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STANDARD

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**Water-cooled secondary connection cables  
for resistance welding —**

**Part 2:**

Dimensions and requirements for  
single-conductor connection cables

ISO 8205-2:1993

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*Câbles secondaires refroidis par eau pour le soudage par résistance —  
Partie 2: Dimensions et prescriptions pour câbles à un conducteur*

INTERNATIONAL

ISO



Reference number  
ISO 8205-2:1993(E)

## 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.

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.

International Standard ISO 8205-2 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 6, *Resistance welding*.

ISO 8205 consists of the following parts, under the general title *Water-cooled secondary connection cables for resistance welding*:

- Part 1: *Dimensions and requirements for double-conductor connection cables*
- Part 2: *Dimensions and requirements for single-conductor connection cables*
- Part 3: *Test requirements*

Annex A of this part of ISO 8205 is for information only.

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# Water-cooled secondary connection cables for resistance welding —

## Part 2:

## Dimensions and requirements for single-conductor connection cables

### 1 Scope

This part of ISO 8205 specifies the dimensions of single-conductor connection cables used for resistance welding and allied processes. It stipulates the requirements regarding the electrical, mechanical and cooling characteristics of these cables and their conditions of use.

Annex A gives additional information when colour coding of the cables is intended.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8205. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8205 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 128:1982, *Technical drawings — General principles of presentation*.

ISO 8205-1:1993, *Water-cooled secondary connection cables for resistance welding — Part 1: Dimensions*

and requirements for double-conductor connection cables.

ISO 8205-3:1993, *Water-cooled secondary connection cables for resistance welding — Part 3: Test requirements*.

### 3 Definition

For the purposes of this part of ISO 8205, the following definition applies.

**3.1 single-conductor connection cable:** Cable comprising one conductor providing an electrical link between the secondary terminals of a welding transformer and the welding set (manual or robotized guns).

### 4 Classification

Single-conductor water-cooled connection cables are classified into two types, C and D, according to the form of the end lugs (see figure 1 and table 1).

### 5 Dimensions

#### 5.1 Cross-sectional area

The effective cross-sectional area of copper shall be one of the following:

160 mm<sup>2</sup> - 200 mm<sup>2</sup> - 250 mm<sup>2</sup> - 315 mm<sup>2</sup>

**5.2 Length**

The length  $L$ , as shown in figure 1, shall be one of the following (non-preferred lengths are given in parentheses):

- 500 mm - 630 mm - 800 mm - 1 000 mm -
- 1 250 mm - 1 600 mm - (1 800 mm) - 2 000 mm
- (2 240 mm) - 2 500 mm - (2 800 mm) -
- 3 150 mm - (3 550 mm) - 4 000 mm

The length shall have a tolerance of  $+1_0\%$ .

**5.3 End lugs**

The end lugs shall have the dimensions given in figure 1 and table 1.

**6 Designation**

The designation for single-conductor connection cables which comply with the requirements of this part

