

JIS

JAPANESE INDUSTRIAL STANDARD

Electric winches

JIS B 8813—1991

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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1. Scope

This Japanese Industrial Standard specifies electric winches composed of a drum, electric motor directly connected with a speed reducing mechanism, brake, etc., capable of lifting, lowering and horizontal pulling of loads with winding-in or winding in return the wire rope (hereafter referred to as the "rope") by positive and reversing revolution of electric motor (hereafter referred to as the "winch").

Remarks 1. Applicable Standards to this Standard are shown in the following:

JIS B 0148-Glossary of Terms for Hoists

JIS C 0601-Operation of Handles and Indication of Electric Installations

JIS C 4004-General Rules for Rotating Electrical Machines

JIS C 4504-General Rules for Direct-on-Line (Full-Voltage) A.C. Starters for Induction Motors

JIS C 4520-General Rules for Control Switches

JIS G 3525-Wire Ropes

2. In this Standard the units and numerical values shown in { } are in accordance with the traditional units and are appended for informative reference.
3. The winch to be applied with the "Industrial Safety and Health Law and Related Legislation of Japan" (Including rules such as the crane and the like safety rule based on the law and notification of crane structure standard.) is to be in accordance with the same law.

2. Definitions

For the purposes of this Standard main definitions are in accordance with JIS B 0148 and to others the following apply.

- (1) rated rope tensile force⁽¹⁾ The maximum rope tensile force capable of loading in the reference layer.
- (2) rated rope speed The rope speed when being wound-in rated rope tensile force in reference layer.
- (3) rope winding length When winding the rope on the drum in adherence orientation, the total length of rope including the dead turn of rope when winding with one or more layers remaining from the outer circumference of drum flange.
- (4) reference layer The layer when having wound the rope on the drum in adherence orientation $(\text{drum diameter} + \text{drum flange diameter}) / 2$.
- (5) operating hours Independently upon loading and non-loading, the hours when operating the winch.
- (6) average operating hours per day The operating hours during one year excluding holidays divided with the number of operating days.
- (7) overall operating hours The overall operating hours of the winch.

Reference Standards:

JIS B 8821-Specification for the Design of Crane Structures

JIS C 9620-Electric Wire Rope Hoists

ISO 4301/1 Cranes and lifting appliances—Classification—Part 1: General

- (8) rate of loading The ratio of rope tensile force to the rated rope tensile force of winch.
- (9) number of starts per hour The number of starts of motor per 1 working h including the pause hours of winch which is the value of number of working times⁽²⁾ added with the number of inching⁽³⁾.
- (10) percentage of duty cycle The ratio of overall operating hours of motor to the working hours including the pause hours of the motor. It is expressed by percentage.
- (11) drum shaft torque The torque at the drum shaft.

Notes ⁽¹⁾ The maximum rope tensile force capable of loading when the rope winding layer does not exceed the reference layer, make it same value as the rated rope tensile force and when exceeding the reference layer, decrease corresponding to the winding layer.

⁽²⁾ The working means the number of working times, when starting in either one direction of winding in or winding-returning, after having reached the total speed, further the travelling of load is carried out only in an optional time, and until stopping.

⁽³⁾ The inching means the operating having the purpose to carry out the microtravelling of load when having started in either direction of winding-in or winding-return and by stopping it in the midway of acceleration directly after starting.

3. Classification

The classification of winches shall be expressed by rated rope tensile force, rated rope speed and rope winding-in length and, as given in Table 1.

Table 1. Classification

Rated rope tensile force	kN {tf}	1	1.6	2.5	3.15	5	7.5	10	12.5	16	20	25	31.5	40	50
		{0.1}	{0.16}	{0.25}	{0.315}	{0.5}	{0.75}	{1.0}	{1.25}	{1.6}	{2.0}	{2.5}	{3.15}	{4.0}	{5.0}
Rated rope speed m/min	50 Hz	10				20	30	40	50						
	60 Hz	12				24	36	48	60						
Rope winding-in length m		30	40	50	60	70	120	150	180	200	300				

4. Grades

Winches shall be divided, according to rate of loading and operating hours into W 1 to W 8 in grades and, as given in Table 2.

