

I Applicable scope

Model CD1 is a kind of electric rope hoist of light and mini type hoisting equipment. It can be used on single beam crane in I-shaped bridge type or straight/curved single rail I-beam bridge suspension for lifting heavy objects. The foot-mounted type of CD1 can be fixed on immovable under prop to lift vertically or with any angle rolling.

With its compact structure, legerity and convenient use/repairation, model CD1 is one of the daily used hoisting equipment in factories, mines, ports and warehouse. Its structure is shown in picture 1 and basic parameters are in Table 1.

Working environmental temperature: -20°C to $+40^{\circ}\text{C}$

It is not used in places where the relative humidity is over 85% or where there is risk of fire and explosion or where there is much erosive gas.

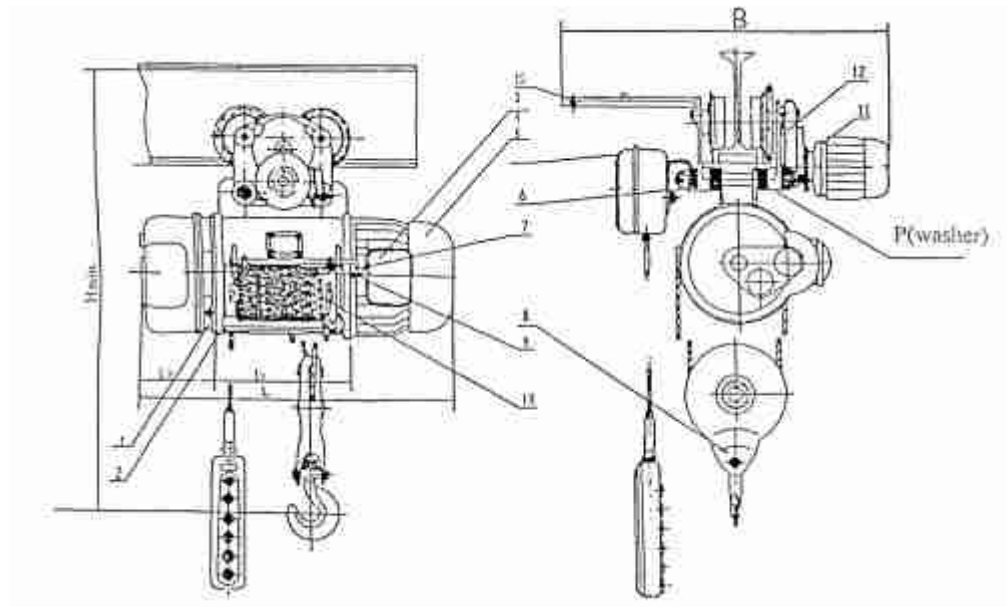
Carrying human being is forbidden. Please operate it strictly in term of GB067 and ZBJ80013.7. When it's used outdoors, shelter is needed to keep away wetness.

Loading persisting rate : FC 25%.

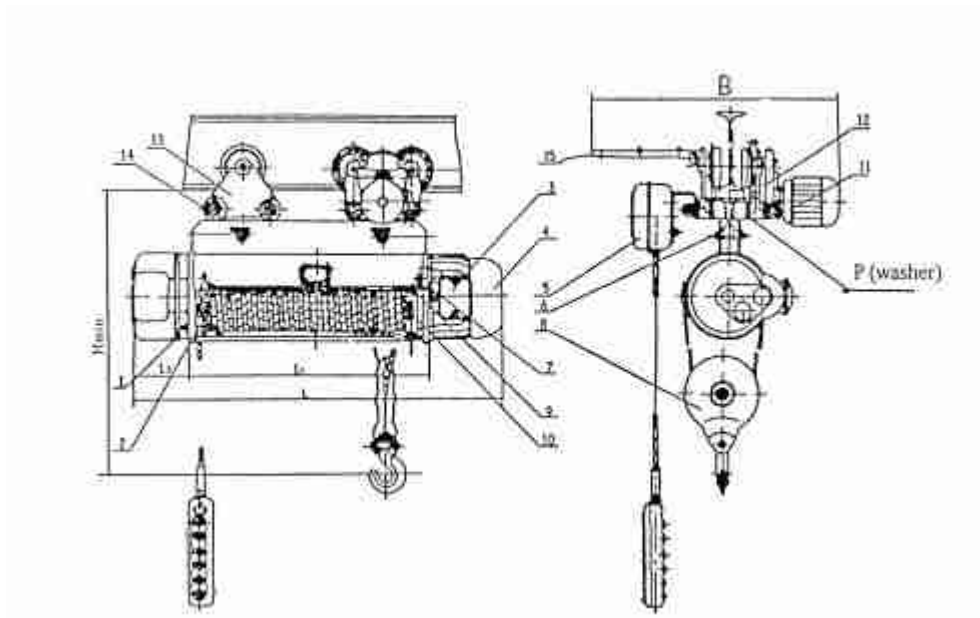
Time of lifting in an hour: 120times/h

The name of this series of products can be expressed as below:

