# INTERNATIONAL STANDARD

# ISO
# 8205-3

First edition
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# Water-cooled secondary connection cables for resistance welding —

## Part 3:
Test requirements

*Câbles secondaires refroidis par eau, pour le soudage par résistance —*
*Partie 3: Spécifications pour les essais*

# 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 8205-3 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Sub-Committee 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*

# Water-cooled secondary connection cables for resistance welding —

# Part 3:
## Test requirements

## 1 Scope

This part of ISO 8205 specifies test procedures for single- and double-conductor secondary connection cables used for resistance welding and allied processes. It stipulates the requirements regarding the electrical, mechanical and cooling characteristics of these cables.

## 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 8205-1:1993, *Water-cooled secondary connection cables for resistance welding — Part 1: Dimensions and requirements for double-conductor connection cables.*

ISO 8205-2:—[1], *Water-cooled secondary connection cables for resistance welding — Part 2: Dimensions and requirements for single-conductor connection cables.*

## 3 Tests

All the tests are type tests.

Figure 1 gives an example of the water supply to the cable for tests requiring this.

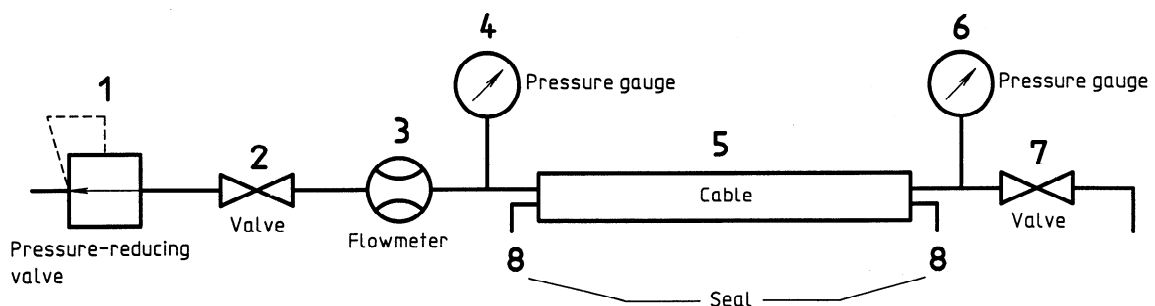When the tests are carried out, there shall be no trace of water at the various connections.



**Figure 1 — Example of water supply to the cable**

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1) To be published.

## 3.1 Leak tightness and pressure resistance of the water circuit

Supply the water circuit, sealed downstream of the cable (e.g. by closing valve 7 as shown in figure 1), under a pressure of 7,5 bar (e.g. by adjusting pressure-reducing valve 1) for 6 min.

## 3.2 Water flow

Carry out this test successively

— with the cable laid flat out straight on a horizontal surface [see figure 2 a)];

— with the cable placed on a horizontal surface but bent with a radius of curvature of 300 mm [see figure 2 b)].

With the water circulating in the cable (e.g. by opening valves 2 and 7 as shown in figure 1), adjust the pressure loss to 70 Pa (0,7 bar) for an upstream pressure equal to or greater than 1 bar.

Measure the water flow using a suitable flow transducer (item 3 as shown in figure 1).

## 3.3 Verification of flexibility at ends

Carry out this test on a low-reactance cable with a cross-sectional area of 200 mm$^2$ and length of 2 500 mm, considered to be representative of cables of the same design with a cross-sectional area or length as specified in ISO 8205-1 and ISO 8205-2.

### 3.3.1 Fixing of the cable

Fix the cable by one of its end lugs to a device fitted with horizontal and vertical graduated rules for measuring the coordinates of a point, in such a way that its other end hangs free (see figure 3).

Carry out the test for each of the two ends of the cable.

### 3.3.2 Measurements to be taken

Using the two graduated rules, measure the ordinate $y$ at each of the points A, B and C with $x$ equal to 0 mm, 150 mm and 300 mm, respectively. The origin A of the coordinates is the point of intersection of the axis of the fixing hole in the end lug with its median plane; points B and C are located on the axis of the cable (see figure 3).

### 3.3.3 Interpretation of results

Determine the arc of the circle passing through the three points A, B and C by geometrical construction. The radius of the arc shall be regarded as the radius of curvature [see figure 3 b)].

NOTE 1   If the ordinate of point C is greater than 0,30 m, the radius of curvature is regarded as being less than 0,30 m provided that the ordinate of point B is different from 0.

