |
| 4 | Lower arm | 8 | Electrode | | |

**Figure 1 — Elements of spot, projection and seam welding equipment**

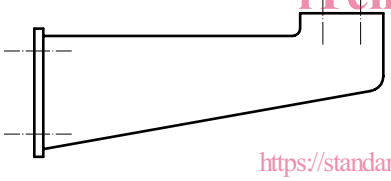



**Key**

| | | | | | |
|---|---|---|---|---|---|
| 1 | Clamping device | 3 | Current-currying clamping die | 5 | Slide |
| 2 | Clamping die | 4 | Slide drive | 6 | Welding transformer |

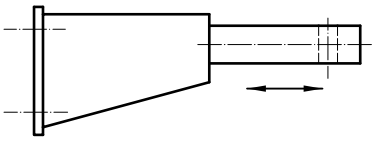
**Figure 2 — Elements of butt welding equipment**



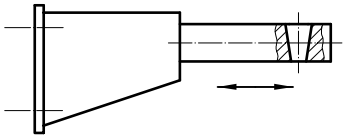


a) not adjustable



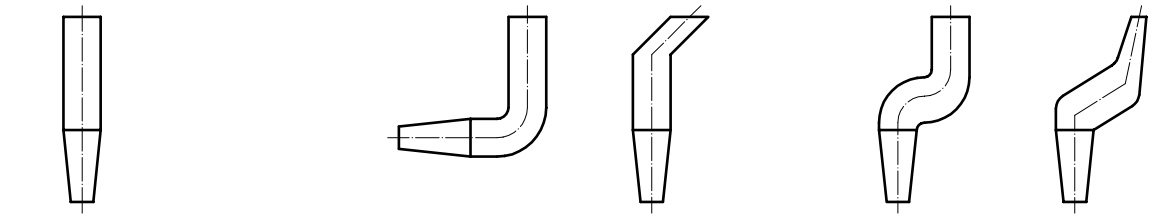


b) adjustable with mounting for an electrode holder



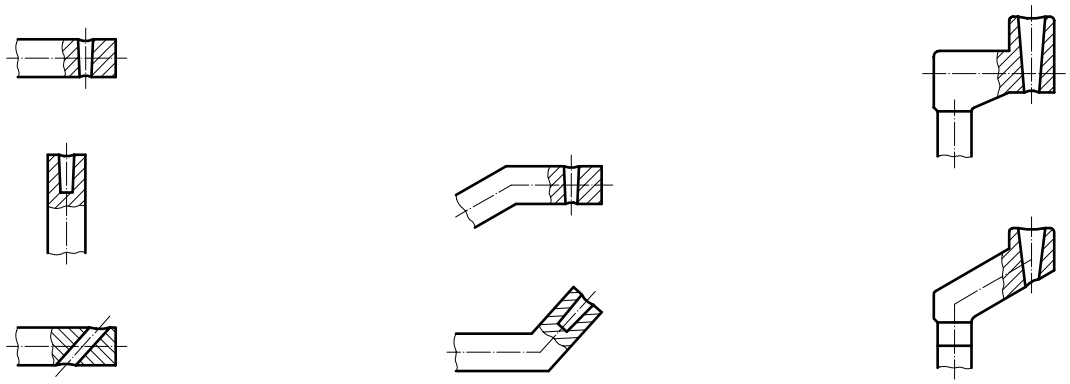
c) adjustable for mounting for a spot welding electrode

**Figure 3 — Arms (lower arms)**



**a) straight** **b) bent** **c) cranked**

**Figure 4 — Spot welding electrodes with male taper at mounting end and flat tip**



a) straight b) bent c) cranked

**Figure 5 — Electrode holders with female taper for spot welding electrodes (fluid cooling is not illustrated)**

**3.1.1**
**arm**
device that transmits the electrode force and conducts the welding current or supports a separate conductor

See Figures 1 and 3.

**3.1.2**
**welding head**
device comprising the force generation and guiding system carrying an electrode holder, platen or electrode wheel head mounted to the upper arm or directly to the machine body



See Figure 1.



**3.1.3**
**electrode holder**
device holding a spot welding electrode or an electrode adaptor 5

[ISO 8430-1, ISO 8340-2 and ISO 8340-3]

See Figures 1 and 5.

**3.1.4**
**spot welding electrode**
electrode designed for spot welding

[ISO 5184]

See Figures 1 and 4.

**3.1.5**
**electrode adaptor**
device holding an electrode cap by means of male or female taper

[ISO 5183-1, ISO 5183-2 and ISO 5829]

**3.1.6**
**electrode cap**
replaceable working end of the spot welding electrode mounted on the electrode adaptor by means of its female or male taper

[ISO 5821 and ISO 5830]

**3.1.7**
**platen**
device normally having tee slots and carrying projection welding electrodes or welding tools

[ISO 865]

See Figure 1.