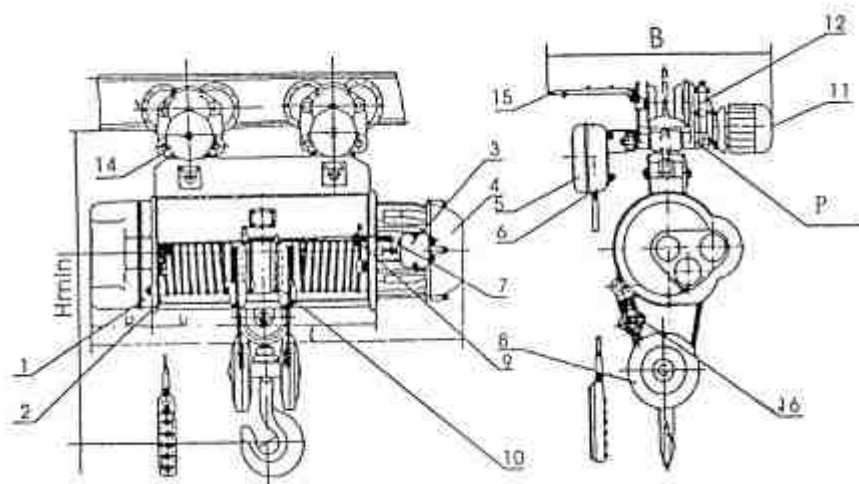
Model + lifting capacity + lifting height (m) + structure (type A=stationary type. According to the direction of rope outlet, it is subdivided into A1, A2, A3 and A4; type D=electric trolley type)



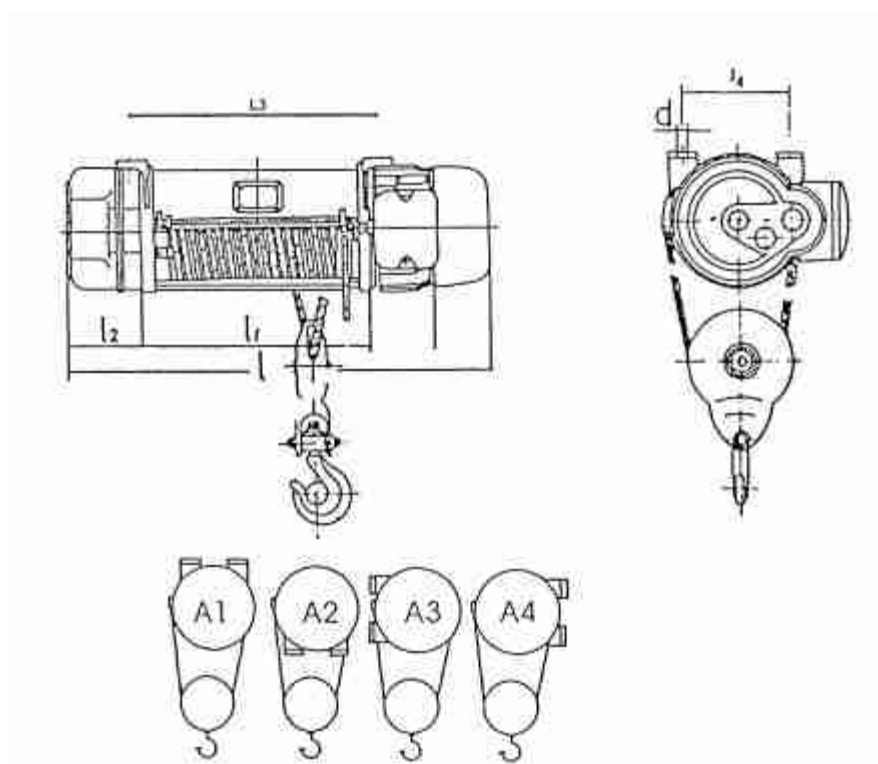
Picture 1a: Model CD1 1-5t H=6-9m
Model CD1 0.5t H=6-12m



Picture 1b: Model CD1 1-5t H=12-30m



Picture 1c: Model CD1 10t H=9-30m



Picture 1d: structure of Model CD1 type A

1. reduction gear
2. drum
3. cut-off limiter
4. lifting motor
5. control box
6. electric trolley
7. limiter level
8. lifting hook
9. stopper
10. rope guide
11. travelling motor
12. reduction gear of the electric trolley
13. double-wheel trolley
14. connecting frame/balance frame
15. guide for flexible cable
16. balance wheel set

II Structure and operating principle

The structure of Model CD1 includes lifting framework, travelling framework (not for stationary hoists) and electric apparatus control system.