## 3.4 Torsion

Carry out this test on a low-reactance cable with a cross-sectional area of 200 mm$^2$ and length of 1 250 mm, regarded as being representative of cables of the same design having a cross-sectional area and length as specified in ISO 8205-1.

### 3.4.1 Test rig

See figure 4.

Suspend the cable vertically, with the end lug by which it is suspended immobilized as regards rotational and translational motion. Apply a force of 500 N ± 50 N to the lower lug of the cable by means of a rotating fork coupling and a pressure cylinder. Fill the cable with water at a pressure of 150 Pa (1,5 bar).

### 3.4.2 Measurement to be taken

Measure the torque required to effect a 180° rotation in each direction of the lower lug.

## 3.5 Measurement of insulation resistance

Measure the insulation resistance of a new dry cable following application of a d.c. voltage of 48 V for 1 min.

## 3.6 Determination of the impedance of the cable (only for cables in accordance with ISO 8205-1)

Determine the impedance of the cable at 30 °C by applying to its terminals an alternating voltage as sinusoidal as possible of frequency 50 Hz, r.m.s. value $U$ and measuring, by means of a calibrated toroid, the intensity $I$ of the current circulating in the cable. The impedance, $Z$, is then given by

$$Z = \frac{U}{I}$$

## 3.7 Determination of the resistance of the cable

Determine the resistance of the cable at 30 °C and with no water in the cable, by applying to its terminals a permanent voltage, $U$, and measuring the intensity $I$ of the current circulating in the cable. The resistance, $R$, is then given by
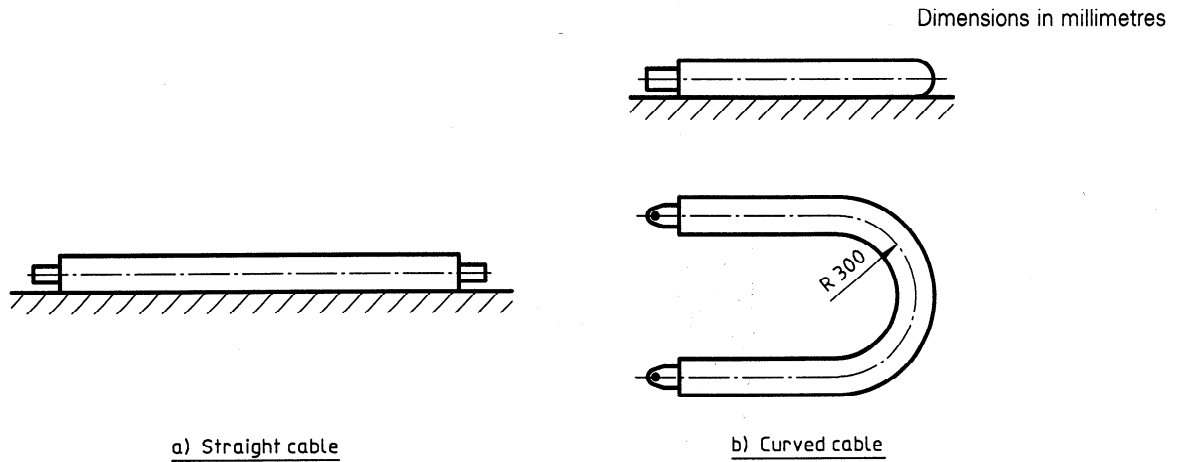
$$R = \frac{U}{I}$$