Table 2. Grades

Rate of loading	Average operating hours per one day h	Grade							
		Exceeding 0.25 up to and including 0.5	Exceeding 0.5 up to and including 1	Exceeding 1 up to and including 2	Exceeding 2 up to and including 4	Exceeding 4 up to and including 8	Exceeding 8 up to and including 16	16 min.	25000 min.
		Exceeding 400 up to and including 800	Exceeding 800 up to and including 1600	Exceeding 1600 up to and including 3200	Exceeding 3200 up to and including 6400	Exceeding 6400 up to and including 12500	Exceeding 12500 up to and including 25000		
Light	Use usually at the tensile force of degree $\frac{1}{3}$ max. of rated rope tensile force and rare use at the rated rope tensile force.	W 1	W 2	W 3	W 4	W 5	W 6	W 7	
Medium	Use usually at the tensile force degree $\frac{1}{3}$ to $\frac{2}{3}$ of rated rope tensile force, and at some times use at the rated rope tensile force.	W 1	W 3	W 4	W 5	W 6	W 7	W 8	
Heavy	In many cases use usually at the tensile force of $\frac{2}{3}$ min. of rated rope tensile force.	W 2	W 4	W 5	W 6	W 7	W 8		
Extra-heavy	Use at almost rated load or at the load near thereto.	W 3	W 5	W 6	W 7	W 8			

5. Rating

5.1 Rated voltage and rated frequency Make the rated voltage and rated frequency, 100 V 50 Hz, 100 V 60 Hz, 200 V 50 Hz, 200 V 60 Hz or 220 V 60 Hz.

5.2 Rating of motor Make the rating of the motor of the winch the short-time rating or repeating rating.

(1) Short-time ratings are in accordance with Table 3.

Table 3. Short-time rating

Short-time rating min	15,	30,	60
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(2) Repeating ratings are in accordance with Table 4.

Table 4. Repeating rating

Frequency division	I	II	III	IV
Percentage duty cycle %ED	15	25	40	60
Maximum starting frequency times/h	90	150	240	360

6. Performance

6.1 Rope speed As to the rope speed of winch, the tolerance of rope speed during winding-in measured according to the method of 8. shall be $\pm 10\%$ of the rated rope speed of Table 1.

6.2 Brake The brake of the winch shall be as follows:

- (1) As to the brake, after performing the winding-return according to the method of 8. until the test load becomes a definite speed, open the starter.

The distance from this time until stopping completely must be not more than 1.5 % of rope length to be wound-in during 1 min.

- (2) The value of brake control torque (for that having electromagnetic brake and mechanical brake, the sum of those) is to be not less than 150 % of the torque when the load is suspended equivalent to the rated rope tensile force.
- (3) When performing the test according to the method of 8., it is to be capable of holding the load suspended in air securely and the position of the load is not to be varied even if the current is broken.

6.3 Temperature rise As to the temperature rise of winch, carry out the operation according to the method of 8. at the short time rating by Table 3 or the percentage duty cycle and starting frequency by Table 4 until the temperature of each part becomes constant, and the temperature rise of each part measured according to the thermometer method or resistance method shall become the value of Table 5 or less.

Further, the limit of reference environmental temperature shall be 40°C.

Table 5. Temperature rise

Unit: °C

Division		Thermometer method		Resistance method
		Fully closed type	Other than fully closed type	
Motor winding	Type E insulation	70	65	75
	Type B insulation	75	70	80
	Type F insulation	90	85	100
	Type H insulation	110	105	125
Electromagnetic brake winding	Type E insulation	—		100
	Type B insulation			110
	Type F insulation			135
	Type H insulation			160
Gear box		When measuring from outside, 70°C		—
Motor bearing		In the case of measuring at surface, 40°C and in the case of measuring by inserting thermometer element into the bearing metal, 45°C. However, in the case of using the lubricant good in heat resistance and measuring at the surface, 55°C, and in the case of using special heat resistant lubricant, it is to be as agreed between the interested parties.		—

6.4 Starting voltage As to starting voltage of winch, make the test load suspended in air according to the method of 8. after temperature rise test, and from this condition at the voltage of 90 % of rated voltage the winding-in shall be capable.