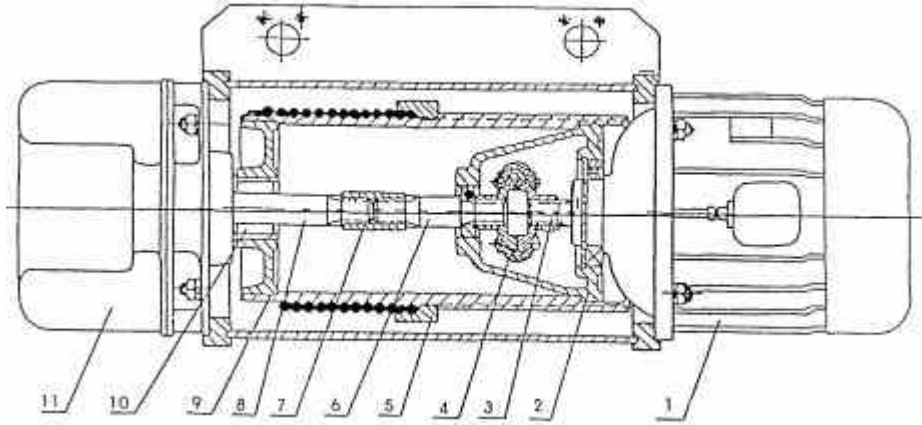
1. Lifting framework

As shown in picture 2, when the hoist is energized, through the spring coupling (4), the lifting motor (1) drives directly the gear shaft in the reduction gear (1) to the quill shaft with conical brake. Then the quill shaft causes the rolling of the drum as to rotate and wind the rope, making the lift hook moves up and down.

Hoists with the lifting height of 6m: it uses a spring coupling (4) to connect the motor gear shaft (3) with the intake shaft of reduction gear (8). This kind of coupling is made up of a high strength rubber type loop and two half-coupling with spline in order to absorb the impact and reduce the fixing error. The rope guide (5) can prevent the rope winding randomly.

Hoists with the lifting height > 9m, adding a jackshaft (6) and solid coupling (7).

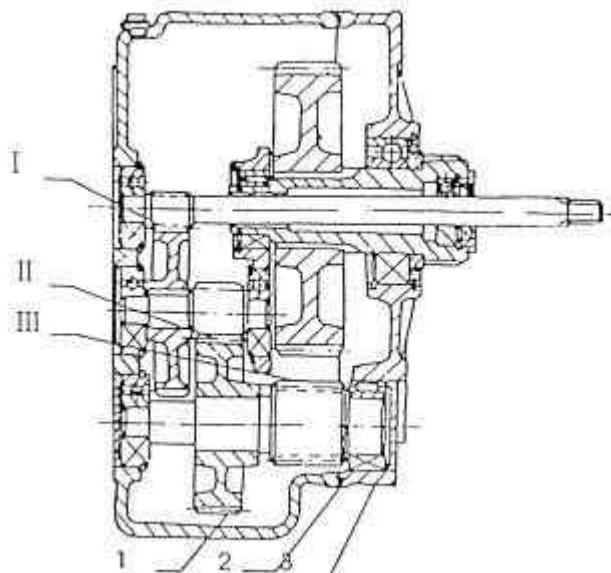
Hoists with the lifting height > 18m: a holder (2) (combines with the right cover) is needed in order to keep the jackshaft steady and rolling reposefully.



Picture 2:

- | | |
|----------------------|------------------------------------|
| (1) lifting motor | (7) solid coupling |
| (2) right cover | (8) intake shaft of reduction gear |
| (3) motor gear shaft | (9) drum |
| (4) spring coupling | (10) quill shaft |
| (5) rope guide | (11) reduction gear |
| (6) jackshaft | |

Reduction gear (picture 3) adopts triple bevel gear drive mechanism. The gear and shaft are made of treated alloy steel. The mating bearings are all rolling bearings. The box body and cover are well sealed with “o” shape oil proof rubber loop.