**3.1.8**
**electrode wheel head**
device comprising an electrode wheel bearing and mounted on the upper and lower arm for longitudinal and/or transversal seam welding

See Figure 1.

**3.1.9**
**electrode wheel bearing**
device guiding the electrode wheel for force transfer and mostly for current transfer

**3.1.10**
**electrode wheel**
electrode as a rotating disc

See Figure 1.

NOTE This device may be driven by a motor or moved by the workpiece (idler wheels). The driver may be direct to the electrode shaft or to its circumference (knurl drive), see Figure 6.



**3.1.11**
**electrode wheel profile**
form of the electrode wheel being single or double sided bevelled, or radiused depending on the welding conditions and access



See Figure 7.

**3.1.12**
**electrode wheel speed**
⟨direct drive⟩ the speed of rotation $n$

**3.1.13**
**electrode wheel speed**
⟨knurl drive⟩ the tangential speed $v$

**3.1.14**
**throat gap**
$e$
⟨spot and seam welding equipment⟩ usable distance between the arms or the outer current-conducting parts of the welding circuit

See Figure 8.

**3.1.15**
**throat gap**
$e$
⟨projection welding equipment⟩ clamping distance between the platens

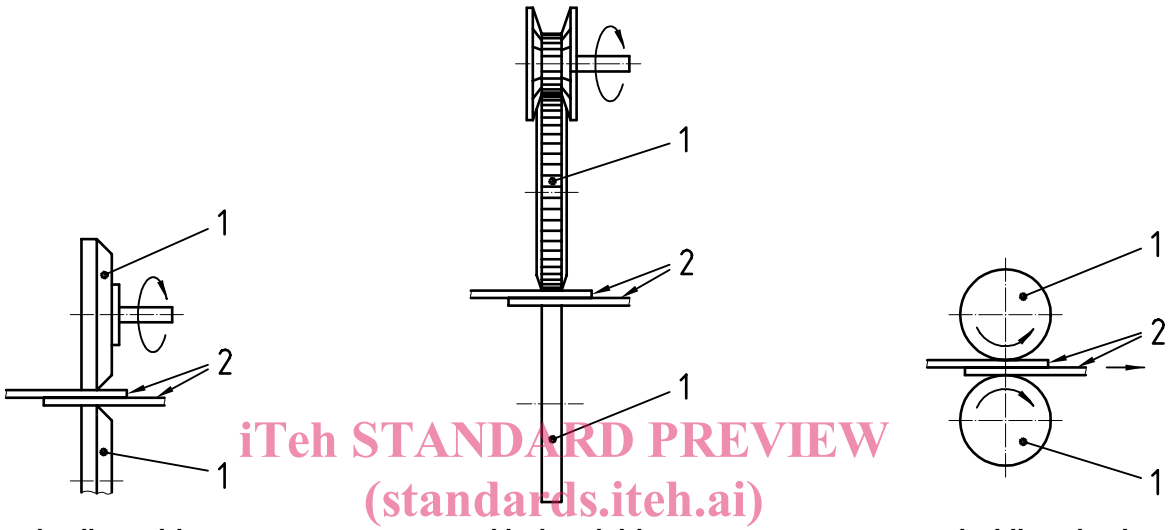
See Figure 8.

NOTE See also die distance, $e$, 3.2.11.

**3.1.16**
**throat depth**
*l*
usable distance from the centre of the platens or the axes of the electrodes or, in the case of oblique electrodes, the point of intersection of the electrode axes in the working position or the contact line of electrode wheels and that part of the equipment body located closest to it

See Figure 8.

NOTE This definition does not consider any offset of the electrode tips.

