

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 700

RATING OF MANUAL ARC WELDING EQUIPMENT

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BRIEF HISTORY

The ISO Recommendation R 700, *Rating of manual arc welding equipment*, was drawn up by Technical Committee ISO/TC 44, *Welding*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question by the Technical Committee began in 1957 and led, in 1965, to the adoption of a Draft ISO Recommendation.

In May 1966, this Draft ISO Recommendation (No. 973) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Ireland	Sweden
Belgium	Israel	Switzerland
Brazil	Japan	Turkey
Chile	Korea, Rep. of	U.A.R.
Czechoslovakia	Norway	United Kingdom
Denmark	Poland	U.S.S.R.
France	Romania	Yugoslavia
Germany	South Africa,	
Hungary	Rep. of	
India	Spain	

Five Member Bodies opposed the approval of the Draft :

Canada
Finland
Netherlands
Portugal
U.S.A.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in March 1968, to accept it as an ISO RECOMMENDATION.

RATING OF MANUAL ARC WELDING EQUIPMENT *

PART I

GENERAL

1. SCOPE

This ISO Recommendation applies to the following most commonly used types of welding equipment for manual arc welding :

- (a) single operator arc welding generators with drooping characteristics and with associated driving equipment (except internal combustion engines);
- (b) single operator arc welding transformer equipment, with drooping characteristics.

It specifies the *minimum* requirements for establishing a common basis for the rating of such equipment.

NOTE. — Welding apparatus with a drooping characteristic is defined as apparatus having an external static characteristic (see clause 2.8) which, in its normal operating region, is such that the voltage decreases as the current increases.

This ISO Recommendation applies to equipment for use under the following conditions :

- (a) *Altitude*. In the absence of any information in regard to height above sea level at which the equipment is intended to work in ordinary service, the altitude is assumed not to exceed 1000 m (3300 ft).
- (b) *Temperature of the cooling medium*. In the absence of any information to the contrary, it is assumed that, in the case of air cooled equipment, none of the following temperature limits is exceeded :
 - maximum ambient air temperature 40 °C
 - daily average ambient air temperature 30 °C
 - yearly average ambient air temperature 20 °C

2. DEFINITIONS**

- 2.1 *Operating conditions*. All quantities defining the performance of a machine, an appliance or network.
- 2.2 *Rated*. Qualifying term applied to a quantity which is used in the specification of the welding equipment.

* For the purposes of this ISO Recommendation, "manual arc welding" implies a reference maximum duty cycle of 60 %.

** All electrical quantities specified in the definitions are those obtained under steady conditions.

- 2.3 *Duty.* A schedule of the loads on a machine or apparatus taking account of their respective duration and sequence.
- 2.4 *Periodic duty.* A duty which is repeated periodically.
- 2.5 *Duty cycle.* The ratio of the duration of operation under load to the duration of the complete cycle. This ratio, lying between 0 and 1, may be expressed as a percentage.

NOTES

1. The duty considered in this ISO Recommendation is periodic duty comprising a certain period of operation on constant load followed by a certain period of no-load operation; this represents the usual conditions obtained during welding.
 2. In English, the term "duty factor", as used in the ISO and IEC definitions, and the term "duty cycle" are synonymous.
- 2.6 *Conventional welding current.* Current delivered by a welding machine on a practically non-inductive resistance load.
- 2.7 *Load voltage.* The voltage between the output terminals of a welding machine, i.e. those to which the electrode and return leads are connected, when a specified current is flowing through a non-inductive resistance load.
- 2.8 *Conventional load voltage.* The voltage, at the output terminals of a welding machine, bearing a linear relationship to the conventional welding current such that it is
- 20 volts at 0 ampere
44 volts at 600 amperes
- i.e. such that the voltage is $(20 \pm 0.04 I)$ volts
where I is the numerical value of conventional welding current in amperes.
- For currents above 600 amperes, the voltage should remain constant at 44 volts.
- 2.9 *Conventional operating welding conditions.* Operating conditions defined by a conventional welding current and the corresponding conventional load voltage.
- 2.10 *Conventional welding duty.* A periodic duty with a duty cycle of 0.6 comprising cycles of 5 minutes duration, a complete cycle consisting of a period of 3 minutes under the conventional operating welding conditions followed by a period of 2 minutes of no-load operation.
- 2.11 *Rated welding current.* The maximum value of the conventional welding current at the conventional load voltage at which the machine meets the requirements of this ISO Recommendation when operated at the conventional welding duty.
- 2.12 *Rated short-circuit current.* The current obtained at the maximum setting of the welding apparatus when operating with a length of cable having a resistance as specified in Table 1 below, the cross-sectional area of the cable being that used in welding practice for the rated current.

TABLE 1 – Resistance corresponding to rated welding current

Rated welding current in amperes		Resistance in ohms
over	up to and including	
–	125	0.013
125	160	0.0070
160	200	0.0050
200	250	0.0040
250	315	0.0030
315	400	0.0020
400	500	0.0015
500	630	0.0012

NOTE. – A tolerance of $\pm 10\%$ should be allowed on the values of resistance.

2.13 *Rated maximum current.* The maximum value of the current which can be obtained at the conventional load voltage for the maximum setting.

2.14 *Duty at rated maximum current.* The periodic duty related to the rated maximum current which corresponds to a duty cycle within the permitted heating limitations, and a cycle duration which is the same as that for the conventional welding duty.

2.15 *No-load voltage.* The voltage between the output terminals of a welding machine when the external circuit is open.

NOTE. – This definition applies generally where the welding machine is not fitted with a device for providing a lower open-circuit voltage. If the machine does have such a device, the no-load voltage defined above appears at the output terminals immediately before the action of the time relays whose action is to effect a reduction in the voltage when the welding circuit is open.

3. PRINCIPLE OF HEATING TESTS

The load should be a non-inductive resistance, and at a voltage equal to the appropriate conventional load voltage. A tolerance of $\pm 10\%$ should be allowed on the value of the conventional load voltage.

Two tests should be made as follows :

- (a) with rated welding current as defined in clause 2.11 and at the duty cycle of 0.6;
- (b) with the rated maximum current as defined in clause 2.13 and at a duty cycle as defined in clause 2.14.

Test (b) may follow test (a) without the equipment returning to ambient temperature.

In the case of welding equipment with circuits which carry heavier current under no-load conditions, an additional heating test should be carried out under no-load conditions and should immediately follow test (a) or (b) without the equipment returning to ambient temperature.