Picture3 : lifting reduction gear

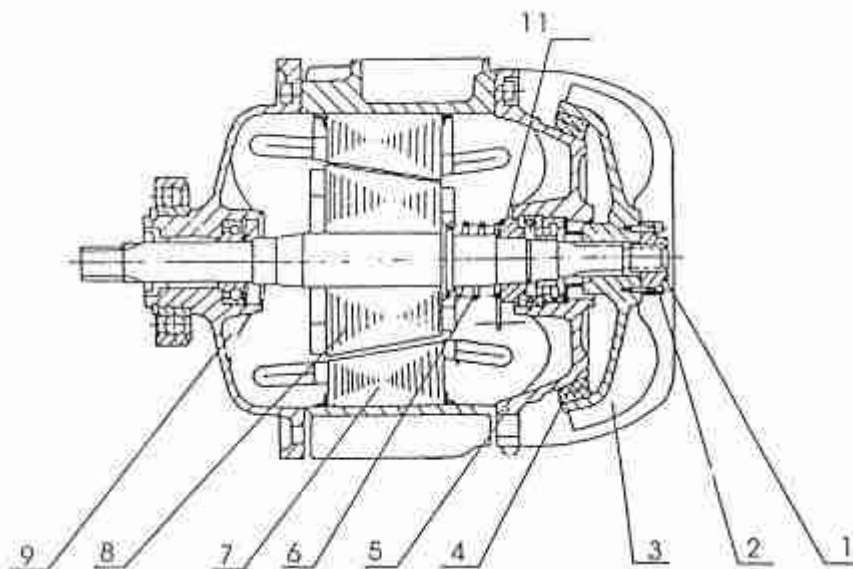
- (1) box cover
- (2) “o” shape oil proof rubber loop
- (3) Box body

Lifting motor (picture 4/5) is conical rotor motor with brake. When the motor is energized, the action of axial magnetic pulling force causes the rotor pressing the brake spring, and the fan brake wheel leaves off the back cover. Then the motor starts to rotate,

When the motor is cut off electricity, the magnetic pulling force disappears. The back cover due to the action of pressing spring stops the fan brake wheel. The conical brake ring which is pressed on the fan brake wheel is made of asbestos rosin with good wear ability. There are vanes fixed on the fan brake wheel in order to ventilate duly. When the rated load falls, the sliding distance “s” caused by braking should be as follows:

For 0.5~5t hoist, $S < 80\text{mm}$; 10t hoist, $S < 70\text{mm}$, If S is more than this regulation, the hoist should be adjusted.

Adjusting method: As shown in picture 4. Loosen the screw (2) and tight the latch nut (1) to raise the pressure on the spring (6) to get large brake moment. Tight the screw (2) and make sure the axial sliding around 1.5 is proper. (The data can be observed by repeated starting.) If this method doesn't work, please make the adjustment in term of Item2, Table 7 (Common troubles and troubleshooting).



Picture 4: Lifting motor of Model CD1 0.5~5t

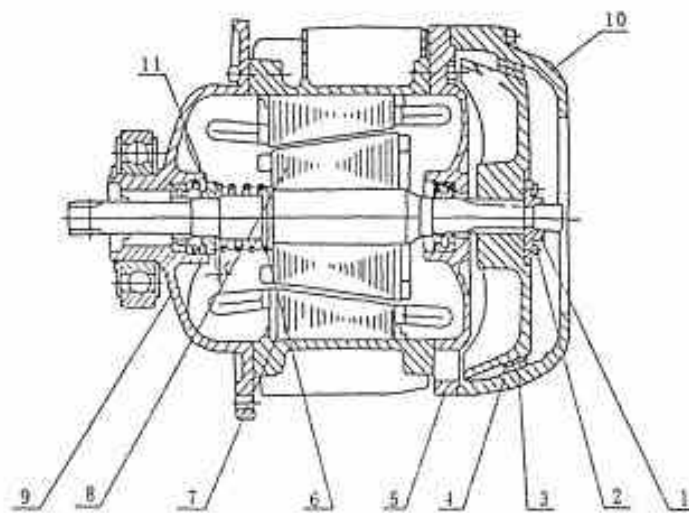
- (1) nut
- (2) screw
- (3) fan brake wheel
- (4) conical brake ring
- (5) back cover

- (6) pressing spring
- (7) stator
- (8) rotor
- (9) front cover
- (10) bearing ring

The principle of adjustment for the hoist shown in picture 5 is the same as above, but the direction of tightening the nut is opposite.

If the brake ring has worn out, replace it and make sure to impact the ring into the fan brake wheel.

After grinding, the conical face of brake ring can contact well with the back cover to insure the hoist working normally.



