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**Water-cooled secondary cables
for portable spot welding machines**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently, **JIS C 9318 : 1990** is replaced with **JIS C 9318 : 1999**.

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Water-cooled secondary cables for portable spot welding machines

Introduction This Japanese Industrial Standard has been prepared based on **ISO 8205-1** *Water-cooled secondary connection cables for resistance welding—Part 1 : Dimensions and requirements for double-conductor connection cables*, **ISO 8205-2** *Water-cooled secondary connection cables for resistance welding—Part 2 : Dimensions and requirements for single-conductor connection cables* and **ISO 8205-3** *Water-cooled secondary connection cables for resistance welding—Part 3 : Test requirements* established in 1993 as the first editions, but specification items and contents not stated in the corresponding International Standards are additionally included as Japanese Industrial Standard.

Some requirements for endurance test are modified.

The portions in this Standard underlined with dots mean the matters not stated in the corresponding International Standards.

1 Scope This Standard specifies the water-cooled secondary connection cables for double-conductor connection system and for single-conductor connection system to be used mainly for connection of a portable transformer and a portable gun (hereafter referred to as “cables”).

Note : The International Standards corresponding to this Standard are given below.

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 : 1993 *Water-cooled secondary connection cables for resistance welding—Part 2 : Dimensions and requirements for single-conductor connection cables*

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

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 9305 *General rule for resistance welding machines*

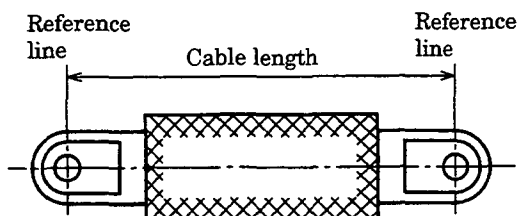
JIS C 9317 *Welding transformers for portable spot welding machines*

3 Definitions For the purposes of this Standard, the following principal definitions apply:

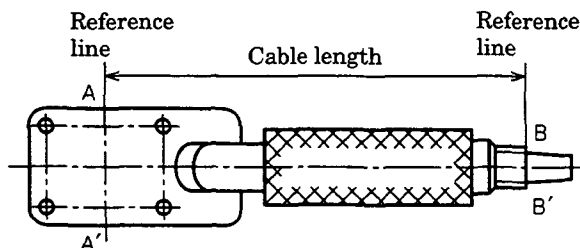
- a) **double-conductor connection cable** A flexible water-cooled cable for electrical connection of secondary terminals of a welding transformer and a welding gun, in which conductors for two paths insulated each other are integrated so as to have as low reactance as possible.
- b) **single-conductor connection cable** A set of two flexible water-cooled cables for electrical connection of secondary terminals of a welding transformer and a welding gun.

- c) **nominal cross-sectional area** The total sum of cross-sectional areas of every element wire in the conductor of one path.
- d) **cable length** The length between two reference lines (see Fig. 1).

a) **Double-conductor connection cable**



b) **Single-conductor connection cable**



Notes 1 AA' is the centre line of the four bolt holes.

2 BB' is the end of screwed part.

Fig. 1 Cable length

4 Classification Double-conductor connection cables and single-conductor connection cables are classified according to the nominal cross-sectional area and the cable length as given in Tables 1-1, 1-2, 1-3 and 1-4.

Table 1-1 Classification of double-conductor connection cables (type J)

Classification	Nominal cross-sectional area mm ²	Length m	Classification	Nominal cross-sectional area mm ²	Length m
K150-10	150	1.0	K160-10	160	1.0
K150-15		1.5	K160-15		1.5
K150-20		2.0	K160-20		2.0
K150-24		2.4	K160-24		2.4
K150-25		2.5	K160-25		2.5
K200-10	200	1.0	K250-10	250	1.0
K200-15		1.5	K250-15		1.5
K200-20		2.0	K250-20		2.0
K200-24		2.4	K250-24		2.4
K200-25		2.5	K250-25		2.5
K315-10	315	1.0	—	—	—
K315-15		1.5			
K315-20		2.0			
K315-24		2.4			
K315-25		2.5			

Note : The symbol in the column of "Classification" means as follows:

The first letter K: double-conductor (low reactance)

The first numeral: nominal cross-sectional area of conductor

The last numeral: cable length

Table 1-2 Classification of double-conductor connection cables (type E)