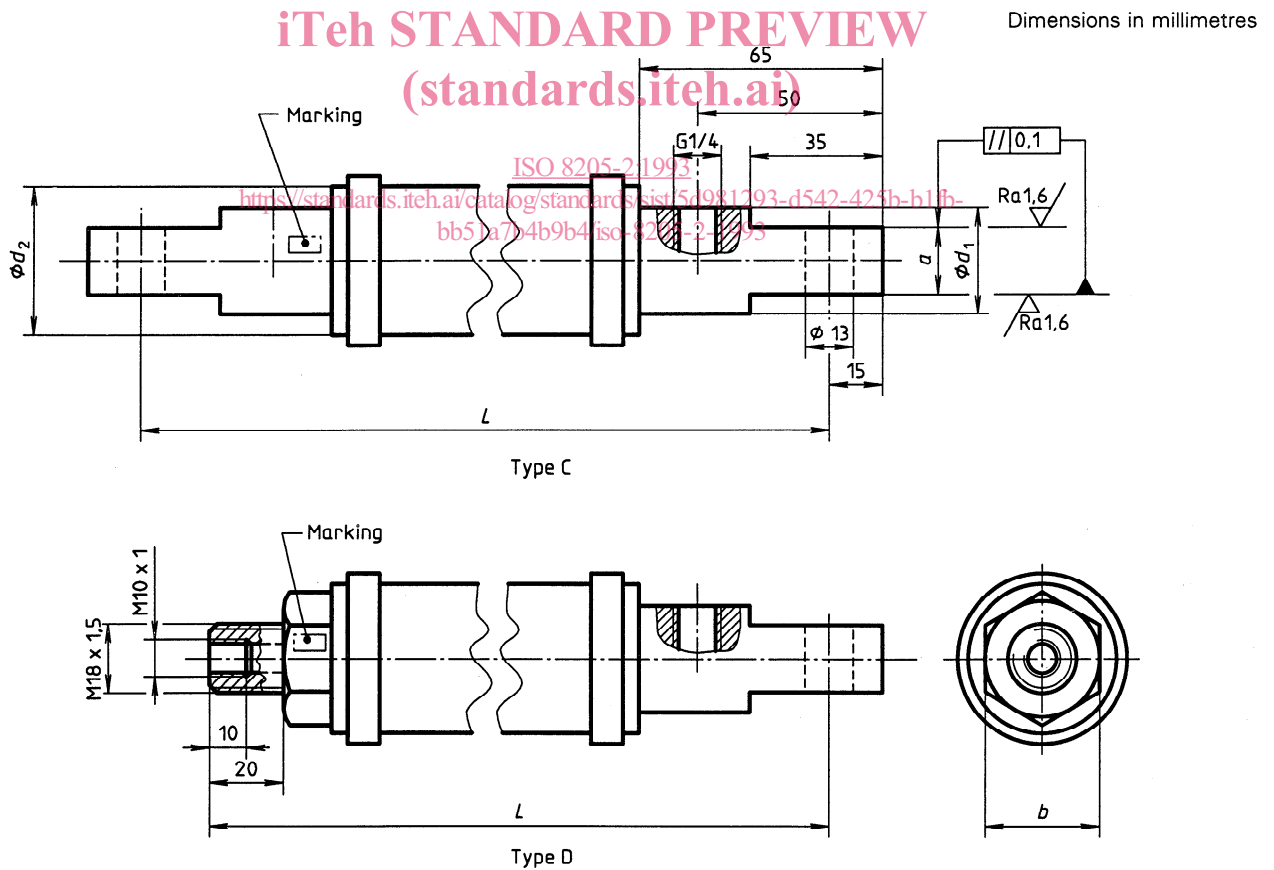
of ISO 8205 shall comprise the following information in the order given:

- a) the description block (i.e. "single-conductor connection cable");
- b) reference to this part of ISO 8205;
- c) the type of connection cable (i.e. C or D);
- d) the cross-sectional area of the cable, expressed in square millimetres;
- e) the length, in millimetres.

EXAMPLE

A type C single-conductor connection cable having a cross-sectional area of 200 mm<sup>2</sup> and a length of 2 500 mm is designated as follows:

**Single-conductor connection cable ISO 8205-2 - C - 200 - 2 500**



**Figure 1 — End lug**

Table 1 — Dimensions

Cross-sectional area	$\varnothing a$	$b$	$\varnothing d_1$	$\varnothing d_2$
mm <sup>2</sup>	mm	mm	mm	mm
160	15	27	25	35
200	15	27	25	35
250	18	30	28	40
315	18	32	32	42

## 7 Materials

The choice of the materials is at the discretion of the manufacturer.

The insulating covering shall be undamaged. In addition, it shall not contain any components which give off toxic gases on burning and shall withstand a maximum temperature of 100 °C without damage.

## 8 Requirements

### 8.1 Electrical characteristics

The electrical characteristics are given as theoretical figures as a function of cross-sectional areas and lengths. The values are only given to calculate the permissible welding current and the voltage drop in the cable, they are not acceptance values.

#### 8.1.1 Permanent current

The values for the permanent current  $I_{2p}$  are given in table 2. The secondary current  $I_x$  at a given duty factor  $X$  may be calculated from

$$I_x = I_{2p} \sqrt{\frac{100}{X}}$$

It shall be taken into consideration that the figures have to be reduced if parasitic heating occurs or other influences require it.

#### 8.1.2 Resistance

Resistance values are given in table 3.

It shall be taken into consideration that, in practice, the values are higher depending on manufacturer and material.