Picture 5: Lifting motor of Model CD1 10t

- (1)~ (9) is the same as picture 4
- (10) back cover
- (11) bearing ring

2. Travelling framework

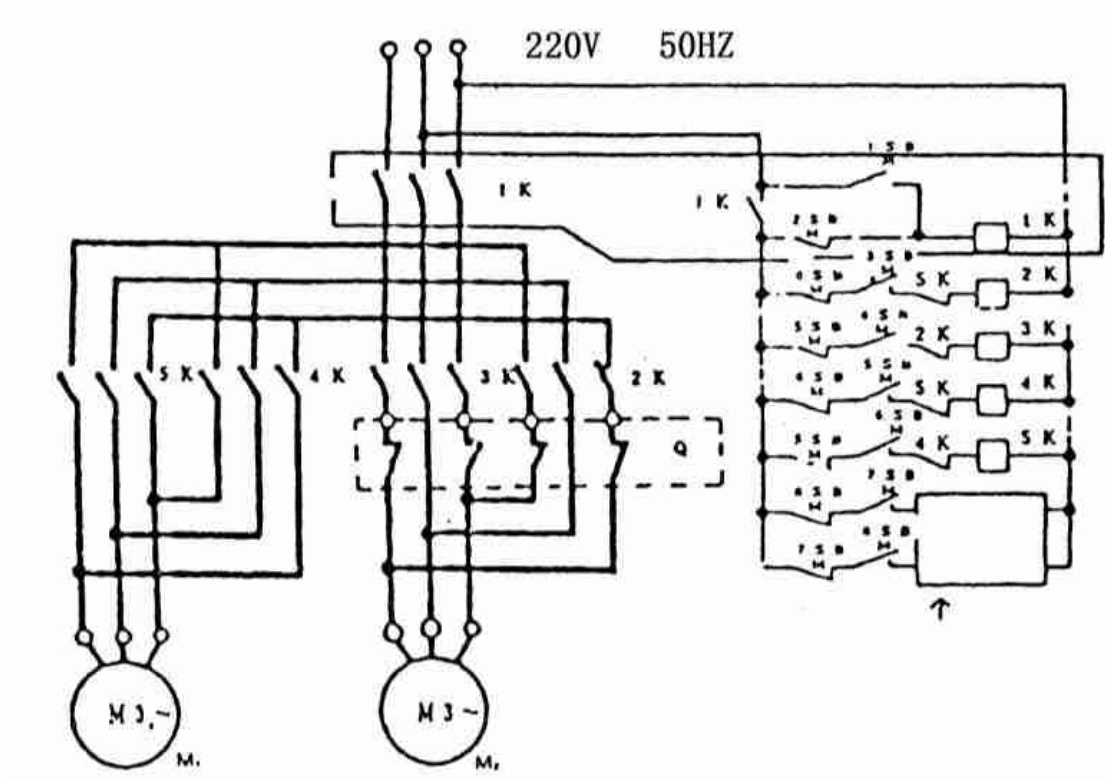
When the motor is energized, the reduction gear works, causing the pair of drive wheels rolling. Hence, the hoist is moving along the I-shaped track.

Travelling motor is also a kind of conical rotor. It is plane braking and has small moment so it brakes slowly to prevent the object shaking from parking. The method of adjustment is the same as 0.5~5t hoist but too much tightness is not needed.

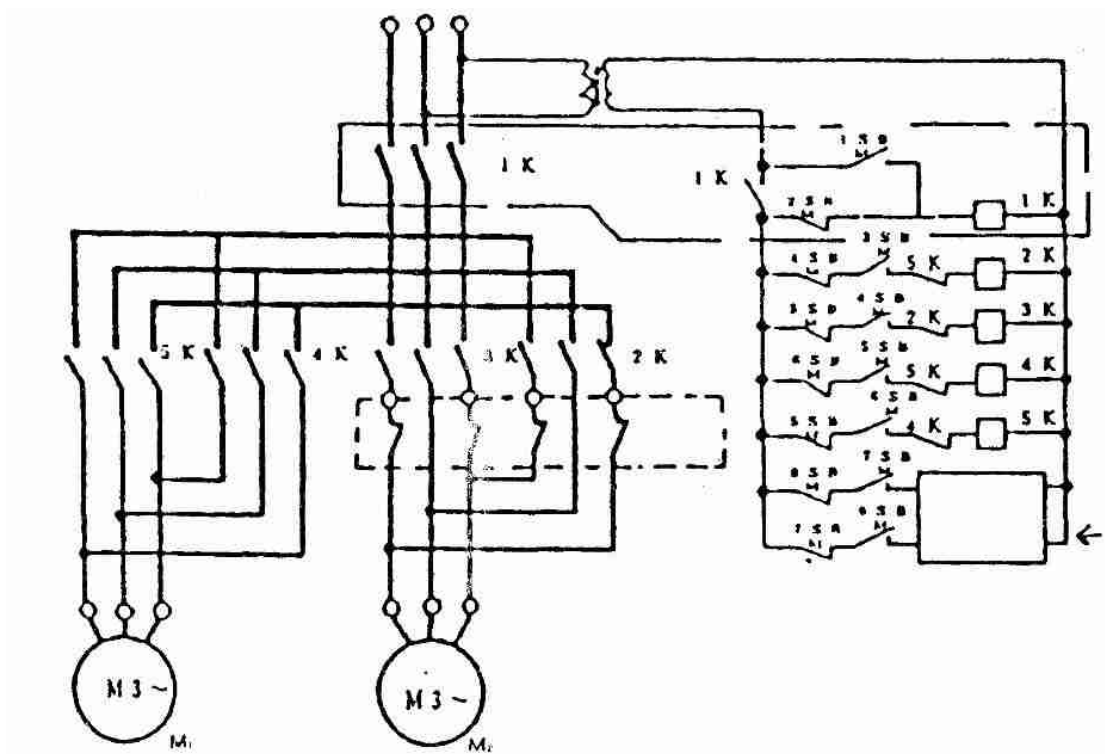
2. Electric apparatus control system (picture6)

Model CD1 is composed of the contactor box, control button and cut-off limiter. The working voltage of control button is 220V and 36V (safety voltage).