Classification	Nominal cross-sectional area mm ²	Length m	Classification	Nominal cross-sectional area mm ²	Length m
A-2×160- 1 000	160	1 000	A-2×200- 1 000	200	1 000
A-2×160- 1 250		1 250	A-2×200- 1 250		1 250
A-2×160- 1 600		1 600	A-2×200- 1 600		1 600
A-2×160-(1 800)		(1 800)	A-2×200-(1 800)		(1 800)
A-2×160- 2 000		2 000	A-2×200- 2 000		2 000
A-2×160-(2 240)		(2 240)	A-2×200-(2 240)		(2 240)
A-2×160- 2 500		2 500	A-2×200- 2 500		2 500
A-2×160-(2 800)		(2 800)	A-2×200-(2 800)		(2 800)
A-2×160- 3 150		3 150	A-2×200- 3 150		3 150
A-2×160-(3 550)		(3 550)	A-2×200-(3 550)		(3 550)
A-2×160- 4 000		4 000	A-2×200- 4 000		4 000
A-2×250- 1 000	250	1 000	A-2×315- 1 000	315	1 000
A-2×250- 1 250		1 250	A-2×315- 1 250		1 250
A-2×250- 1 600		1 600	A-2×315- 1 600		1 600
A-2×250-(1 800)		(1 800)	A-2×315-(1 800)		(1 800)
A-2×250- 2 000		2 000	A-2×315- 2 000		2 000
A-2×250-(2 240)		(2 240)	A-2×315-(2 240)		(2 240)
A-2×250- 2 500		2 500	A-2×315- 2 500		2 500
A-2×250-(2 800)		(2 800)	A-2×315-(2 800)		(2 800)
A-2×250- 3 150		3 150	A-2×315- 3 150		3 150
A-2×250-(3 550)		(3 550)	A-2×315-(3 550)		(3 550)
A-2×250- 4 000		4 000	A-2×315- 4 000		4 000

Note : The symbol in the column of "Classification" means as follows:

The first letter A: classification of type A or type B of double-conductor cable (see Table 10 Classification).

Information : The length in parentheses should not be used as far as possible.

Table 1-3 Classification of single-conductor connection cables (type J)

Classification	Nominal cross-sectional area mm ²	Length m	Classification	Nominal cross-sectional area mm ²	Length m
S150-06	150	0.6	S160-06	160	0.6
S150-10		1.0	S160-10		1.0
S150-15		1.5	S160-15		1.5
S150-20		2.0	S160-20		2.0
S150-25		2.5	S160-25		2.5
S180-06	180	0.6	S200-06	200	0.6
S180-10		1.0	S200-10		1.0
S180-15		1.5	S200-15		1.5
S180-20		2.0	S200-20		2.0
S180-25		2.5	S200-25		2.5
S250-06	250	0.6	S315-06	315	0.6
S250-10		1.0	S315-10		1.0
S250-15		1.5	S315-15		1.5
S250-20		2.0	S315-20		2.0
S250-25		2.5	S315-25		2.5

Note : The symbol in the column of "Classification" means as follows:

The first letter S: single-conductor

The first numeral: nominal cross-sectional area of conductor

The last numeral: cable length

Table 1-4 Classification of single-conductor connection cables (type E)

Classification	Nominal cross-sectional area mm ²	Length m	Classification	Nominal cross-sectional area mm ²	Length m
C-160- 500	160	500	C-200- 500	200	500
C-160- 630		630	C-200- 630		630
C-160- 800		800	C-200- 800		800
C-160- 1 000		1 000	C-200- 1 000		1 000
C-160- 1 250		1 250	C-200- 1 250		1 250
C-160- 1 600		1 600	C-200- 1 600		1 600
C-160- (1 800)		(1 800)	C-200- (1 800)		(1 800)
C-160- 2 000		2 000	C-200- 2 000		2 000
C-160- (2 240)		(2 240)	C-200- (2 240)		(2 240)
C-160- 2 500		2 500	C-200- 2 500		2 500
C-160- (2 800)		(2 800)	C-200- (2 800)		(2 800)
C-160- 3 150		3 150	C-200- 3 150		3 150
C-160- (3 550)		(3 550)	C-200- (3 550)		(3 550)
C-160- 4 000		4 000	C-200- 4 000		4 000
C-250- 500	250	500	C-315- 500	315	500
C-250- 630		630	C-315- 630		630
C-250- 800		800	C-315- 800		800
C-250- 1 000		1 000	C-315- 1 000		1 000
C-250- 1 250		1 250	C-315- 1 250		1 250
C-250- 1 600		1 600	C-315- 1 600		1 600
C-250- (1 800)		(1 800)	C-315- (1 800)		(1 800)
C-250- 2 000		2 000	C-315- 2 000		2 000
C-250- (2 240)		(2 240)	C-315- (2 240)		(2 240)
C-250- 2 500		2 500	C-315- 2 500		2 500
C-250- (2 800)		(2 800)	C-315- (2 800)		(2 800)
C-250- 3 150		3 150	C-315- 3 150		3 150
C-250- (3 550)		(3 550)	C-315- (3 550)		(3 550)
C-250- 4 000		4 000	C-315- 4 000		4 000

Note : The symbol in the column of "Classification" means as follows:

The first letter C: classification of type C or type D of cable terminals (see Fig. 4 Cable terminals).