Dimensions in millimetres



a) Straight cable                    b) Curved cable

**Figure 2 — Verification of water flow**

Dimensions in millimetres



a) Test device                    b) Determination of radius of curvature
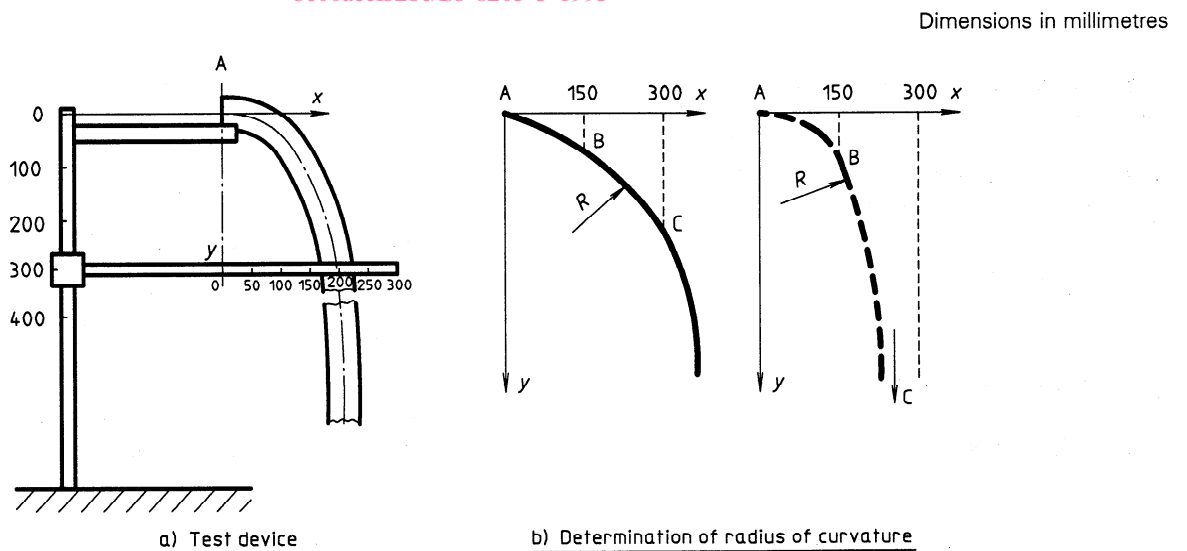
**Figure 3 — Measurement of radius of curvature**
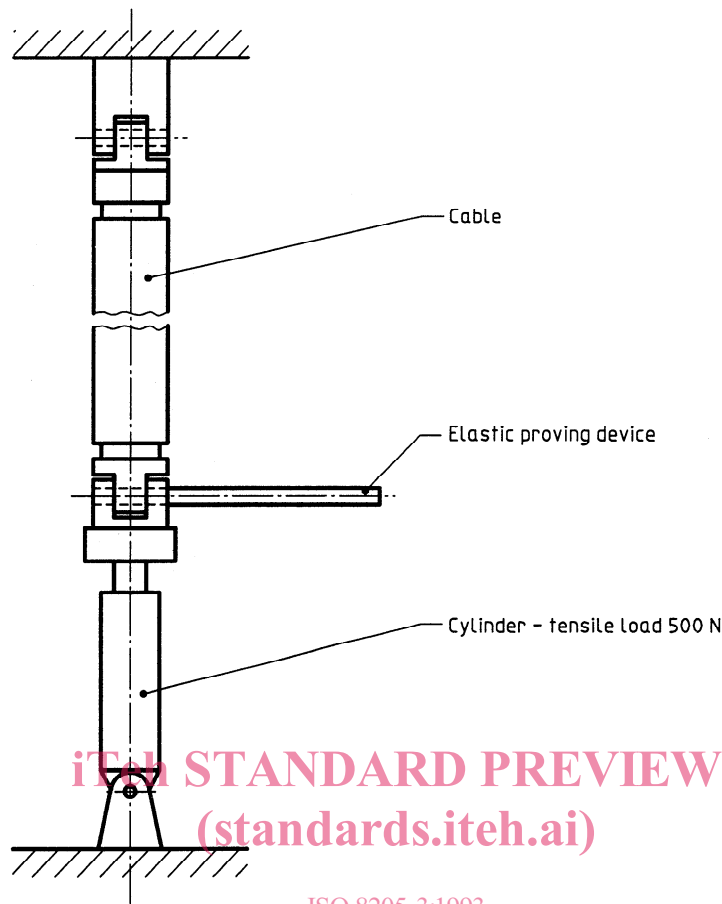
**Figure 4 — Rig for torsion test**

### 3.8 Calculation of cos $\phi$ (only for cables in accordance with ISO 8205-1)

The value of cos $\phi$ for the cable can then be calculated by using the values obtained in 3.6 and 3.7 as follows:

$$\cos \phi = \frac{R}{Z}$$

### 3.9 Endurance test

#### 3.9.1 Principle

Estimation of the life of a type of low-reactance cable and the variation in time of its resistance.

The cable is fixed to a test device which enables the displacements, tilting and twisting likely to occur in normal service to be reproduced and is supplied by a welding transformer and cooled. It is then subjected to a series of cycles comprising a fixed number of the various possible movements and pulse currents (referred to below as welding duration and current).

This type test shall be carried out on the length stated in table 1.

#### 3.9.2 Test apparatus

Figure 5 gives an example of test apparatus.

#### 3.9.3 Adjustment parameters

The test shall be carried out on a 2 500 mm long cable. The adjustment parameters given in table 1 for the various cross-sectional areas shall be used.