The button includes up, down, left, right, forward, backward (forward and backward are use for bridge hanging), turn-on and turn-off. The cut-off limiter is a kind of safety measure used to prevent possible accidents when the lift hook goes up or down beyond the limit. When the hook reaches the limit, axially moving rope guide will hit the stopper on the level, and the level will push or pull the rod to cut off the electricity. Hence, the object stops moving.



Control box connected to single girder



Control box connected to single girder

M1: travelling motor

M2: lifting motor

Q: cut-off limiter

T: low-tension transformer

1K-5K: contactor

15B-85B: button

Picture 6: The diagram of wiring of the mating control box

Table 1: Main technical parameters for CD1 Electric Hoist

Type		CD1 0.5 -6D	CD1 0.5 -9D	CD1 0.5 -12D	CD1 1 -6D	CD1 1 -9D	CD1 1 -12D	CD1 1 -18D	CD1 1 -24D	CD1 1 -30D	CD1 2 -6D	CD1 2 -9D	CD1 2 -12D	CD1 2 -18D	CD1 2 -24D	CD1 2 -30D	CD1 3 -6D	CD1 3 -9D	CD1 3 -12D	CD1 3 -18D	CD1 3 -24D	CD1 3 -30D	CD1 5 -6D	CD1 5 -9D	CD1 5 -12D	CD1 5 -18D	CD1 5 -24D	CD1 5 -30D	CD1 10 -9D	CD1 10 -12D	CD1 10 -18D	CD1 10 -24D	CD1 10 -30D		
Capacity	T	0.5			1						2						3						5						10						
Lifting height	M	6	9	12	6	9	12	18	24	30	6	9	12	18	24	30	6	9	12	18	24	30	6	9	12	18	24	30	9	12	18	24	30		
Lifting speed	m/min	8			8						8						8						7												
Running speed	m/min	20(30)			20(30)						20(30)						20(30)						20(30)												
Steel wire	Rope Dia.	4.8			7.4						11						13						15						15						
	Length	M	14.43	20.43	26.43	14.65	20.65	26.65	38.65	50.65	62.65	15.4	21.4	27.4	39.4	51.4	63.4	15.85	21.85	27.85	39.85	51.85	63.85	16.43	22.43	28.43	40.43	52.43	64.43	43	55	79	103	127	
	Structure	D-6X37+1			D-6X37+1						D-6X37+1						D-6X37+1						D-6X37+1						D-6X37+1						
Type of I-steel (GB706-650)		16-28b			16-28b						20a-32c						20a-32c						25a-63c						25a-63c						
Min. radius of circular track	M		1		1	1.2	1.8	2.5	3.2	1.2	1.5	2.0	2.8	3.5	1.2	1.5	2.0	2.8	3.5	1.5	2	2.5	3.0	4.0	3.0	3.5	4.5	6.0	7.2						
Lifting motor	Type	ZD ₁ 21-4			ZD ₁ 22-4						ZD ₁ 31-4						ZD ₁ 32-4						ZD ₁ 41-4						ZD ₁ 51-4						
	power	kw	0.8			1.5						3						4.5						7.5						13					
	Specified speed	r/min	1380			1380						1380						1380						1400						1400					
	Phase		3			3						3						3						3						3					
	Voltage	V	380			380						380						380						380						380					
	Current	A	2.4			4.3						7.6						11						18											
	Frequency	HZ	50			50						50						50						50											

Table 2: Main technical parameters of the reduction gears

Cap. (t)	Drive grade	Modulus	Teeth No. Direction of spiral		Speed ratio	Pitch angle	Direction of spiral
			left	right			
0.5	I	1.5	14	55	42.4	8° 6′ 34″	20°
	II	2	14	44			
	III	3	14	48			
1	I	1.5	16	62	47.7		
	II	2	15	48			
	III	3	13	50			
2	I	2	12	59	60.5		
	II	3	12	44			
	III	4	14	47			
3	I	2	15	67	69		
	II	3	13	56			
	III	5	12	43			
5	I	2.5	12	68	81.2		
	II	4	12	42			
	III	6	11	45			
10	I	2.5	14	90	113.3		
	II	5	12	47			
	III	6	12	54			

III Installation

1. Check the hoist when it is transported to the worksite.
2. On the purpose of using in different kinds of I-steel rails, when installing the hoist, the space between the wall plates is required to be adjusted with washer P (picture 1) to ensure 4-5mm space between the lower flange side face of the –steel and the rim of the travelling wheels. (See Table 3)
3. To prevent the hoist from getting off the rail or colliding, elastic buffer should be equipped at the ends of the rail.
4. Safe and reliable ground wire is needed for the I-steel rail. Generally $\phi 4-5\text{mm}$ bare cooper wire or flat steel with section area $\geq 25\text{mm}^2$ are adopted.
5. When electric apparatus have been installed, the resistance to ground of the alive circuits in all power loops and control loops should not be less than 1000Ω wc

Table 3: Adjustment for quantity of washer P

Type of I-steel rail (GB 706-65)	Capacity (t)		
	0.5~1	2~3	5~10
16	0		
18	2		
20 ^a	3	0	
20 ^b	4	1	
22 ^a			
22 ^b	6	3	
25 ^a	7	4	0
25 ^b	8	5	1
28 ^a			
28 ^b	9	6	2
32 ^a			
32 ^b		8	4
32 ^c		9	
36 ^a			5
36 ^b			
36 ^c			6
40 ^a			
40 ^b			7
40 ^c			
45 ^a			8
45 ^b			
45 ^c			9
50 ^a			
50 ^b			10
50 ^c			
56 ^a			11
56 ^b			
56 ^c			12
63 ^a			
63 ^b			13
63 ^c			
			14
			15
			16

P.S. the quantity above expresses how many washers are needed in one end inboard of a bolt. The thickness of one washer is 2mm. If it is changed, the quantity should be determined accordingly.

IV Test

1. Whether all the parts that should be lubricated are lubricated according to the requirements of Table 4.
2. Whether the joint surface of mono-bridge rail is appropriate.
3. Make sure the power source is not less than 342V in the worksite. Especially, don't let the voltage dropping too much because of the over-small of cable section.
4. Start the motor and make it run clockwise and counter clockwise under no load. Check the control buttons. Limiter and rope guide. Make sure whether the control wiring is correct and everything works normally.
5. If the rope is loose or tangled, put it in order and tighten it.
6. The place of the stopper of the limiter equipment should be adjusted after installation. Method: start the motor under no load, when the hook reaches the peak, the rope guide hits the stopper on the right and pushes the limiter level to cut off the electricity. Hence, the hook stops rising. At this time, the distance between the top of block cover and the end of drum cover should be 50 to 150mm. In the same way, when the hook reaches the bottom, the hook stops and there are should be 2to 3 rounds (safety round) rope left on the drum.
7. Start the motor under the rated load and check if it works normally. Check whether the sliding distance is proper and the limited is leaking oil.

Table 4: Lubrication instructions

No.	PART	METHOD	GERASE TYPE	QUANTITY	INTERVAL
1	Reduction gear	Fill in from the top crews.	Machine oil GB443-89-L-AN46	For lifting reduction gear: 0.5t-1litre, 1t-1.5l, 2t-2l, 3t-3l, 5t-3l, 10t-4l For travelling gear: 0.5t~3t-0.6l, 5~10t-1l	3 months
2	Rope and drum	Coat the surface	Rope grease		1 month
3	Bearings in the parts of the hook, block, travelling wheels, drum and motor.	Coat the surface or squeeze in.	Lime grease ZG-3 (or ZG-I, ZG-2)		1 year

V Common troubles and troubleshooting

1. The hoist should be operated by a sole operator who is familiar with the regulations for safe operation.
2. The limiter is a kind of safety measure used to prevent possible accidents when the hook goes up or down beyond the limit, which should not be used as often as travelling button.
3. It is not advisable to suspend the object in the area for a long time in order to prevent working part permanent distortion or causing accident.
4. When the hoist is not used, lift hook 2m up the ground and cut off the electricity.
5. Don't lift sideways or dragging along as to protect the rope guide. Don't lift over load.
6. Check the hoist term and lubricate it on the basis of Table 4.
7. In case the object goes down rapidly due to ineffective brake during operation, immediately pre

downward button to cause the object going down at normal speed. Check it after the object reaching the ground safely.

8. Replacement of the rope: The rope should be replaced when broken steel wires reach a certain quantity within one length of lay (en twisting) in terms of Table 5.

Table5: Replacement of the rope.

Safety factor of steel wires: 5.5	Structure of the wire			
	6X19=114		6X37=222	
	Cross en twisting	Single direction en twisting	Cross en twisting	Single direction en twisting
	12pcs	6pcs	22pcs	11pcs

*22pcs is used commonly. When the broken wires reach 22pcs, the rope should be discarded. If there is any abrasion or erosion on the rope, the quantity of replacement should be reduced according to the Table 6.

Table 6: The rope should be replaced when the cases listed in the table occur.

Quantity if diametric surface abrasion or erosion of wires	Percentage of the quantity of broken wires within one length of lay based on Table 5 (%)
10	84
15	76
20	68
25	60
30-40	50

When the diameter surface abrasion of broken wires reaches 40%, the rope should be discarded. Check he rope term and make sure whether the end of it is fastness.

Keep the rope with enough lubrication to prevent rapid abrasion.

The structure of wire for the hoist is 6x37. It is allowed to use 6x19 but it will cause tangle and has short life because of its low flexibility.

Table 7: Common troubles and troubleshooting

Troubles	Main causes	Troubleshooting
1. the motor doesn't lift	Overloaded; Voltage is 10% lower than rated voltage; Lead breaks or in bad contact; Brake wheel adheres to back cover because of rust.	Overloaded is not allowed. Adjust the voltage. Repair the lead. Clean out the rust.
2. sliding distance is overrun	The pressure of spring reduces because of abrasion of brake ring; Brake ring has bad contact with back cover; Brake surface is smeary;	Increase the pressure of spring according to picture 4 and 5. Take out the ring and grind it. Take out the surface and clean it. Replace the ring. Replace the spring. Check and repair it.
3. temperature of motor is too high	Over loaded; Using frequently; Space of the brake is too small so that the brake ring can't work	Overloaded is not allowed. Duty of load should be JC25 times of lifting are 120/h. Adjust the space.

	normally.	
4.reduction gear causes strong noise	Poor lubrication; Gear or bearing has worn out.	Lubricate enough oil. Replace the broken parts.
5.motor makes noise	Power source voltage is too low; Lead brakes or in bad contact.	Adjust the voltage. Repair the lead.
6. Hoist lifts the object in the air and can't restart to go on to lift.	Low voltage	Adjust the voltage.
7. hook can't stop to move even it reaches the peak	The head of contactor is broken; Limiter is ineffective.	Cut off the electricity immediately And replace the broken parts.
8. oil leakage at the reduction gear	Oil seal is ineffective; Blots are not properly tightened.	Check the seal and bolts.

Table 8: Lift of rolling bearing for electric hoist

Parts of hoist	Kind of bearing	Standard code	0.5t		1t		2t		3t		5t		10t	
			type	QTY.	type	QTY.	type	QTY.	type	QTY.	type	QTY.	type	QTY.
Reduction gear	Single row radial bearing with stopping slot on the outer ring	Gb277-82	50302	4	50303	4	50303	1	50305	1	50405	1	50407	1
			50202	1	50202	1	50305	3	50306	3	50406	3	50408	2
			50205	1	50205	1	50202	1	50202	1	50204	1	50409	1
							50205	1	50205	1	50206	1	50204	2
Reduction gear	Needle roller bearing	Jb3588-84	4074105	1	4074105	1					4074106	1	50206	2
			4084105	1	4084105	1	4084106	1	4074109	1	4074111	1	4074113	2
Reduction gear	Single row radial bearing sealed in both faces	Gb279-88 Gb276-82	180510	1	180510	1	180512	1	180515	1	180516	1		
			(210)		(210)		(212)		(215)		(216)			
Reduction gear	Single row radial bearing sealed in one face	Gb279-88 Gb276-82	160504	1	160504	1	160505	1	160505	1	160505	1	160507	1
			(204)		(204)		(205)		(206)		(206)		(207)	
Electric trolley	Single row radial bearing	Gb276-82		4	204	**1	206	**1	206	**1	208	**1	208	**1
			305	*6	305	4	407	4	407	4	408	4	408	8
						*6		*6		*6		*6	221	*6
Lifting motor	Single row thrust ball bearing	Gb301-84	8204	1	8204	1	8205	1	8206	1	8208	1	8311	1
			8105	1	8105	1	8105	1	8105	1	8113	1	8112	1
			8109	1	8109	1	8112	1	8112	1	8107	1	8107	2
	Single row radial bearing with dustproof cover on one face	Gb278-82	60212	1	60212	1	60213	1	60213	1	60218	1	60319	1
			60305	2	60305	2	60307	2	60308	2	60313	2	60313	4
Travelling motor	Single row radial short cylindrical roller bearing	Gb283-87	32206	1	32206	1	42307	1	42308	1	32207	1	32208	1
			32203	2	32203	2	32203	2	32203	2	32204	2	32204	4
			32204	1	32204	1	32205	1	32205	1	32209	1	32211	1
							32208	1	32208	1				
drum	Knuckle bearing	Gb304-81			Ug30	*2	Ug40	*2	Ug40	*2	Ug50	*2		

P.S. *these QTY are used for the hoist H>12m except 0.5t hoist

**these QTY are used for hoist H>18m