Information : The length in parentheses should not be used as far as possible.

5 Standard service conditions The service conditions of cables shall be as stated in JIS C 9305.

6 Cooling water

6.1 Water temperature The temperature of water to be used for cables shall not exceed 30 °C at the input port.

6.2 Water quality The quality of water to be used for cables shall be that of the industrial water or the similar one.

7 Characteristics

7.1 Electrical characteristics The electrical characteristics are given as theoretical values 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, and they are not acceptance figures.

7.1.1 Insulation resistance The insulation resistance of a new dry double-conductor connection cable between the reference lines shall be not less than 1 MΩ when measured in accordance with the method of 9.2.1.

7.1.2 Resistance and impedance The resistances of double-conductor connection cables stated in Table 1-1 and single-conductor connection cables stated in Table 1-3, the converted value at 25 °C, shall be such that the values of cables in Table 1-1 do not exceed the appropriate value in Table 2-1 and the values of cables in Table 1-3 do not exceed the appropriate value in Table 2-3, when measured in accordance with A system of 9.2.2.1 a). The resistance value is that for the cable length of go-and-return paths as stated in the above system.

The resistances of double-conductor connection cables stated in Table 1-2 and single-conductor connection cables stated in Table 1-4 shall be such that the values of cables in Table 1-2 do not exceed the appropriate value in Table 2-2 and the values of cables in Table 1-4 do not exceed the appropriate value in Table 2-4, when measured in accordance with B system of 9.2.2.1 b).

Table 2-1 Resistance values of double-conductor connection cables (type J)

Unit : μΩ at temperature 25 °C

Nominal cross-sectional area (mm ²)	Length (m)				
	1.0	1.5	2.0	2.4	2.5
150	260	390	520	625	650
160	245	365	490	490	615
200	195	295	390	470	490
250	155	235	310	370	390
315	125	190	250	300	310

Table 2-2 Resistance values of double-conductor connection cables (type E)

Unit : μΩ at temperature 30 °C

Nominal cross-sectional area (mm ²)	Length (m)										
	1.0	1.25	1.6	1.8	2.0	2.24	2.5	2.8	3.15	3.55	4.0
160	245	305	390	440	490	550	615	685	770	870	980
200	195	245	310	350	390	435	490	545	615	690	780
250	155	195	250	280	310	345	390	435	490	550	620
315	125	155	200	225	250	280	310	350	395	445	500

Table 2-3 Resistance values of single-conductor connection cables (type J)

Unit : $\mu\Omega$ at temperature 25 °C

Nominal cross-sectional area (mm ²)	Length (m)				
	0.6	1.0	1.5	2.0	2.5
150	155	260	390	520	650
160	145	245	365	490	615
180	135	220	330	440	545
200	120	195	295	390	490
250	95	155	235	310	390
315	75	125	190	250	310

Table 2-4 Resistance values of single-conductor connection cables (type E)

Unit : $\mu\Omega$ at temperature 30 °C

Nominal cross-sectional area (mm ²)	Length (m)													
	0.5	0.63	0.8	1.0	1.25	1.6	1.8	2.0	2.24	2.5	2.8	3.15	3.55	4.0
160	125	155	175	245	305	390	440	490	550	615	685	770	870	980
200	100	125	155	195	245	315	350	390	440	490	545	645	655	780
250	80	100	125	155	195	250	280	310	350	390	435	490	550	620
315	65	80	100	125	155	200	225	250	280	310	350	395	445	500

The impedances of double-conductor connection cables stated in Table 1-1 shall be such that the impedance value measured in accordance with 9.2.2.2 and the converted value at 25 °C shall not exceed the appropriate value given in Table 3.

Table 3 Impedance values for connection cables

Unit : $\mu\Omega$ at temperature 25 °C

Nominal cross-sectional area (mm ²)	Length (m)					
	1.0	1.5	1.8	2.0	2.4	2.5
150	270 (275)	405 (410)	485 (495)	540 (550)	645 (655)	670 (680)
160	255 (260)	380 (385)	460 (470)	505 (510)	610 (620)	630 (640)
200	205 (210)	310 (320)	370 (380)	410 (420)	495 (505)	515 (525)
250	165 (170)	250 (260)	295 (305)	330 (340)	395 (405)	410 (420)
315	135 (140)	200 (205)	245 (250)	265 (270)	315 (325)	330 (340)

Note : The impedance values are those for 50 Hz power supply and those in parentheses are for 60 Hz power supply.