6.5 Insulation resistance and dielectric strength As to the insulation resistance and dielectric strength, after the temperature rise test, when the insulation resistance between the live part and the non-live metal part is measured with 500 V insulation-resistance tester shall be not less than 1 MΩ.

Successively apply the voltage⁽⁴⁾ of 1500 V near the sine wave of 50 Hz or 60 Hz in frequency for 1 min, and it shall endure this.

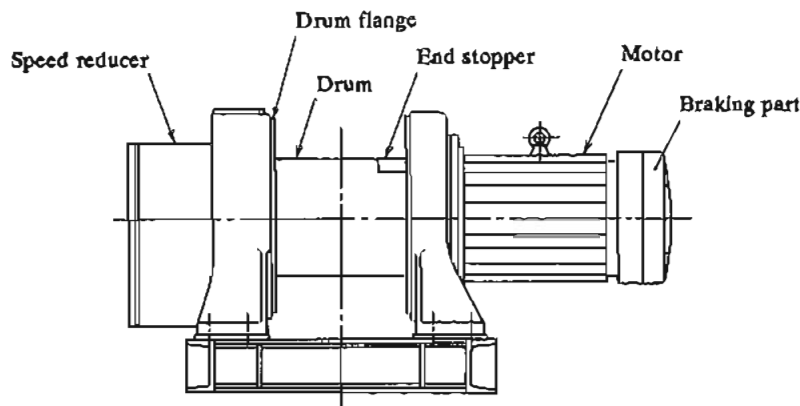
Note ⁽⁴⁾ In the case of 100 V in the rated voltage, apply the voltage of 1000 V for 1 min.

6.6 Over load As to the over load of winch, according to the method of 8., at the test load of rope tensile force corresponding to 125 % of rated rope tensile force, repeat the operation to make the load move up and down by 2 m or more three times, and each part shall be free from abnormalities.

7. Structure and dimensions

7.1 General structure The winch shall be composed of the drum, motor, speed reducer, brake, etc., be rigid, little in noise, vibration, be correct in working, and easy in handling (Refer to Fig. 1).

Fig. 1. Electric winch (Example)



7.2 Wire rope For the winch rope, as a rule, the wire rope specified in JIS G 3525 shall be used.

7.3 Drum The drum of the winch shall be as follows:

- (1) The drum must endure sufficiently to the clamping force of rope, and the flange, be safe against side pressure by the rope.
- (2) The end stopper of rope to the drum, under the condition of remaining two windings, must endure sufficiently to 1.25 times the rated rope tensile force.
- (3) The size of drum must satisfy Table 6.

Further, the relations between the rated rope tensile forces and the rope diameters are shown in Reference Table 1.

Table 6. Grades of winches and $D/d^{(5)}$ of ropes

Grade	W 1	W 2	W 3	W 4	W 5	W 6	W 7	W 8
D/d	11.2 min.	12.5 min.	14 min.	20 min.	20 min.	20 min.	20 min.	20 min.

Note ⁽⁵⁾ D : It is the rope pitch circle diameter (mm) of first layer and expresses the size of drum.

d : rope diameter (mm)

Reference Table 1. Rated rope tensile forces and rope diameters

Rated rope tensile force	kN {tf}	1 {0.1}	1.6 {0.16}	2.5 {0.25}	3.15 {0.315}	5.0 {0.5}	7.5 {0.75}	10 {1.0}	12.5 {1.25}	16 {1.6}	20 {2.0}	25 {2.5}	31.5 {3.15}	40 {4.0}	50 {5.0}
Rope diameter	mm	4	5	6.3	8	8	10	11.2	12.5	14	16	18	20	22.4	25

7.4 Motor The motor of winch shall be the motor specified in JIS C 4004. However, the marking specified in JIS C 4004 may not be performed.

7.5 Direct-on-line a.c. starter The direct-on-line a.c. starter of the winch shall be that not inferior to No. 3 Class 3 specified in JIS C 4504, and in the case of using of switch for operation, that not inferior to No. 3 Class 3 specified in JIS C 4520.

Further, the marking of knob operation shall be in accordance with JIS C 0601.

7.6 Operation circuit The operation circuit of the winch shall be as follows: