

BUCKET ELEVATOR

OPERATION MANUAL



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Important instruction:

1 This manual detailedly describes bucket elevator of each system structure, function and use and maintenance method. Before installation and use of the machine , customer should read the manual, and have a full understanding of the ministries and its structure and function ,then have operation and maintenance of the machine. Due to the continuous improvement of product structure, after a certain time period, the manual of narrative content and the actual situation of the products will have small changes.Users should pay attention to it.

2 Please propose your advice to us for melioration when finding quality problem or others.Thanks !

1 GENERAL INTRODUCTION

TDTG Series Bucket Elevator is applicable for continuous and vertical elevating of materials in shape of powder, granule and small piece. It can be widely used in the industries of feed, cereal, oil, food, chemicals, building materials, grain depot, port and pier.

1.1 Main Performance Features

1.1.1 The structure is compact and overall dimension of cross section is small, thus floor space can be saved remarkably;

1.1.2 Elevator foot can be fitted with direct and converse feeding hopper for users' selection according to requirement;

1.1.3 Rubber-covering technology is used for head pulley and tail pulley so as to increase the friction coefficient and improve the driving efficiency;

1.1.4 A transition section is added under the head pulley and fitted with outlet adjusting plate and buffer chamber so as to reduce the return of materials and improve the capacity;

1.1.5 Elevator head is fitted with changeable wear proof plate;

1.1.6 Explosion-proof elevator housing is available and can effectively prevent the explosion of dust;

1.1.7 Tensioner is fitted with spring buffer device so as to reduce the vibration and prevent belt from breaking caused by sudden overload;

1.1.8 The tensioning plate is fitted with two layers of seal so as to overcome the leakage of dust and materials from the adjusting plate;

1.1.9 Speed detector and offset alarm can be used according to users' requirement so as to ensure safe and normal production;

1.1.10 Anti-reverse device can be used to prevent the machine from being blocked due to power failure;

1.1.11 The installation height is optional, but heights in Table 1 must not be exceeded.

1.2 Main Technical Parameters

Table 1 Main Technical Parameters

Parameters Model	Head Pulley Dia. (mm)	Conveying capacity		Bucket Number (pc/m)	Rotational Speed (rpm)	Max. Elevating Height (m)
		Granular Materials(t/h)	Powder Materials(t/h)			
TDTG36/18	φ400	14.5	8	4	80	<25
TDTG36/23	φ400	26	11	4	80	<35
TDTG36/28	φ400	30	18	4	80	<35
TDTG50/28	φ500	76	30	5	84	<45
TDTG60/30	φ600	108	62	5	84	<45

2 STRUCTURE FEATURES AND WORKING

PRINCIPLE

2.1 General Structure

TDTG Series Bucket Elevator mainly consists of elevator head, elevator casing, bucket, bucket belt, elevator foot and drive. Elevator head, elevator tail and elevator casing flanges are connected with bolts and sealed with sealing gasket. Buckets are fixed to the bucket belt with special-purpose bucket bolts.

Table 2 Overall Dimension of TDTG Series Elevator

Item Model	Elevator Foot Size										Elevator Head Size		
	A ₁	A ₂	A ₃	B ₁	B ₂	B ₃	h	h ₁	h ₂	n ₁ -g ₁	A ₄	B ₄	h ₃
TDTG40/18	3×224	798	1506	286	316	410	1150	388	188	8-φ16	1206	622	1126
TDTG40/23	3×235	850	1558	346	376	470	1150	388	188	8-φ16	1258	682	1126
TDTG40/28	3×235	850	1558	396	426	520	1150	388	188	8-φ16	1258	732	1126
TDTG50/18	2×396	900	1868	286	316	474	1300	375	200	6-φ16	1342	855	1186
TDTG50/23	2×422	952	1922	346	376	514	1300	375	200	6-φ16	1417	915	1186
TDTG50/28	2×422	952	1922	396	426	564	1300	375	200	6-φ16	1417	965	1186

Item Model	Inlet Size							Inlet Size						
	a ₁	a ₂	a ₃	b ₁	b ₂	b ₃	n ₂ -φg ₂	a ₄	a ₅	a ₆	b ₄	b ₅	b ₆	n ₃ -φg ₃
TDTG40/18	255	354	2×147	250	2×143	316	8-φ9	280	319	2×159	250	2×143	316	8-φ9
TDTG40/23	255	354	2×147	310	3×115	376	9-φ9	280	319	2×159	310	3×115	376	10-φ9
TDTG40/28	255	354	2×147	360	3×132	426	9-φ9	280	319	2×159	360	3×132	426	10-φ9
TDTG50/18	380	545	3×135	250	2×143	316	9-φ9	300	339	2×174	250	2×143	316	8-φ9
TDTG50/23	380	545	3×135	310	3×115	376	10-φ9	300	339	2×174	310	3×115	376	10-φ9
TDTG50/28	380	545	3×135	360	3×132	426	10-φ9	300	339	2×174	360	3×132	426	10-φ9

2.2 Working Principle and Working Process

After being turned on, motor drives the head pulley through sprocket and chain and transmits power to bucket belt. Buckets move from bottom to top circularly along the casing together with bucket belt. When buckets full of materials pass the head pulley, materials, under the action of centrifugal force and gravity, are thrown out of the buckets and discharged from the outlet along the housing.

2.3 Structure of Main Parts and their Working Principle

2.3.1 Elevator Head

It consists of elevator head base, head pulley, head pulley shaft and elevator housing and is fitted with adjustable materials-returning device and buffer chamber to reduce the return of materials.

2.3.2 Casing

It consists of common casing, air pressure balance casing, maintenance casing and explosion proof casing. The standard length of common casing is 2m for each section. Air pressure balance casing is mounted in the elevator casing through flanges (The installing

position and quantity shall be determined according to requirement) so as to make air pressure in two casings keep balanced and ensure that materials are fed to and discharged out of the buckets smoothly. There is access door in the maintenance casing for observation and replacement of buckets and bucket belt.

2.3.3 Elevator Foot

It consists of elevator foot housing, tail pulley, tail pulley shaft, tensioner and feeding hopper. Elevator foot is fitted with direct and converse feeding hoppers which can meet the different requirement of users. Tensioner is used to adjust the relative position of head pulley and tail pulley and tension the bucket belt so as to prevent the offset and slipping. Elevator feet are fitted with discharging flapper at both sides for removing the remaining materials and impurities inside the machine.

2.3.4 Buckets and Bucket Belt

Bucket includes steel bucket and light high-strength plastic bucket. Users can make choice according to the property of materials. Buckets are fixed to the bucket belt with special-purpose bucket screws in certain spacing.

Bucket belt is the strengthened fabric rubber belt with low stretching rate, high strength, wear proof quality, low weight and without toxicity and smell.

3 INSTALLATION, ADJUSTMENT AND COMMISSIONING

3.1 Installation Conditions

3.1.1 The foundation for elevator foot is poured with concrete and has a thickness not lower than 300mm. It is required to be level and solid enough to bear the weight of the machine and meet the requirement of load in the running process.

3.1.2 The foundation should have the embedded anchor bolts or steel plate with foot with size larger than elevator foot.

3.1.3 When elevator housing need pass through the floors, floors should have the reserved holes. Long hole is recommended for convenience of installation and adjustment. See Figure 4 and Table 3 for sizes.

3.1.4 There should be sufficient space not smaller than 500mm between cover of elevator head and building (or structural member).

3.1.5 The access door of the housing (central line) should be arranged in a position about 1400mm away from the floor or ground for convenience of inspection and repair.

3.1.6 The working bench for installing the drive should be installed on the floor (or platform of structural member) and fixed with anchor bolts.

3.1.7 It should be designed that a working platform is available at the part of head pulley for convenience of operation and repair.

3.2 Installation

3.2.1 Position the elevator foot on the finished foundation, take the flange face of elevator foot as datum for aligning (it is allowed to insert the leveling iron pad with thickness not larger than 40mm) with deviation not higher than 1/1000, and fix the anchor bolts.

3.2.2 Mount the housings section by section from bottom to top according to the requirement of technological design, and use seal for sealing.

3.2.3 Mounting of Drive

Motor, reducer, coupling, drive bracket and guard have already been assembled before the delivery. To mount the drive to the elevator body, the detailed requirement of Assembling General Drawing should be followed and the drive should be fixed to drive platform or head housing. The drive may become loose due to transportation or other factors, so check should be made prior to installation and starting. After the drive is fixed, check to see if the connecting bolts become loose and if coupling reach the requirement of installation.

3.2.4 When elevator has drive platform, the parallelism allowance of installation datum plane of reducer on the platform to level should not be larger than 1mm.

3.2.5 When mounting bucket belt and buckets, firstly adjust the tail pulley base of elevator foot to the top position, and then pull the pre-stretched bucket belt in from elevator head. One end rounds the tail pulley and is pulled out of the access door, and is connected with another end. Bucket belt adopts lap joint or angular joint. For lap joint, it would be better that length of lap joint section equals the length of 3-5 buckets. See Figure 5 for lap joint and Figure 6 for angular joint. Then mount the buckets one by one to the bucket belt at the access door of bearing branch section. The central line of bucket should align the central line of bucket belt with deviation not larger than 4mm. For users who have the inspecting and repairing motor, after mounting the drive and connecting the power, they can start the inspecting and repairing motor by touch to drive the belt and then mount buckets one by one.

3.2.6 After mounting the buckets, adjust the tensioner to make bucket belt be tensioned to proper extent. Observe the position of tail shaft and take note that the remaining tension stroke is not less than 50% of total stroke. If it is not qualified, connect the belt again until it is qualified.

3.2.7 Adjust the position of return retainer at elevator head to make the gap between it and outer edge of bucket keep at 5mm-10mm.

3.2.8 The arrangement of position of elevator head should follow the requirement of technological process. Its discharging outlet and feeding inlet of elevator foot can be arranged in same side (The feeding type is direct feeding), also in opposite side (The feeding type is converse feeding). The fill-up coefficient of bucket for converse feeding is higher than that of bucket for direct feeding. Converse feeding type is recommended.

3.2.9 Quality Requirement and Inspection Method of Casing

After mounting of the casing is finished, the mounting quality should be checked by using the following method. If there is anything not meeting the requirement, the casing cannot be fixed until correction is made by means of adding the pad.

3.2.9.1 The parallelism allowance of upper plane of elevator foot to level is not larger than 1.2mm.

3.2.9.2 The parallelism allowance of head pulley shaft to level is not larger than 0.3/1000.

3.2.9.3 Check the perpendicularity and curvature and see Table 4 for requirement on deviation.

Table 4 Deviation of Perpendicularity and Curvature

Measuring Position	Elevating Height H(m)		
	<7	7-30	>30
	Deviation (mm)		
$ A_1-A_2 $	4	6	8
$ B_1-B_2 $			

3.2.9.4 See Figure 8 for mounting of tail pulley shaft and see Table 5 for requirement on deviation.

Table 5 Installing Deviation of Tail Pulley Shaft

Measuring Position	Elevating Height H(m)		
	<7	7-30	>30
	Deviation (mm)		
$ B_1-B_2 $	5	7	9
$ A_0-A_1 $	3	5	7

3.3 Adjustment

3.3.1 Adjustment of Tensionness of Bucket Belt (Tensioner of Screw Rod)

3.3.1.1 Turn the screw rod with spanner and push the bearing housing of tail pulley downwards to tension the bucket belt; if turning the screw rod conversely, the bearing housing will be pushed upwards.

3.3.1.2 Adjust the tensioner at another side by using the same method. During the adjustment, the height of bearings at two sides should be same.

3.3.1.3 After tensionness is adjusted, the fixing nuts must be fastened so as to prevent elevator from becoming loose in the running process.

3.3.1.4 Gravity tensioner can be used to adjust the tensionness of bucket belt through increasing or reducing the balance.

3.3.2 Adjustment of Return Retainer (See Figure 9)

3.3.2.1 Open the sight cover of the elevator head base.

3.3.2.2 Adjust the gap between return retainer and bucket and keep it at 5-10mm.

3.3.2.3 Fix the return retainer and close the sight cover.

3.4 Unloaded Trial Run

3.4.1 Preparation prior to Trial Run

3.4.1.1 Add the lubricator.

3.4.1.2 Open the discharging flapper of elevator foot and get rid of the impurities inside.

3.4.1.3 Check to see if bucket belt has proper tensionness, straight joint and correct lap joint direction.

3.4.1.4 Check to see if fasteners become loose.

3.4.1.5 Check to see if gap between return retainer and bucket is proper.

3.4.1.6 Remove the reverse stopper and adjust the rotation direction of motor. Mount the reverse stopper after the rotation direction is correct.

3.4.1.7 Start the motor by touch and check to see if there is abnormal noise.

3.4.2 Unloaded Trial Run

3.4.2.1 Race the machine for 2 hours, meanwhile adjust the tensionness of bucket belt and remove the offset and slipping of bucket belt.

3.4.2.2 Check to see if reducer leaks oil and produces abnormal noise.

3.4.2.3 The bearing should not have a rise of temperature exceeding 40°C and should have good lubrication.

3.4.2.4 After racing the machine for 4 hours, stop the machine and check to see if bearings, fasteners, buckets, connecting screws of bucket belt and lubricated parts are normal.

3.5 Points for Attention in Loaded Trial Run

3.5.1 After the machine is started, materials should be fed gradually, and the running with full load is not allowed until all is normal. If return of materials is excessive, retainer can be adjusted. It would be better that gap between bucket and retainer is about 5-10mm.

3.5.2 To elevate the powder materials, 2 rows of Φ6 hole can be made at the bottom of bucket so as to reduce the negative pressure and make the feeding and discharging of powder materials smooth.

3.5.3 The hopper should receive the materials smoothly, and feeding should be even at the feeding inlet and excessive feeding is not allowed. If materials blockage occurs, stop the machine in time and open the discharging flapper at the bottom of elevator foot to get rid of materials. It is prohibited to stretch hands into the elevator foot for handling the materials in the discharging process.

3.5.4 The reverse stopper should work reliably without reverse.

3.5.5 Bucket belt should not slip during the running with full load. If it slips, speed detector (if any) should act and stop the machine.

3.6 Electric Control

3.6.1 See Figure 10 and Figure 11 for Diagram of Electric Control Principle.

3.6.2 The machine and electric control box should have good earthing.

3.6.3 The installation and operation of electric components should follow their operation manuals. They are required to work safely and reliably.

4 OPERATIONS

4.1 Preparation and Check prior to Operation

4.1.1 Before operating the machine, please carefully read this operation manual and know how to operate this machine correctly so as to avoid unnecessary loss;

4.1.2 Materials to be elevated should conform to the bucket type;

4.1.3 Before starting the machine, make regular check, that is, check the fasteners, safety guard and lubrication.

4.2 Operation

4.2.1 To use the machine, firstly start the follow-up equipment of the machine, then start the elevator, and then start the preceding equipment from back to front in turn, finally feed the materials.

4.2.2 The machine should be started without load. Materials cannot be fed until the running without load is normal. Adjust the feeding slide properly and keep the coming flow rate smooth and proper so as to prevent the blockage caused by excessive feeding. Once the feeding slide is adjusted and positioned, careless action is not allowed.

4.2.3 Check to see if bucket belt has offset and slipping. Make adjustment in time.

4.2.4 In the normal running process, it is prohibited to open the guard of elevator head or pull out the flapper of elevator foot.

4.2.5 The remaining materials in the feeding hopper should be removed in time.

4.2.6 If there is no special condition, stopping with load is not allowed. Generally speaking, before stopping the machine, firstly stop the feeding, and then race the machine for 1-3 minutes. The machine cannot be turned off until the materials in the machine are discharged.

4.2.7 The stopping sequence is opposite to the starting sequence.

5 TROUBLES AND TROUBLESHOOTING

Table 6 Trouble and Troubleshooting

Trouble	Cause	Troubleshooting Method
Materials return.	(1)Follow-up equipments are in trouble. (2)Feeding amount increases suddenly. (3)Retainer is not adjusted properly and gap between it and bucket is excessive.	(1)Stop the machine and remove the trouble of follow-up equipment. (2)Adjust the feeding slide and control the feeding amount of materials. (3)Open the elevator head and adjust the retainer.
The machine has abnormal noise.	(1)Foreign materials enter the machine. (2)Bucket bolts become loose and buckets come off and are damaged. (3)Gap between bucket and retainer is too small and there is collision. (4)Bucket belt becomes loose or offsets and buckets touch the housing.	(1)Stop the machine and clear away the foreign materials in the machine. (2)Open the access door of repair housing, fix the bucket bolts and replace the come-off and damaged buckets. (3)Open the access door of elevator head and adjust the retainer. (4)Adjust the tensioning bolts to tension the bucket belt and eliminate the offset.
The machine is blocked by materials.	(1)The discharging outlet or slide pipe is blocked by foreign materials. (2)The feeding amount is excessive	(1)Remove the foreign materials at the discharging outlet or in the slide pipe. (2)Correct the flow rate of materials.

	and exceeds the technical performance of the machine. (3) Drive or electric control is in trouble and cause sudden stoppage.	(3) Remove the trouble of drive or electric control.
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6 MAINTENANCE

6.1 Buckets and bucket belts should be checked and repaired completely once every month. If finding that they become loose or are damaged, fix or replace them in time. Complete check should be made and parts should be fixed or replaced during the annual overhaul.

6.2 The rolling bearing should be lubricated with #2 lithium based lube once every month. It should be disassembled for cleaning once and lube should be replaced during the annual overhaul.

6.3 In the running process, iron, large-piece hard materials and impurities should be prevented from entering the elevator so as to avoid the damage of the machine. The feeding inlet and discharging outlet should be fitted with grids. Often check these two positions to see if there are foreign materials and come-off buckets.

6.4 When bearing need be replaced, remove the mounting bolts of bearing (Driving parts should be firstly removed from the driving end), then bearing can be removed and replaced.

6.5 Maintenance of motor, gearbox, hydraulic coupling should follow their operation manuals.

6.6 Check the rise of bearing temperature. If exceeding 40°C, stop the machine for check and removal of trouble.

6.7 When checking and repairing the elevator head, firstly remove the connecting bolts of elevator head cover and use ears to remove the elevator head cover. It is prohibited to use ears at the elevator head to lift the machine.

6.8 Generally speaking, the elevator should have a current once every quarter and an overhaul once every year.

7 TRANSPORTATION AND STORAGE

7.1 Collision is prohibited during the transportation so as to prevent the machine housing from deforming or prevent paint on the surface from being damaged, thus prevent appearance quality from being influenced. And damp proof measures should be taken to prevent the machine from becoming damp and rusting.

7.2 When the machine will be laid aside for a long time, it should be kept in a well-ventilated, dry and cool place, and there should be damp proof facilities. The exposed surface not coated with paint should be coated with antirusting oil.

8 WEARING PARTS

Table 7 List of Easily-worn Parts

No	Model	Elevator Head Bearing	Elevator Tail Bearing	Bucket Model	Bucket Belt (width mm)	Remarks
1	TDTG40/18	UCP210	F90509	18/14	200	
2	TDTG40/23	UCP210	F90509	23/14 19/14	250	
3	TDTG40/28	UCP211	F90509	28/14	300	
4	TDTG50/18	SN518	F90511	18/14	200	
5	TDTG50/23	SN518	F90511	23/16	250	
6	TDTG50/28	SN518	F90511	28/16	300	

9 CAUTIONS

9.1 During the operation of equipment, any parts of human body must not touch the rotating parts of equipment so as to avoid the human body injury accident.

9.2 To inspect or repair the equipment, equipment must be turned off.

9.3 When the machine is running, the discharging flapper at both ends of elevator foot must not be opened. Cleaning must be done after the machine stops.



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