Table 2 — Permanent current  $I_{2p}$ 

Current values in amperes

Length mm	Cross-sectional area mm <sup>2</sup>			
	160	200	250	315
500	14 000	16 000	18 000	20 000
630	12 500	14 000	16 000	18 000
800	11 200	12 500	14 000	16 000
1 000	10 000	11 200	12 500	14 000
1 250	9 000	10 000	11 200	12 500
1 600	8 000	9 000	10 000	11 200
(1 800)	7 500	8 500	9 500	10 600
2 000	7 100	8 000	9 000	10 000
(2 240)	6 700	7 500	8 500	9 500
2 500	6 300	7 100	8 000	9 000
(2 800)	6 000	6 700	7 600	8 500
3 150	5 600	6 300	7 100	8 000
(3 550)	5 300	6 000	6 700	7 500
4 000	5 000	5 600	6 300	7 100

NOTE — The values have been calculated with a water flow of 4 l/min, with an inlet temperature of 30 °C and an outlet temperature of 70 °C.

### 8.2 Mechanical characteristics

#### 8.2.1 Radius of curvature of ends

With the tests carried out as described in ISO 8205-3:1993, subclause 3.3, the radius of curvature shall be equal to or less than 300 mm (in view of the information given in ISO 8205-3:1993, subclause 3.3.3).

### 8.3 Cooling

A minimum flow through the cable of 4 l/min of water shall be obtained with a maximum pressure differential at the cable ends of 70 kPa (0,7 bar), and with a 300 mm radius of curvature applied at any point along the connection cable.

**Table 3 — Resistance,  $R_{30}$**   
Resistance values in microohms

Length mm	Cross-sectional area mm <sup>2</sup>			
	160	200	250	315
500	63	50	40	32
630	80	63	50	40
800	100	80	63	50
1000	125	100	80	63
1 250	160	125	100	80
1 600	200	160	125	100
(1 800)	224	180	140	112
2 000	250	200	160	125
(2 240)	280	224	180	140
2 500	315	250	200	160
(2 800)	355	280	224	180
3 150	400	315	250	200
(3 550)	450	355	280	224
4 000	500	400	315	250

NOTE — The values have been calculated with  $\rho = 0,018\ 5\ \Omega \cdot \text{mm}^2/\text{m} + 10\ \%$  and are rounded to the next preferred numbers.

## 9 Marking

Single-conductor connection cables which comply with the requirements of this part of ISO 8205 shall be marked indelibly on the end lug of one terminal, with the designation stipulated in clause 6, but excluding the description block and the reference to this part of ISO 8205, i.e.

### C - 200 - 2 500

The cable shall be clearly marked with the manufacturer's/supplier's name or trademark.

If colour coding is being used, connection cables shall be marked in accordance with annex A.

## 10 Delivery conditions

The cables shall be delivered with suitable protection, particularly to the end lugs and ports of the sealed cooling circuits.

## Annex A (informative)

### Colour coding

**Table A.1 — Colour for single-conductor connection cables**

Length of cable <sup>1)</sup> mm	Colour	Cross-sectional area mm <sup>2</sup>			
		160	200	250	315
		Number			
		1	2	3	4
1 600	Brown	—	≡	≡≡	≡≡≡
1 800	Red	—	≡	≡≡	≡≡≡
2 000	Orange	—	≡	≡≡	≡≡≡
2 240	Yellow	—	≡	≡≡	≡≡≡
2 500	Green	—	≡	≡≡	≡≡≡
2 800	Blue	—	≡	≡≡	≡≡≡
3 150	Violet	—	≡	≡≡	≡≡≡
3 550	Grey	—	≡	≡≡	≡≡≡
4 000	White	—	≡	≡≡	≡≡≡

1) For lengths of 500 mm, 630 mm, 800 mm, 1 000 mm and 1 250 mm, no colour coding is given.

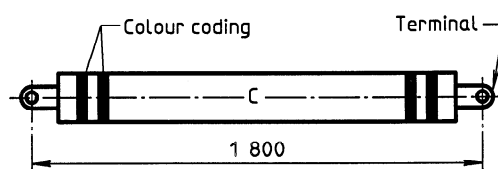
Table A.1 shall be used if colour coding is intended; in addition, the type of cable shall be given on the cover.

The colour may be applied as tape or vulcanized with the rubber cover of the cable.

It shall be possible to identify the colour marking after one year of normal use of the cable.

#### EXAMPLE

Colour coding for cable type C - 200 - 1 800.



**Figure A.1**

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**Descriptors:** welding, resistance welding, welding equipment, electric cables, single-core cables, specifications, dimensions, designation, marking, colour marking, delivery condition.

Price based on 5 pages

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