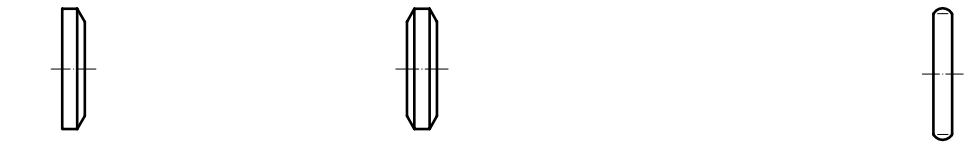



**a) direct drive** **b) knurl drive** **c) idler wheels**



**Key**
1 Electrode wheel
2 Components to be welded

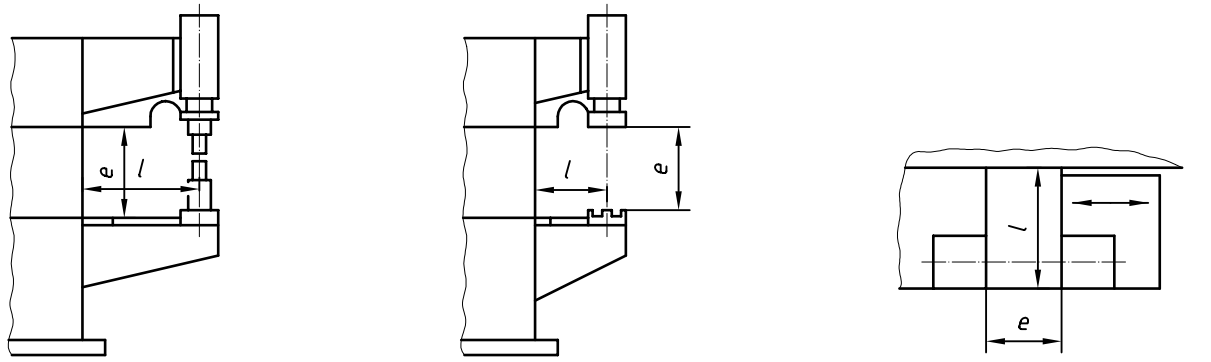
**Figure 6 — Drive types of electrode wheels**



single sided double sided

**a) bevel** **b) radiused**

**Figure 7 — Profiles of electrode wheel**




**a) spot welding equipment** **b) projection welding equipment** **c) butt welding equipment** (top view)

**Figure 8 — Main dimensions**

**3.1.17**
**electrode stroke**
*c*
physical displacement of electrodes during process function

NOTE 1 When the electrode is attached to the driving cylinder, the stroke of both the electrode and the driving cylinder, is equal.



NOTE 2 When the moving electrode is attached to a hinged lever moved by a driving cylinder, the maximum stroke of the electrode, by convention, equals the length of the chord of the arc generated by the tip of the moving electrode for the full stroke of the driving cylinder.



NOTE 3 The stroke of the electrode may be composed of a "work clearance stroke" without any contact, facilitating the introduction of the workpiece between the electrodes and a smaller "working stroke".

**3.1.18**
**electrode force**
*F*
force to the workpiece transmitted by the electrodes

**3.1.19**
**maximum electrode force**
$F_{max}$
maximum electrode force, which can be generated by the welding equipment without permament damage to its mechanical parts

**3.1.20**
**minimum electrode force**
$F_{min}$
minimum electrode force which can be used for proper functionning of the welding equipment

## 3.2 Mechanical parts of butt welding equipment

**3.2.1**
**slide drive**
drive generating and transferring the movements and upset forces necessary for welding to a workpiece located in the clamping device

NOTE For flash welding the drive may be required to reciprocate the slide for preheating by following the flashing movement and to provide the upset force.

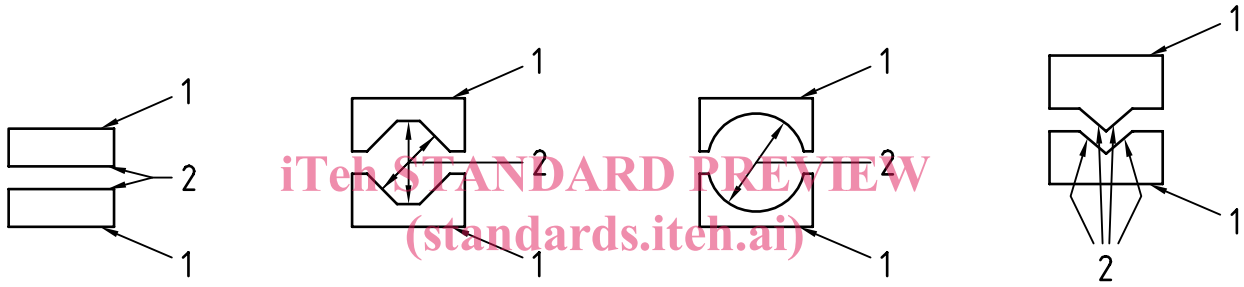
**3.2.2**
**clamping device**
device generating the contact force necessary for current flow and providing the clamping force necessary to withstand the upset force if no supplementary clamping devices or backstops exist

**3.2.3**
**supplementary clamping device**
non-current-carrying device to provide the clamping force necessary to resist the upset force

**3.2.4**
**backstop**
device to support the total or a part of the upsetting force to a workpiece in order to prevent a workpiece from sliding during upsetting

**3.2.5**
**clamping die**
device designed to transfer all forces to the workpiece in contacting with its clamping face

See Figure 9.




**flat** **prism** **cylindrical** **profile**



**Key**

1 Mounting or support face

2 Contact and/or clamping face

**Figure 9 — Types of clamping dies**
(illustrated in upsetting direction)

**3.2.6**
**die length**
$G$
usable length of a clamping die in the upsetting direction

See Figure 10.

**3.2.7**
**die width**
$W$
usable width of a clamping die perpendicular to the upsetting and clamping direction

See Figure 10.

**3.2.8**
**die thickness**
$\delta$
dimension in the clamping direction

See Figure 10.