The cooling circuit shall be adjusted so as to obtain a pressure loss of 70 Pa (0,7 bar).

#### 3.9.4 Test cycle

Each test cycle shall have the duration specified in table 1 and shall comprise

— one forward movement of the carriage over a distance of 700 mm;

— 15 forward torsional movements over an angle of 90° followed by torsion in the opposite direction to return to the initial position;

— 10 forward tilting movements over an angle of 90° followed by tilting in the opposite direction to return to the initial position;

— 30 applications of current for the duration specified in table 1;

— one backward displacement of the carriage returning it to its initial position.

The beginning of the cycle is defined as the start of forward motion of the carriage and the end of the cycle is defined as the return of the carriage to its initial position.

Figure 6 gives a chart of a test cycle.

### 3.9.5 Test procedure and duration

Determine the impedance of the cable every 2 000 cycles and plot the curve $Z = f(N)$, $N$ being the number of cycles.

Halt the test at the first sign of failure, e.g. escape of water or rupture of the cable. Note the number of cycles carried out and the nature of the failure.
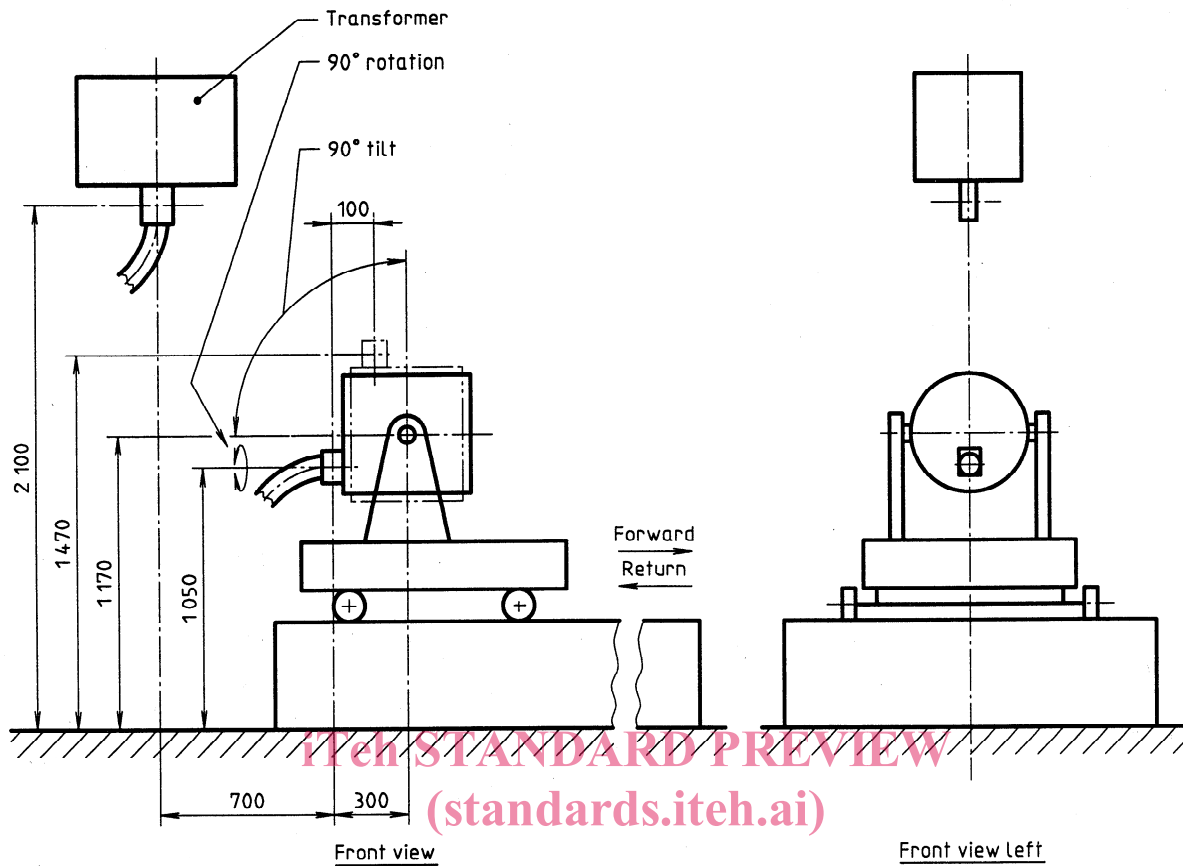
### 3.10 Test report

The test report shall include the following information:

a) a reference to this part of ISO 8205;

b) an identification of the cable tested;

c) the results of the tests;

d) any circumstances affecting the results.

**Table 1 — Adjustment parameters for 2 500 mm long cables**

| Cross-sectional area of cable mm² | Current kA | Duration of application of current s | Number of current pulses per minute | Duty ratio % | Duration of one welding cycle s | Duration of test cycle |
|---|---|---|---|---|---|---|
| 160 | 16 | 0,24 | 13 | 5,2 | 4,6 | 2 min 25 s |
| 200 | 19 | 0,4 | 13 | 8,6 | 4,6 | 2 min 25 s |
| 250 | 19 | 0,4 | 15 | 10 | 4 | 2 min 7 s |
| 315 | 24 | 0,5 | 10 | 8,3 | 6 | 3 min 7 s |

Dimensions in millimetres



- Transformer
- 90° rotation
- 90° tilt

100

2 100

1470

1170

1050

Forward

Return

700   300

Front view

Front view left

**Figure 5 — Example of test apparatus for testing the endurance of a low-reactance cable**



C

T

B

I

4,6 s
4,0 s
6,0 s

2 min 18 s
2 min
3 min

2 min 25 s
2 min  7 s
3 min  7 s

Key

C Carriage        → Carriage forward        ← Carriage return
T Torsion         ⌄ Forward torsion         ⌄ Reverse torsion
B Tilting         ↓ Forward tilt            ↗ Reverse tilt
I Current
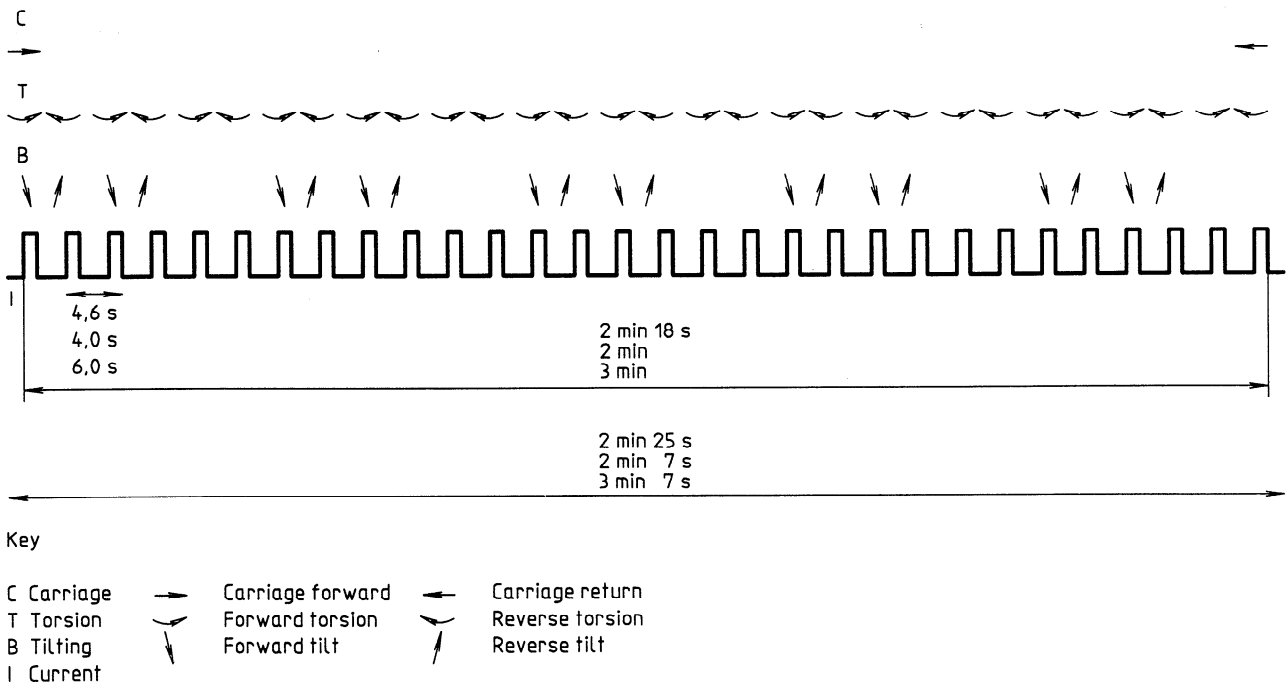
**Figure 6 — Chart of test cycle**

ISO 8205-3:1993
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be00aecfb2bc/iso-8205-3-1993