

TYPHON TERROR ONE
Mini EXCAVATOR
OPERATION & MAINTENANCE MANUAL

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Attachment: BOM List of TERROR ONE Parts

As product improvements, technical data and parameters is likely to change.

Chapter I Usage Features and Performance Parameters of TERROR ONE Excavators

Section I Usage and features

TERROR ONE Excavators are provided with excavating, crushing, ditch cleaning, drilling and bulldozing, with their attachments quick hitched and thus its utilization up greatly. In addition, they are easy to operate and transport and at the same time, agile at narrow sites.

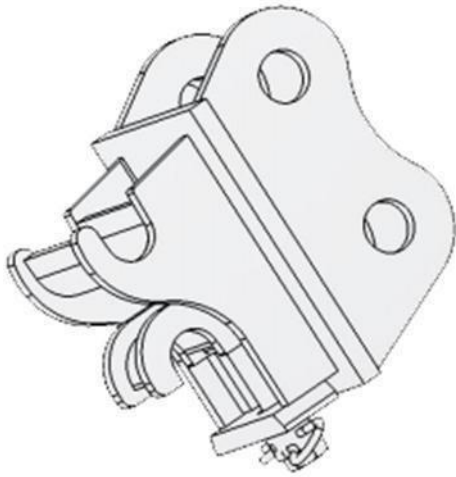
TERROR ONE Excavators, hydraulic type with single bucket



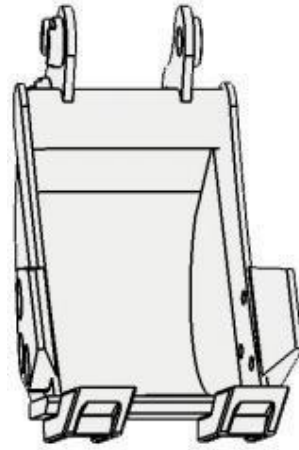
This type of excavators are mainly used in: farming, landscaping, ditching and fertilization in garden, vegetable greenhouse, agricultural transformation, indoor demolition, small earthwork, civil engineering, road recovery, basement and indoor construction, concrete breaking, burying of cable, laying of water supply line, garden cultivation and others.

The excavator is equipped with B e l t o n g a s o l i n e e n g i n e

TYPHON excavators can be equipped with multiple attachments, such as quick hitch, log grapple, ripper, leveling bucket, auger and narrow bucket, as well as optional roof, radiator and others, so as to meet your needs.



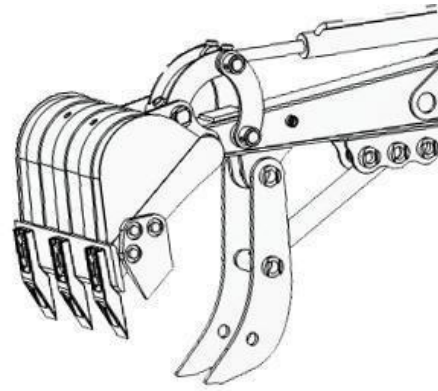
Quick hitch



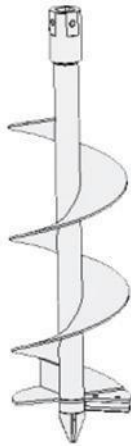
Narrow bucket



Log grapple



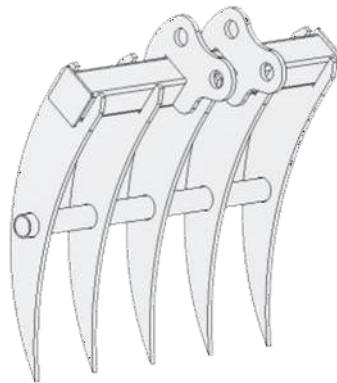
Mechanical thumb



Auger

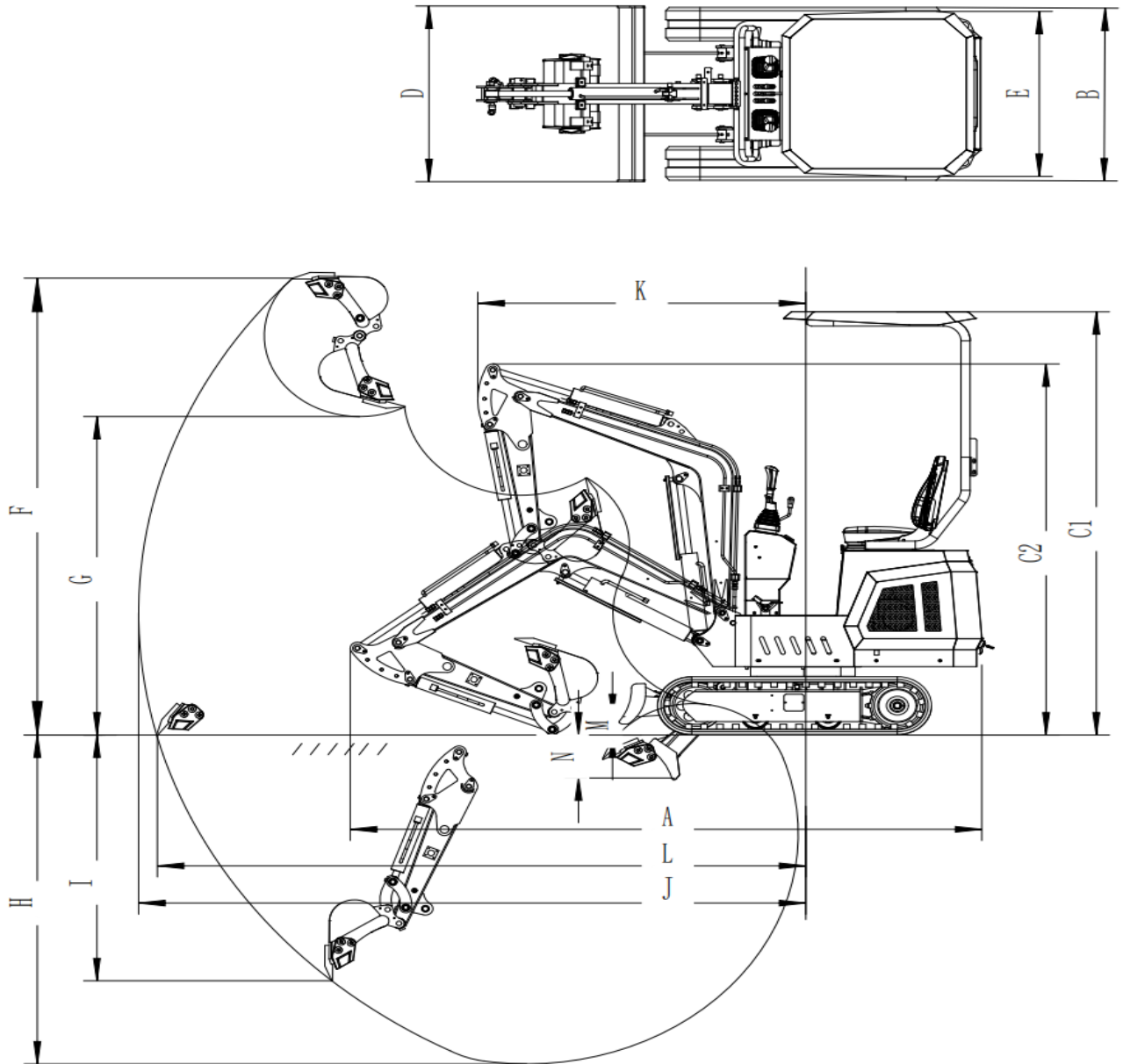


Ripper



Rake

Section II Main performance parameters

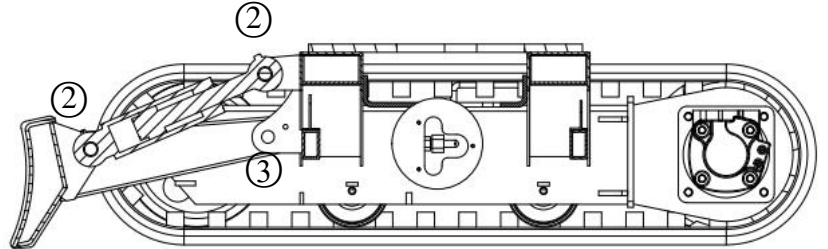
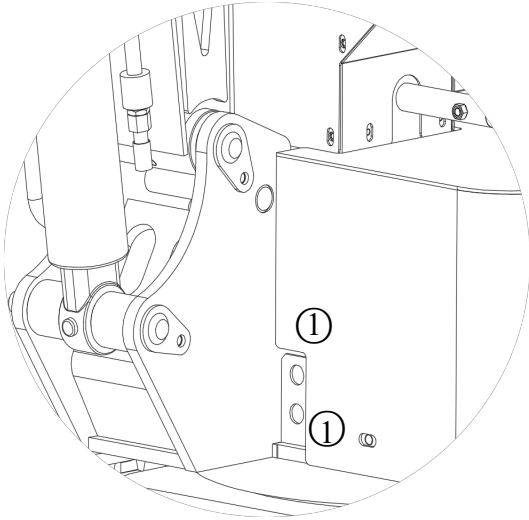


Overall size	Code	Unit	Standard
Total Length (transport time)	A	mm	2970
Total width (transportation / operation)	B	mm	930
Total height (with / without ceiling)	C	mm	2260(2074)
Bulldozer blade width	D	mm	941
Bulldozer blade height		mm	217
Caterpillar band center distance	E	mm	746
Standard caterpillar band board width		mm	180
Platform clearance		mm	405
Standard bucket width (with / without side teeth)		mm	380/330
Total length of caterpillar band		mm	1200
Scope of work	Code	Unit	Standard
Maximum excavation height	F	mm	2490
Maximum unloading height	G	mm	1745
Maximum excavation depth	H	mm	1725
Maximum vertical arm excavation depth	I	mm	1655
Maximum excavation distance	J	mm	3030
Minimum turning radius at front end	K	mm	1490
Maximum excavation ground distance	L	mm	2940
Maximum bulldozing height	M	mm	170
Maximum bulldozing height	N	mm	240

Note(grease up):

①Root surface of rotary bearing.

At inner ring of rotary bearing.

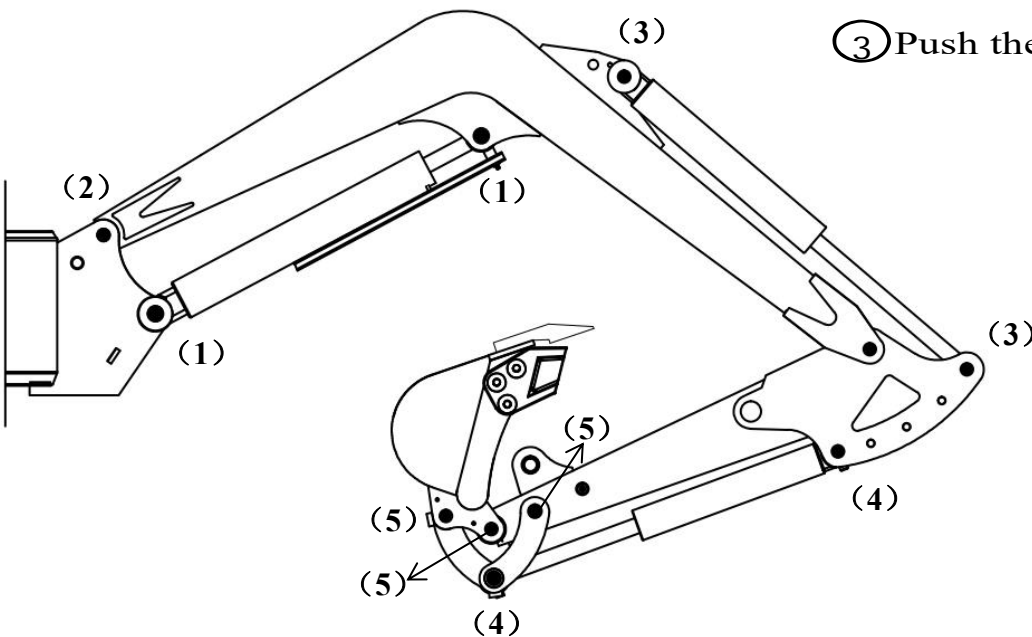


Note (grease up):

Chassis, such as:

②Push and shovel cylinder 2;

③Push the shovel 2.



Note (grease up): Lubricating grease is added to the working device as follows:

- (1)Big arm cylinder 2;
- (2)Big arm and side swing head 1;
- (3) Bucket rod cylinder 2;
- (4)Bucket cylinder 2;
- (5)Bucket connecting rod 3;
- (6)Boom bucket rod 1.

Outline parameter list

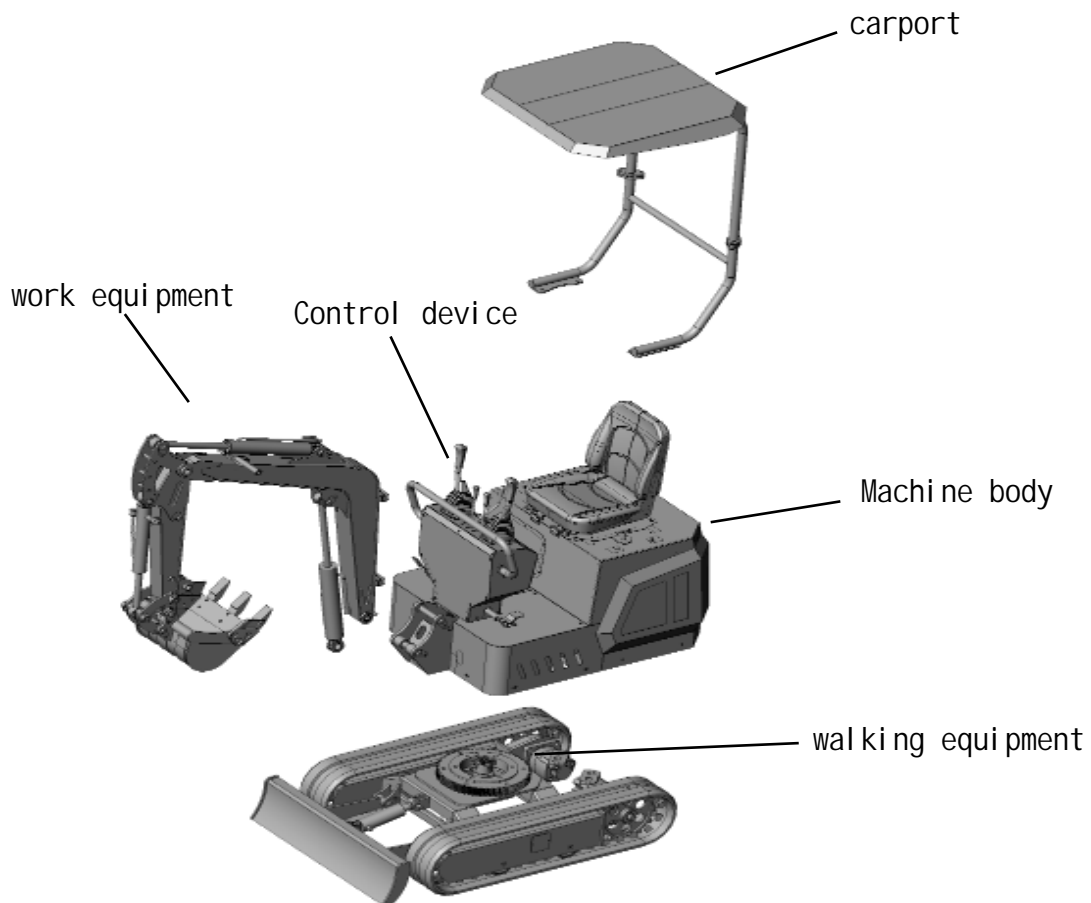
	Technical parameter	Unit		
Mini-excavator weight		kg	864.5	
Bucket capacity		m ³	0.022	
Working device form			Backhoe	
Engine	Model		XR2100	
	Delivery capacity	CC	420	
	Rated output power / speed	HP/r/min	13.5/3600	
Speed	Maximum travel speed	km/h	1.2	
	Slewing speed	rpm	9	
	Maximum climbing ability		30°	
	Maximum digging force	kN	6.5	
Size	Total length (Transportation)		2970	
	Total width		930	
	Total height (with / without ceiling)		2260 (2225)	
	Bulldozer	Maximum cleaning depth		240
		Maximum ground clearance height		170
Caterpillar band part	Ground pressure	kgf/cm ²	0.39	
	Caterpillar band	Material	Rubber	
	Tension type		Grease cylinder	
Hydraulic pump	Form		Gear pump	
Hydraulic fluid capacity	Working pressure	MPa	16	
	Flow	L/min	18	
	Hydraulic tank capacity	L	13	
	Engine oil capacity	L	1.1	
	Fuel tank capacity	L	6.6	

Chapter II Basic Structures and Work Principle of TERROR ONE Excavators

Section 1 Basic Structure of Excavator

Basic structure of excavator

The excavator consists of a carport, a machine body, a console, a chassis, and working devices.

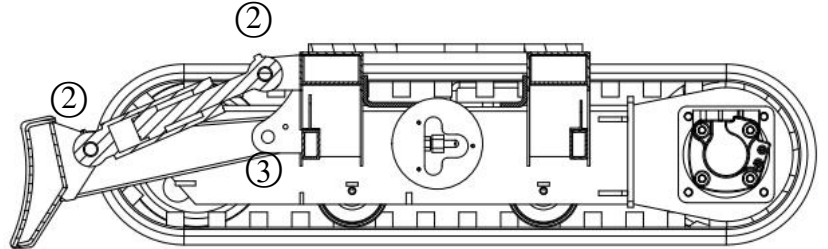
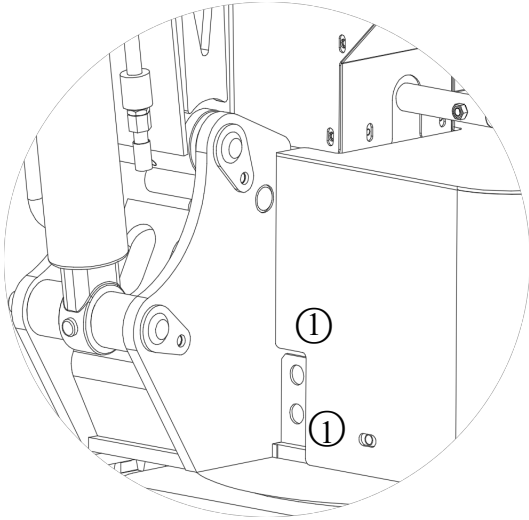


The carport prevents foreign objects from falling and protects the operator's safety. The machine body generates power and the console is responsible for normal operations. The chassis consists of a traveling device and a slewing support. The working device consists of a large arm and a small arm and a bucket.

Note(grease up):

①Root surface of rotary bearing.

At inner ring of rotary bearing.

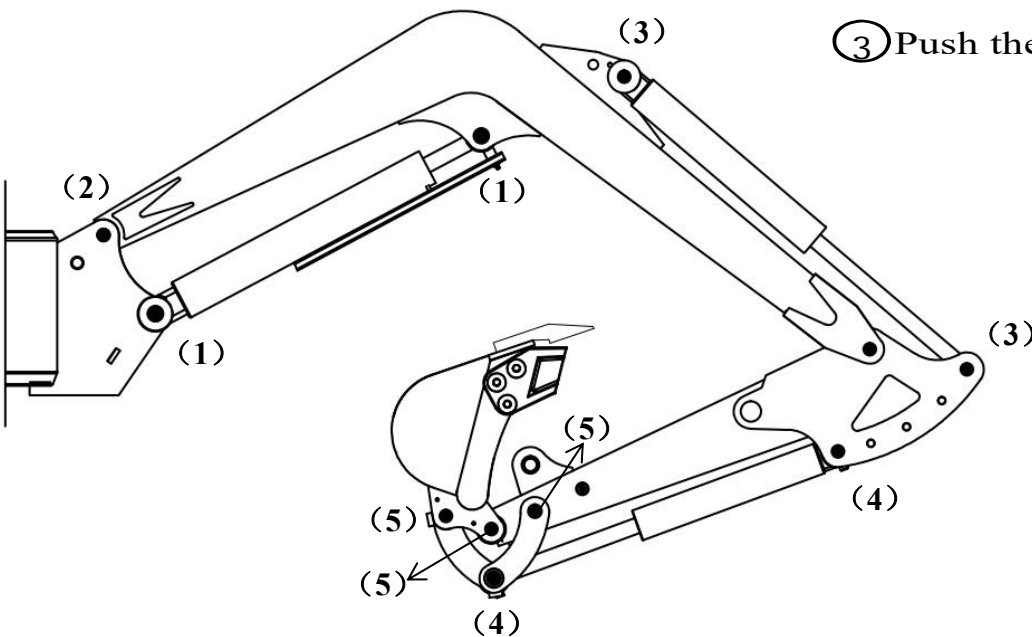


Note (grease up):

Chassis, such as:

②Push and shovel cylinder 2;

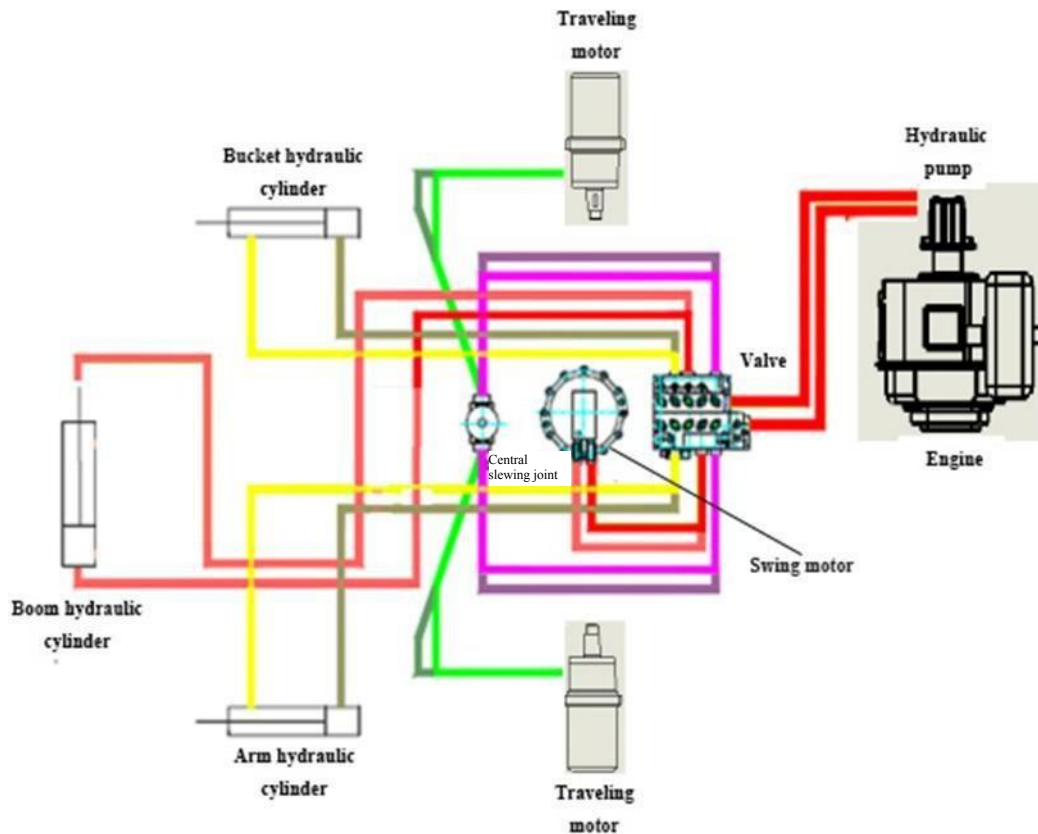
③Push the shovel 2.



Note (grease up): Lubricating grease is added to the working device as follows:

- (1)Big arm cylinder 2;
- (2)Big arm and side swing head 1;
- (3) Bucket rod cylinder 2;
- (4)Bucket cylinder 2;
- (5)Bucket connecting rod 3;
- (6)Boom bucket rod 1.

Section II Work principle of excavators



Movement and power transmission route of excavator shown below:

1. Traveling power route: e n g i n e — coupler — hydraulic pump (mechanical energy changed to hydraulic energy) — distributor valve — central swing joint — traveling motor (hydraulic energy changed to mechanical energy) — sprocket — rubber crawler — starting of traveling
2. Swing power route: e n g i n e — coupler — hydraulic pump (mechanical energy changed to hydraulic energy) — distributor valve — swing motor (hydraulic energy changed to mechanical energy) — slewing bearing — realizing of wing
3. Boom power route: e n g i n e — coupler — hydraulic pump (mechanical energy changed to hydraulic energy) — distributor valve — boom cylinder (hydraulic energy changed to mechanical energy) — boom movement
4. Arm power route : engine — coupler — hydraulic pump (mechanical energy changed to hydraulic energy) — distributor valve — arm cylinder (hydraulic energy changed to mechanical energy) — arm movement
5. Bucket power route: engine — coupler — hydraulic pump (mechanical energy changed to hydraulic energy) — distributor valve — bucket cylinder (hydraulic energy changed to mechanical energy) — bucket movement

Section III Basic structure of TERROR ONE excavators mechanical system

1 Power system

10 excavators are equipped with gasoline engines. Belton horizontal bar gasoline engine

2 Drive system

In the drive system of the excavator, the kinetic energy generated by the engine is transferred to the traveling mechanism of the swing device of the working equipment through the hydraulic system.

3 Swing mechanism

Swing mechanism could turn the work equipment and upper rotary leftwards and rightwards, so as to do the excavating and the unloading. TERROR ONE excavator's swing mechanism has to fix the rotary table onto frame and has it swing flexibly, without any risk of inclining. Therefore, TERROR ONE excavator is equipped with a slewing support (supports) and a slewing drive (power of turntable slewing), which are termed as swing mechanism.

3.1 Slewing support

TERROR ONE excavator has its rotary table supported with a rolling bearing, enabling the swinging of upper rotary.

3.2 Rotary drive

TERROR ONE excavator adopts the direct drive type. Namely, the output shaft of low-speed high-torque hydraulic motor is mounted with a driving pinion which meshes with the slewing gear ring.

4 Traveling mechanism

Traveling mechanism supports the complete weight of excavator and drives it.

excavator has the crawler traveling mechanism similar to other crawlers, with one hydraulic motor driving each track. This excavator adopts low-speed high-torque motor. When two hydraulic motors run in the same direction, this machine goes straightly forward; when one motor is supplied with oil and the other is braked, excavator steers around the braked track; when two motors runs reversely, excavator rotates as circle.

Each part of traveling mechanism is mounted on integral traveling frame. The pressure oil from hydraulic pump goes through the multi-way directional valve and the central swing joint into the hydraulic traveling motor that changes the pressure energy into output torque that then goes to sprocket, enabling the machine to move.

excavator's sprockets are integral castings and are able to correctly engage with the tracks. Each track is equipped with a tensioner, which adjusts the tracking tension and reduces the track vibration noise, abrasion, wear and power loss.

5 Work equipment

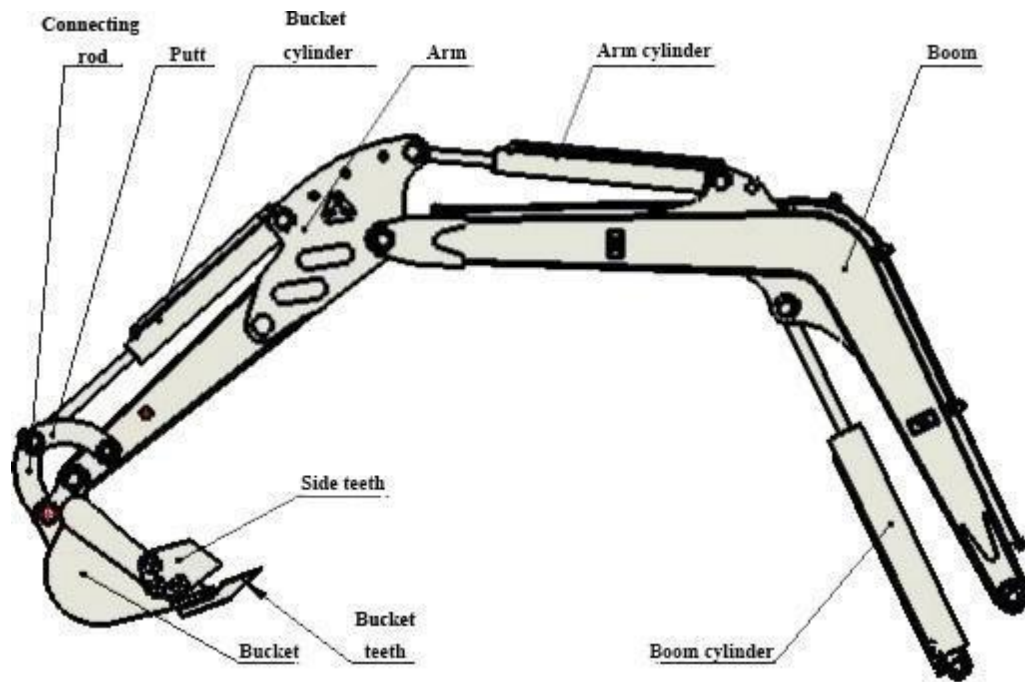
The hydraulic excavator could install multiple working equipment, Bucket breaking hammer, tipping bucket, mother-child clamp, wood grabber, spiral rotation and other auxiliary tools.

The boom, arm and bucket are articulated with each other, as shown in figure and swing around their articulated points respectively with aid of the hydraulic cylinder, to complete tasks of excavating, lifting and unloading.

5.1 Boom

As the main component of backhoe work equipment, the integrated skewed boom is installed

Being the most popular technology, skewed boom could allow excavator to dip deeper and to lower the unloading depth, fulfilling backhoe requirements.



5.2 Bucket

5.2.1 Basic requirements

- 1) The longitudinal profile of bucket facilitates the material flow and minimizes the loading resistance of materials.
- 2) Bucket teeth are mounted to increase the linear specific pressure of bucket onto material, with unit cutting resistance relatively low and easing to cut in and break soil. In addition, the teeth are resistant to wear and easy to replace.
- 3) The load is easy to get off, shortening the unloading time and increasing the effective capacity of bucket.

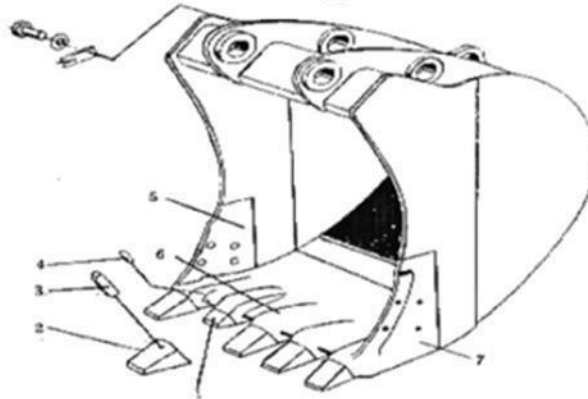
5.2.2 Structure

Bucket shape and size for backhoe are highly related to work objectives. In order to meet various excavation objectives, one excavator could be equipped with multiple types of buckets.

Connection between bucket and hydraulic cylinder is done using linkage mechanism, with bucket directly articulated with hydraulic cylinder, which drops the rotation angle of bucket but enables the working torque to change greatly.

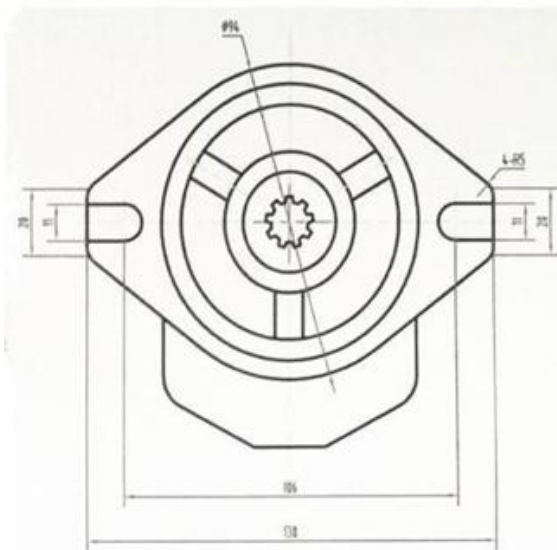
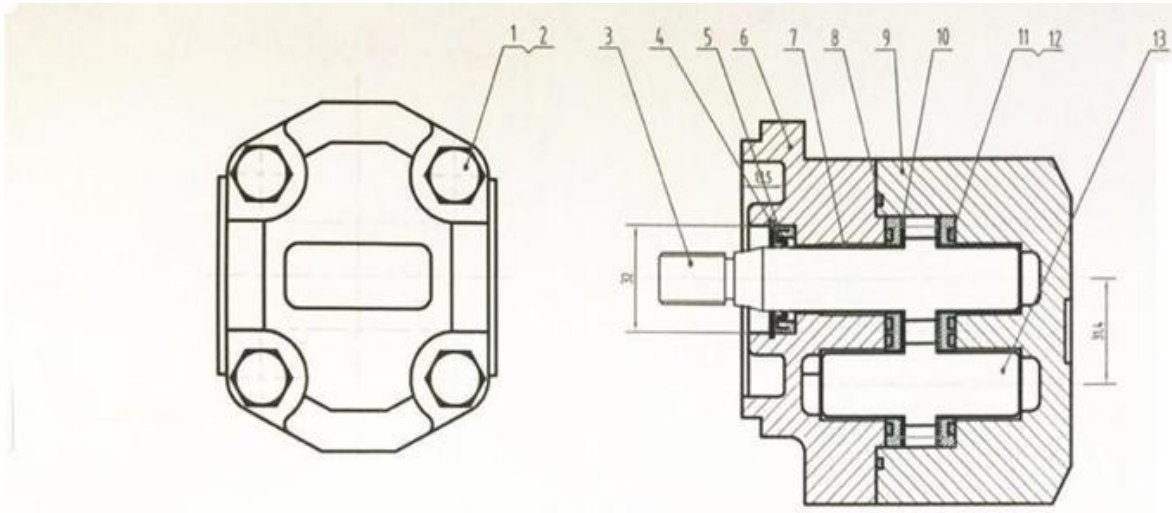


Bucket type



Bucket structure

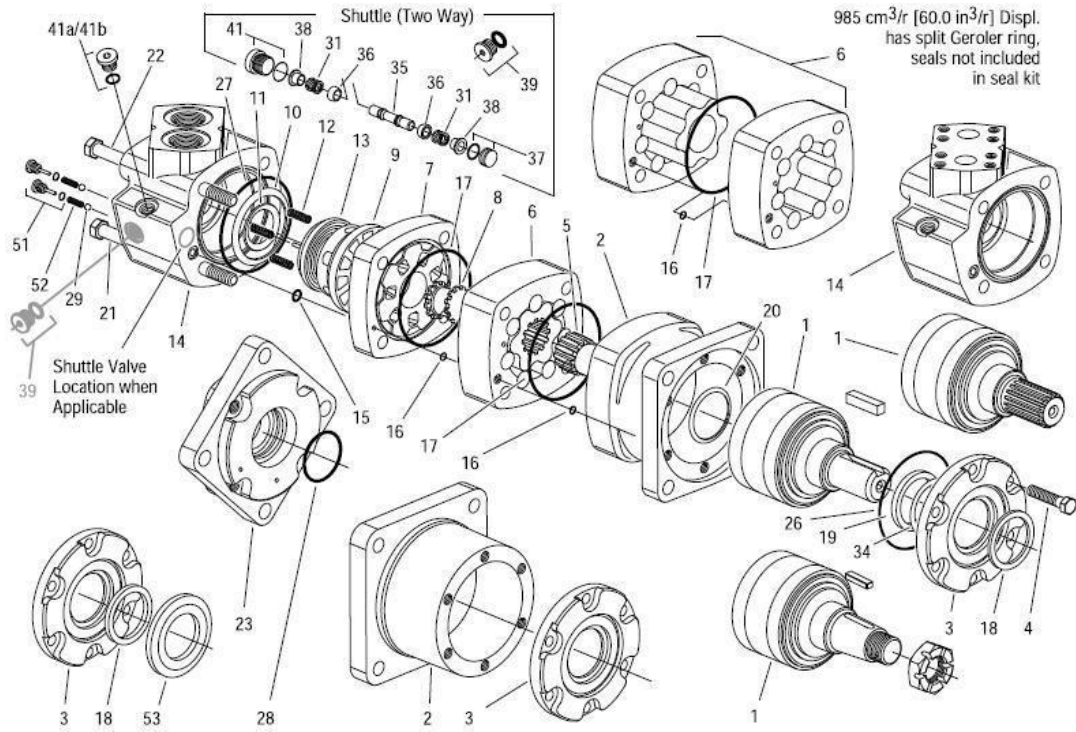
II. Main pump



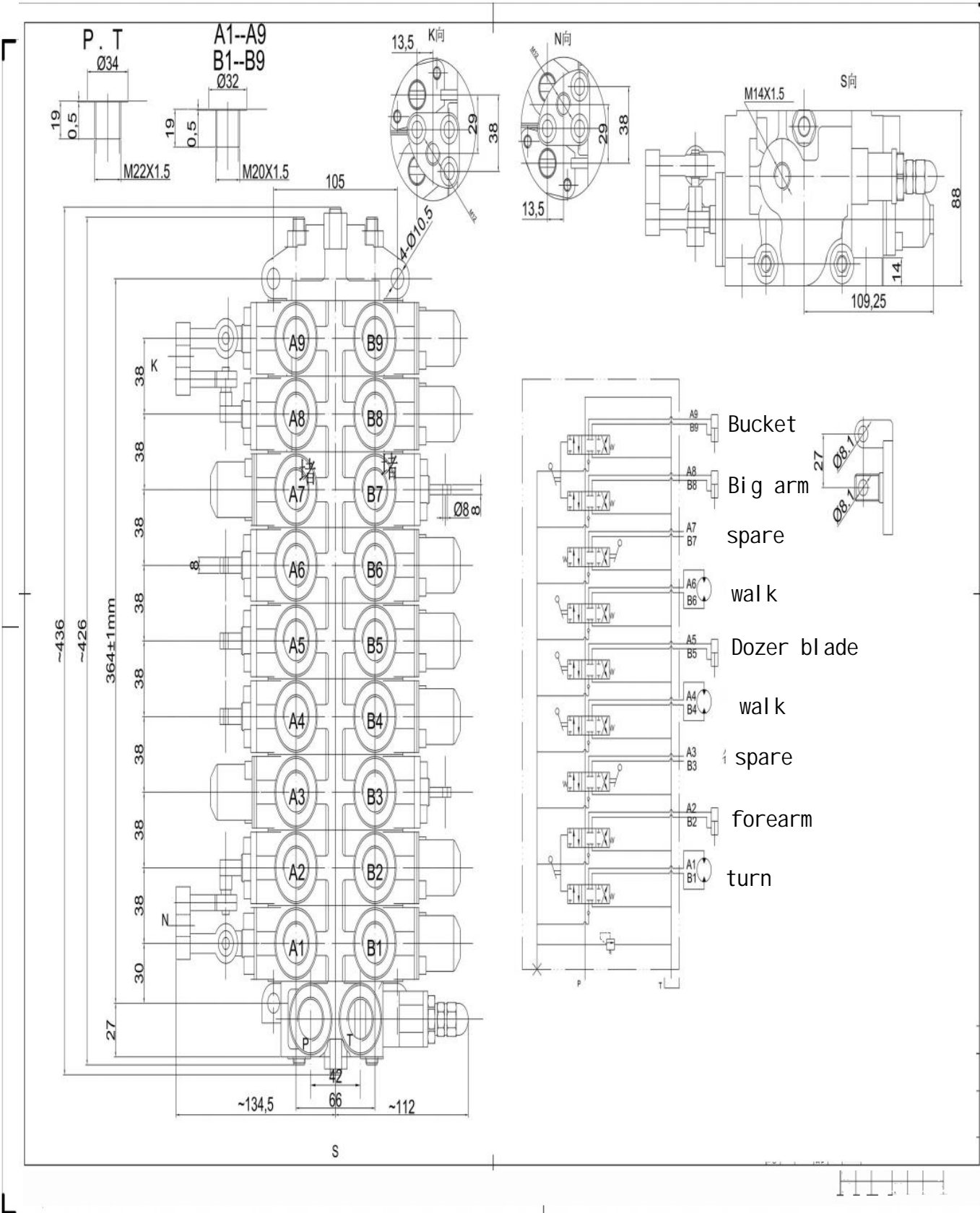
1	GB75-85	bolt M10x65-10.9	4	40Cr
2	GB93-87	gasket 10	4	65Mn
3	DHP006-01	driving gear shaft	1	20CrMnTi
4	GB893.1-86	ring 32	1	65Mn
5	oil seal	NY19x32x7	1	Combine parts
6	DHP006-02	front cover	1	QT450-10
7	DU bearing	φ21x φ19x20	4	Combine parts
8	DHP006-03	RECTANGULAR RING	1	Rubber L-4
9	DHP006-04	pump casing	1	QT450-10
10	DHP006-05	lateral plate	1	25copper-base powder metallurgy material
11	DHP006-06	Ear gasket	2	Rubber L-4
12	DHP006-07	Ear shape block slice	2	nylon
13	DHP006-08	driven gear	1	20CrMnTi

Traveling motor

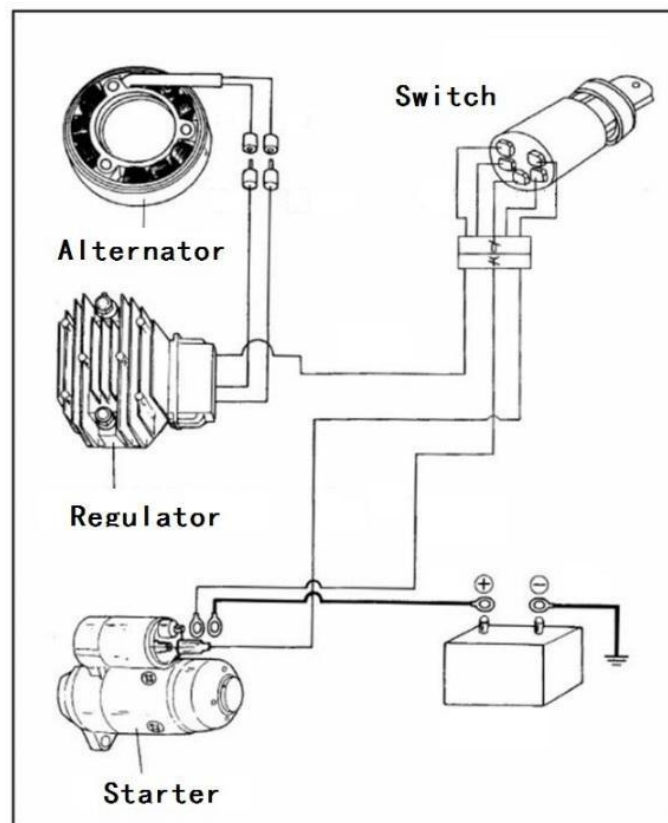
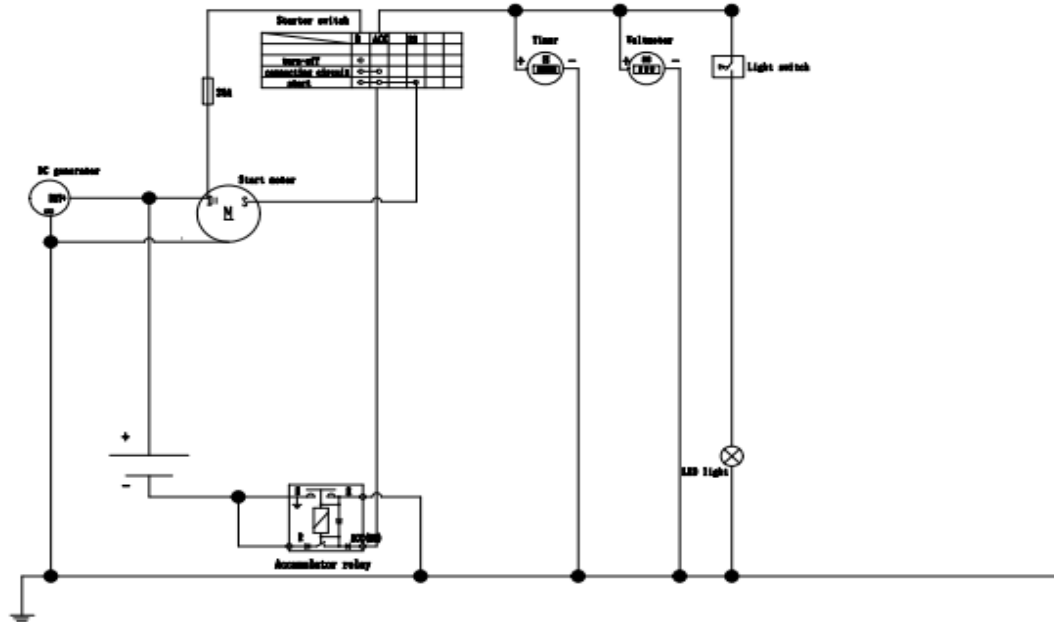
Disc Valve Motors--- BM series -005 and -006



Section IV Schematics of main valve



Section V. Electrical system diagram



Chapter III Service Excavator service technology

Built to withstand high temperature and pressure, the hydraulic oil temperature of excavator can go to a high of 85 °C, with a maximum engine silencer temperature of 700°C and pressure of 15-16Mpa. Therefore, the operators should be specially certified to handle the TYPHON mini excavators. In addition, maintenance and repair of excavator should be strictly in line with regulations to avoid any accident.

Section I Basic construction knowledge

There are four basic movements: bucket rotation, arm stretching / backing, boom lifting / lowering and turntable swinging.

In general, pulling/pushing of hydraulic cylinder and rotation of hydraulic motor is controlled with three-way axial slide valve through the oil-flow direction and the work speed is controlled by operator or auxiliary devices according to the quantitative system and the valve openness.

1.1 Basic requirements on control system

Basic requirements on control system include:

- 1) Control system should be centralized in the driving area of upper rotary and satisfy the man-machine requirements. For example, controllers and driver seat has been designed to cater to heights of 160-180 cm for males and 150-170 cm for females.
- 2) Starting up and stopping should be steady, with its speed and power in control.
- 3) Easy, handy and visual operations In general, the operational force on handle should not exceed 40~60 N and handle travel should not exceed 17cm.
- 4) Control mechanism should minimize the deformation of its lever, as well as the inside clearance and the idle travel.
- 5) Ensure the operational performance does not vary much outside -20~45°C.

Section II Preparation for work

1. Inspection before startup

In order to ensure the stable performance and safe operation of the excavator, some inspections need to be done before starting the machine.

- 1: Check whether there are obstacles within the working radius of the excavator to avoid collisions
- 2: Check whether there is oil leakage in the machine
- 3: Check whether the engine oil and fuel are normal and check the hydraulic oil level.
- 4: Check whether each lubrication point needs to be filled with lubricating oil
- 5: Check the track tension and adjust it in time if there is any looseness.
- 6: When the engine is not started, check whether each operating handle is normal (whether the movable handle returns normally) and whether each button of the machine is normal.
- 7: Start the engine, allow the engine to idle for 5-10 seconds, then increase the throttle to operate the machine.

2: Inspection after shutdown

- 1: Drive the machine to a flat place, place the bucket on the ground, and turn off various switches to turn off the engine.
- 2: Check whether there is oil leakage in the machine
- 3: Add lubricating oil to each hinge according to working hours
- 4: If it is not working for a long time, please cover the machine to prevent rain from corroding the lines.

Section III Operational essentials

1. Traveling

Use the traveling handles.

(1) Straight

Forwards or backward move the handle, running the machine forwards or backwards.

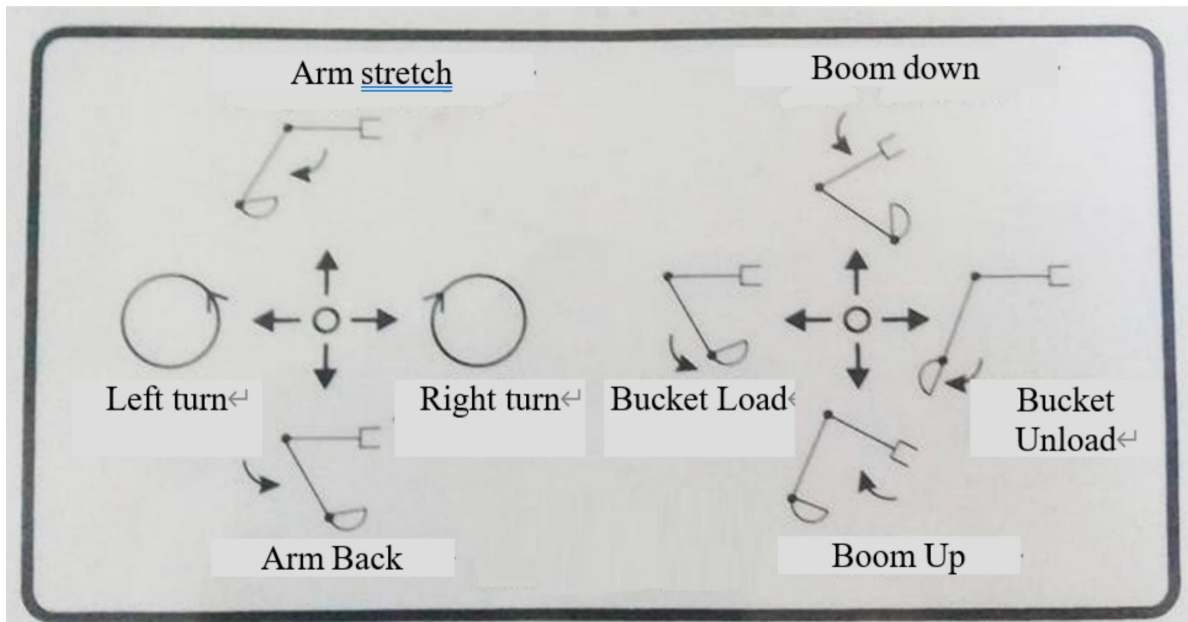
(2) Steering

- A. Left turn in situ: backward shift the left handle and meanwhile forward push the right handle.
- b. Right turn in situ: backward shift right handle and meanwhile forward push the left handle.
- c. Left turn with left track as axis: forward move the right handle
- d. Right turn with right track as axis: forward move the left handle

2. Excavation

- 2.1 The excavator slewing and the work equipment are respectively controlled with two handles, with positions shown below:





2.2 Basic excavation

1. Before excavation, the arm cylinder should have angle with the arm as 90° , bucket with ground to be excavated as 30° . Only in such cases, can each cylinder have the max excavating force. It is suitable for relatively hard soil, so as to decrease the excavating resistance.
2. To excavate any soft soil, bucket should be angled with the soil to be 60° , increasing the work efficiency.

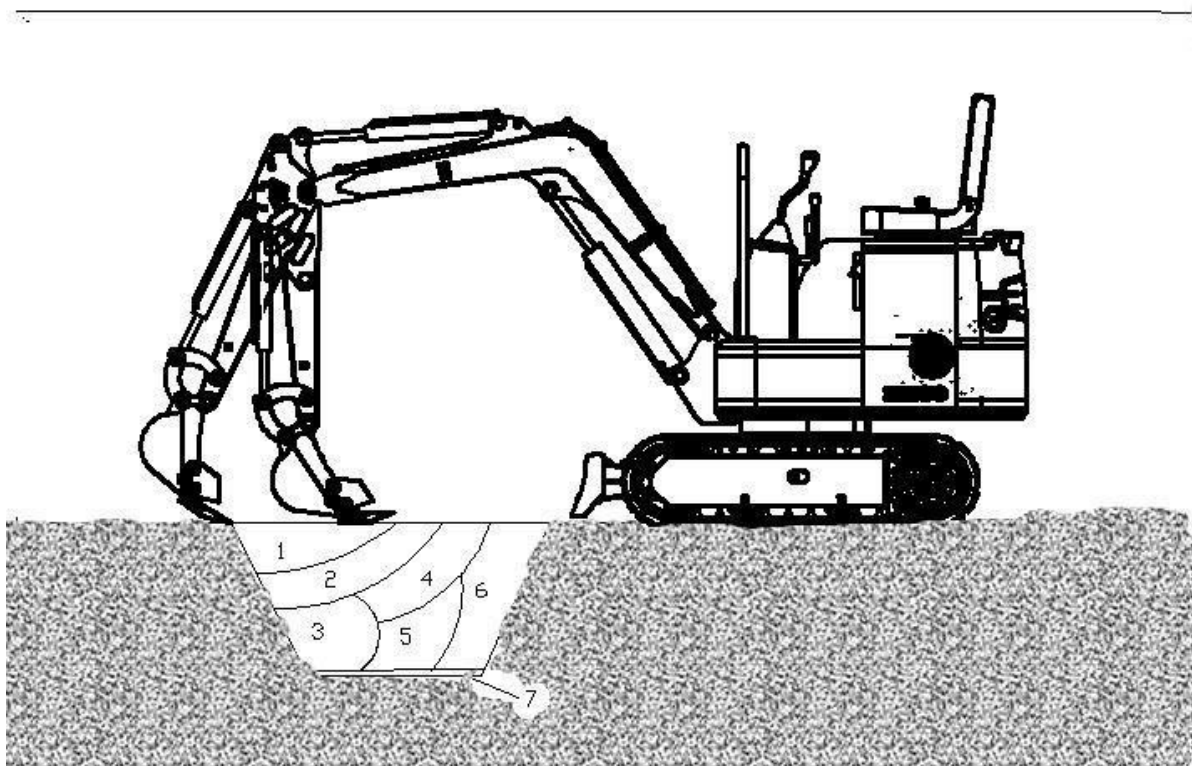
2.3 Lower excavation

Keep the angle between bucket base and the bevel at 30° , and retract the arm to start work.

2.4 Upper excavation

Keep the bucket blade vertical to the ground, and retract the arm to start work.

2.5 Ditching is carried out in 7 steps, as shown in figure.



Section IV Operational Precautions

Prohibitions and precautions for hydraulic excavators

1. Avoid the sliding land and falling stones.
2. Avoid any striking of work equipment.
3. Prevent the bucket from colliding with other vehicles, Avoid loaded bucket crossing over other vehicle cab or persons.
4. Do not let the excavator sink into soft ground or wetland.
5. While traveling, avoid any large obstacles such as large rocks.
6. It is prohibited to work with water depth exceeding the allowable limit.
7. While unloaded or loaded, the large stones should be handled carefully.
8. On cold days, park the machine on solid ground to avoid the track from being frozen. Remove any scrap away from track and its frame. If track is iced onto ground, use boom to lift track and carefully move the machine, so as not to damage the sprocket and the track.
9. Before moving machine, make sure the traveling direction is consistent with its handle. When traveling motor is at rear part, forward push the traveling handle, to drive machine forwards.
10. For long - distance traveling, please rest for 5min after every 20min of moving from point to points, so as not to damage the traveling motor.
11. Avoid climbing slopes of more than 15 degree, so as to reduce the risk of the machine overturning.
12. Take note of blind spots while machine is reversing or slewing.
13. While working, do not completely dig the soil from out of bottom of machine.
14. Never move the machine fast on high dam or slope. This may make the machine collapse or slide away, leading to severe accident.
15. Be careful when operating in underground facilities: unexpected severing of the underground cables or gas pipes may lead to explosion, fire or even personal casualty.
16. Keep a look out for overhead facilities such as over head bridges or gantries: if work equipment or other parts collides with over head structures, it may result in personal injury. Care must be taken to prevent the boom or the arm from colliding with any elevated item.
17. Keep a safe distance away from overhead power lines. Try work around power line, and let the part of machine or any load keep a minimum distance of 3m distance away from the power insulation. Verify and abide by the local related laws and rules. Different neighbourhoods have different requirements when using machinery.

Periodic checklist

No.	period project		The number The amount	The hour watch shows the time																Since then
				5	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	Side swing fulcrum pin	grease up	2																	Every day
2	Working device	grease up	11																	Every day
3	chassis	grease up	4																	Every day
4	Root surface of rotary bearing/ At inner ring of rotary bearing	grease up	1																	Every day
5	Side of the cylinder	grease up	1																	Every day
6	Air filter element	Clean the check	1				○				○					○			○	Every 200 hours
		replace	1																	Every 1000 hours Or every 1 year
7	Radiator hoses and hoops	check	2				○				○					○			○	Every 200 hours
		replace	2 4																	Every 2 years
8	Oil (CF grade)	replace	1	◎						○					○				○	Every 250 hours
9	Oil filter	replace	1	◎						○					○				○	Every 250 hours
10	Hydraulic oil return oil filter ☆	replace	1					◎											○	Every 500 hours
11	The hydraulic oil being☆	replace	1																	Every 1000 hours
12	Hydraulic oil suction filter element	replace	1																	Every 2000 hours
13	Tension part of guide wheel	replace	2																	Every 2000 hours
14	Ac engine, starter motor	check	-																	Every 2000 hours
15	Use of electrical wiring and fuse	check	-																	Every year

Note: 1、◎ Symbol indicates only the first time.

2、☆Symbol indicates that the replacement time will be shorter when using hydraulic front working devices such as crushing hammers.

3、As the machine runs, the oil is gradually consumed and reduced. Consumption varies depending on the operation, engine, etc. Before use, be sure to confirm whether the oil level is in Between the upper and lower limits of the oil mark, and then refueling maintenance. In order to avoid the danger of shortening engine life and cylinder, please use the oil designated by Kubota and the authentic oil filter of Kubota. And comply with the specified replacement time.

Inspection and maintenance of hydraulic system



Caution: in work, the hydraulic system may become very hot. Please cool the machine down before inspection or maintenance!

1. Before maintenance of hydraulic system, make sure the machine stands on flat and solid ground.
2. Lower the bucket onto ground and shut down engine.
3. Do not start any maintenance until the hydraulic oil and lubricant completely cool down, as the hydraulic system may be still hot and pressurized as soon as work is over.
 - a. Drain the air out of hydraulic oil reservoir to release inside pressure.
 - b. Cool the machine down.



Caution: inspection and maintenance of hot and pressure parts may cause them or hydraulic oil to spray out, leading to personal injury!

- c. While removing the bolts or nuts, do not have your body facing them, as the hydraulic parts, even if they cool down, they may still have pressure..
 - d. Never try to check the traveling or slewing motor circuits on slope, as they may have pressure due to their dead weight.
4. While connecting the hydraulic hoses and pipeline, keep the seal surface free of any dirt and damage. Keep the above mentioned in mind:
 - a. Clean the hose, the pipeline and inside of hydraulic oil tank with detergent, and then thoroughly dry them.
 - b. Use the O-ring free of any damage or defect.
 - c. While connecting the pressure hose, do not twist it; otherwise its service span will be shortened. .
 - d. Carefully tighten the low-pressure hose clamp.
5. The hydraulic oil to be added should have the same grade. Namely, do not mix the oil with different grades. The hydraulic oil has been added before delivery, and therefore, please use the recommended oil. All oil in system should be changed at once.
6. With no hydraulic oil, never start up engine.

I. Inspection of hydraulic oil level --- each day



Important: With no hydraulic oil, never start up engine!

1. Park machine on the flat ground.
2. Completely retract the arm cylinder and extend out the bucket cylinder, so as to locate the machine.
3. Lower the bucket onto the ground.
5. Idle engine at low speed for 5min.
6. Shut down engine Unplug the ignition key.
8. Check if the oil level in hydraulic oil tank between the markers on dipstick, and add it if needed. . .

Caution: Hydraulic oil tank has pressure, therefore slowly open its cap to release pressure before adding of oil.

9. Open the hydraulic oil tank to add oil and then check the oil level again. .
10. Put the cap back on hydraulic oil tank



III. Change the hydraulic oil ---2000 h

Replace the hydraulic oil suction filter element-----every 1000 h



Caution: do not do so until the hydraulic oil cools down as it may be very hot.

1. Park machine on the flat ground.
2. Completely retract the arm cylinder and extend out the bucket cylinder, so as to locate the machine.
3. Lower the bucket onto the ground.
4. Idle engine at low speed for 5min.
5. Shut down engine Unplug the ignition key.
6. Dismantle the covers
7. Clean the top of hydraulic oil reservoir to avoid any dirt into its system.
8. Slowly open the hydraulic oil cap to release the pressure.
9. Loosen and take down the oil-pickup filter element cap.
10. Loosen and take down the drain plug at bottom of hydraulic oil tank to drain the oil out of tank.
11. Take out the oil-pickup filter and the levers.

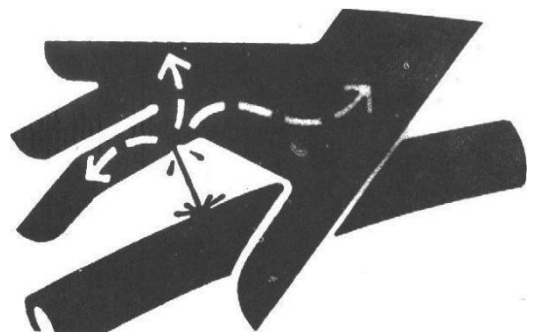


Caution: the hydraulic oil tank has pressure. Slowly open the hydraulic oil cap to release the pressure before taking off the cap!

12. Clean the filter and inside of hydraulic tank.
13. Use oil -pickup pump to suck the oil residue out of bottom of hydraulic oil tank.
14. Put on the filter and the levers to make sure the filter is correctly fixed onto the outlet.
15. Clean and re-install the drain plug onto the bottom of tank.
16. Add the oil until between markers on oil dipstick.
17. Put on the oil-pickup filter element cap to make sure the filter and the levers are at correct position and then tighten the bolts to 49N.m.

Important: with no oil in hydraulic pump, starting up of engine may damage to hydraulic pump!

18. Tighten the oil tank cap.
19. With engine idling at low speed, slowly and steadily control the lever for 15min to drain the air out of hydraulic system.
20. Completely retract the arm cylinder and extend out the bucket cylinder, so as to locate the machine.
21. Lower the bucket onto the ground.
22. Turn off the engine. Unplug the ignition key.
23. Check the hydraulic oil level in hydraulic oil tank and add it if needed.



V. Inspection of hose and pipeline

--- Each day

---every 250 h



Caution: any sprayed fluid could penetrate your skin, leading to personal casualty!

Therefore, use a paperboard to check for leakage.

In addition, care must be taken to keep your hands and body away from pressure oil.

In case of accident, please immediately go to doctor with trauma experience. Any fluid into skin has to be removed in a few hours, which may lead to gangrene.



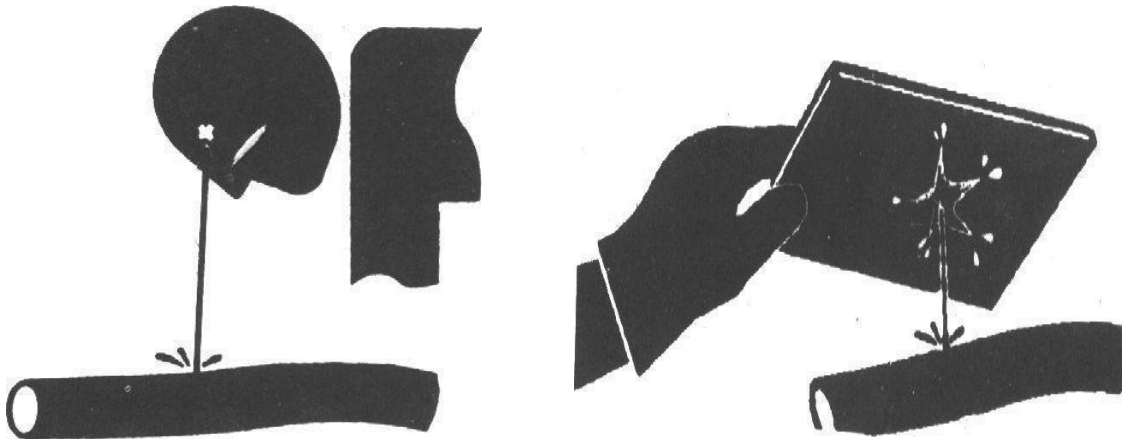
Caution: leaked hydraulic oil and lubricant may lead to fire or personal casualty!

1. Park machine on the flat ground. Lower the bucket onto the ground. Shift the pilot switch to Lock Turn off the engine. Unplug the ignition key.
2. Check if there is lost part, loosened pipe clamps, twisted hose, pipeline or hose rubbing with each other. In case of any abnormal, please replace or tighten it according to table 1-3.
3. Tighten, repair or replace any loosened, damaged or lost pipe clamps, hoses, pipes, oil cooler and flange bolts.

Do not bend or impact any pressure pipeline.

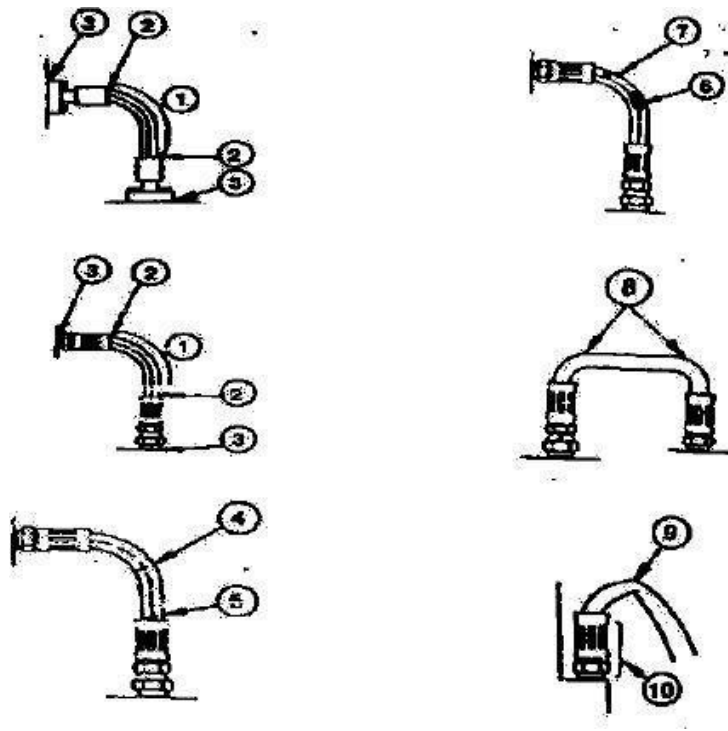
Never install any bent or damaged hose or pipeline.

Caution: related positions of check points and the abnormalities



Please use the genuine TYPHON excavator parts

Interval (h)	Check points	Abnormal	Measures
Every day	Hose surface Hose end Connector body	Leakage 1 Leakage 2 Leakage 3	Replace it Replace it Tighten or replace the hose or O-ring
Every 250h	Hose surface Hose end Hose surface Hose surface Hose Hose Hose end and joint body	Crack 4 Crack 5 Reinforcing material protruded 6 Local part protruded 7 Bend 8 Bend 9 Deformation or corrosion 10	Replace it Replace it Replace it Replace it Replace it Change it (proper bending radius) Replace it



Fuel system

capacity of fuel tank: 6 L

Parts		Quantity	Interval (h)						
			10	50	100	250	500	1000	2000
Drain dirt out of collector of fuel tank		1		★					
Check carburetor		1		★					
Replace spark plug		1					★		
Check the fuel hose.	Leakage	--	★			★			
	Crack / twist / others	--	★			★			
★ Maintenance interval under normal conditions									

Fill up the fuel

1. Park machine on the flat ground.
2. Lower the bucket onto ground.
- 3: Turn off the engine, pull out the key, and let the machine cool down naturally.
- 4: Add fuel



When adding fuel, be sure to keep the surface of the tank clean to prevent foreign matter from entering the tank and keep it away from sources of fire

After adding fuel, you should immediately close the fuel tank cap and check whether there is any fuel leakage. If a leakage is found, clean it up in time to eliminate the hidden danger before starting the machine.

Electrical system - battery

- I. Check the battery electrolyte level and the terminals.



Caution: gas inside of battery may explode it. Therefore, keep any spark and flame away from battery. Use a flashlight to check the electrolyte level. In addition, the sulphuric acid in battery electrolyte is as toxic as to burn your skin or your cloth holes or to blind your eyes. . .

Therefore, take the following methods to avoid any rick:

1. Refilling of battery should be done at well-ventilated site.
2. Put on goggles and plastic gloves.
3. Care must be taken not to spray out the electrolyte.
4. Use the proper measures to assist battery startup.

If touched with acid:

1. Rinse the skin
2. Use the soda or the lime to neutralize the acid.
3. Rinse eyes for 10 - 15 min and then go to doctor.



Caution:

- a. Always firstly disconnect the battery clips (-) away from the ground and then lastly connect it.
- b. Always keep the terminals at top to battery and the breather clean, to avoid the battery from discharging. Check if the battery terminal is loosened or rusted. Coat the terminals with vaseline to avoid any corrosion.

Replace the battery

There is a 12V battery with one negative pole (-) grounded.

If battery cannot be charged or store any electricity, replace the battery with same model.

Replace the fuse.

If the electrical device does not work, please firstly check the fuse.

Important: please install the fuse with correct amperage, so as to prevent against burning of electrical system due to overloading!

Others

Parts	Quantity	Interval (h)							
		10	50	100	250	500	1000	2000	4000
Check if the bucket teeth is worn or loosened.		★							
Change the bucket	—	If needed							
Replace the bucket and connect the new one to machine.	—	If needed, replace the bucket and connect the new one to machine.							
Adjust the connecting rod of bucket	1	If needed							
Take down the traveling lever	2	If needed							
Check and replace the fuse	1	★	Every 3 years						
Check the track defection	2					★			
Maintenance of tensioner	2						★		
Check the fuel injection timing	—	If needed							
Measure the compression pressure of engine	—						↗		
Check the starter	—						↗		
Check the bolts and nuts for tightening torque	—		↻		★				

Note:
 ★ Maintenance interval under normal conditions
 ↻ Maintenance needed at the first inspection
 ↗ Contact dealers

Check the bucket teeth --- each day

1. Check if the bucket teeth is worn or loosened.

Worn beyond the service limit, the bucket teeth may be replaced.



Caution: care must be taken to avoid the metal scrap from flying out, leading to personal injury. Wear the goggles or the safe glasses or safe devices suitable for operations!

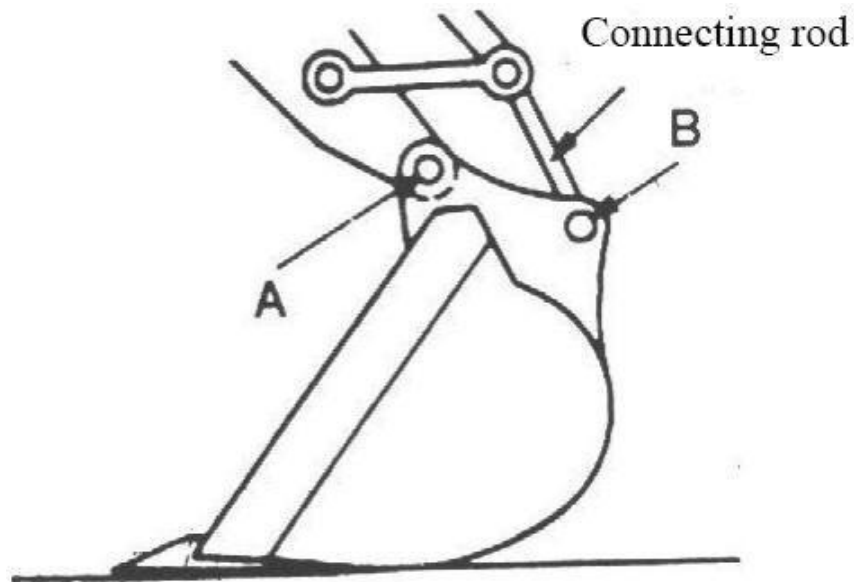
Change the bucket



Caution: while hitting out or into the connecting pin, care must be taken to prevent against any personal injury due to out-flieed metal scrap. Wear the goggles or the safe glasses or safe devices suitable for operations!

1. Park the machine on flat ground and lower the flat surface of bucket onto ground to make sure the bucket does not move after the removal of pin.

2. Slide the O-ring out, as shown in the figure.
3. Remove the bucket pins A and B to separate the bucket and the arm. Clean the pin and its pin hole and then properly grease them.
4. Adjust the arm and the new bucket correctly, and make sure the bucket does not roll away..
5. Install the bucket pins A and B.
6. Put the locker and ring onto pins A and B.
7. Adjust the connection clearance of bucket at pin A. Refer to the way to adjust the bucket connection clearance.
8. Grease the pins A and B.
9. Start up engine and run it at low speed. Slowly rotate the bucket to two directions to check if there is any interference to movement of bucket. Do not use any machine with interference, which should be solved immediately. .



Check the bolts and nuts for tightening torque

.....every 250 h (initially at 50 h)

Check the tightness at initial 50h and then every 250 h. Tighten it to the set torque if needed. Replace it with bolts and nuts with same or higher grade.



Important: please use the torque wrench to check the torques of bolts and nuts!

Metric bolts and nuts			
Thread dimensions	Standard torque (N.m)	Thread dimensions	Standard torque (N.m)
M6	12±3	M14	160±30
M8	28±7	M16	240±40
M10	55±10	M20	460±60
M12	100±20	M30	1600±200

2. Torque of main components: (N.m)

Thread dimensions	Recommended torque
M16 bolts fixing the traveling motor	252±39.2
M16 bolts fixing the sprocket	252±39.2
M20 bolts fixing the slewing bearing	570±60
M20 bolts fixing the swing mechanism	570±60



Important:

1. Before installed, the bolts and nuts should be cleaned.
2. Grease the bolts and the nuts (such as the white zinc b able to be dissolved to lubricant), so asto stabilize their abrasion coefficient.
3. The counterweight bolts should be kept tightened up.

Caution: all the tightening torques should be expressed with kgf.m.

For example: use a wrench with 1m long to tighten the bolts and nuts, and apply 12kgf of force to the end of wrench, generating the following torque:

$$1\text{m} \times 12\text{kgf} = 12\text{kgf.m}$$

To generate the same torque with 0.25m wrench: $0.25\text{m} \times y = 12\text{kgf.m}$

Needed force: $y = 12\text{kgf.m} / 0.25\text{m} = 48\text{kgf}$

Maintenance under the special cases

Operational conditions	Precautions for maintenance
Moor land, rainy or snowy	After operation, clean machine and check bolts and nuts for break, damage, looseness or loss. Lubricate all parts to be lubricated on time.
On beach	After work, thoroughly clean the clean to remove the salt. Frequently maintain the electrical system from being corroded.
Dusty environment	Air filter: clean the filter element periodically or at shorter interval Fuel system: clean the filter and its element periodically or at shorter interval. Electrical devices: periodically clean it, specially the AC generator and starter's rectifier.
Stony roads	Track: careful operations Frequently check if bolts and nuts are broken, damaged or lost. Loosen the track a little than the usual. Work equipment: parts may be damaged on stony roads, and therefore please use the reinforced bucket or heavy-duty bucket. .
Freezing cold	Fuel: use the high fuel suitable for low temperature Lubricant: hydraulic oil and engine oil with dry quality and low viscosity. Battery: keep the battery fully charged and maintain it at shorter interval. The electrolyte may be frozen if it is not fully charged. Track: keep the track clean. Park the machine on solid ground to avoid the track frozen.
Falling stone	Roof at driver seat: add the protective for cab roof if needed to prevent the machine from being damaged with falling stone.

Storage of machine

1. Repair any worn or damaged parts, and put the new one if needed. .
2. Clean the primary air filter elements.
3. If possible, retract all the hydraulic cylinders. If not, grease all the plungers exposed out of cylinder.
4. Lubricate all the grease points.
5. Put the track on the solid and long pad.
6. Cleaning of machine especially in winter, clean each part of excavator, especially the track.
7. Fully charged, the battery should be stored at dry and safe site. If battery cannot be taken down, separate the battery negative pole from (-) pole.
8. Painting if needed to avoid rusting.
9. Store the machine at dry and safe site. If outdoors, it should be covered with water-proof cloth.
10. If machine is to be stored for long time, run it at least once each month.

Chapter XII Troubleshooting

Section I General

To ensure excellent performance of TERROR ONE excavator, high quality Machine's performance and service life are determined not only by manufacturing quality and assembling quality, but also maintenance quality.

The marketing representative and service engineer shall remind the user that preventive maintenance is the easiest and most economical one among various ways of maintenance.

There are daily inspection and long-, medium- and short-term maintenance according to maintenance frequency.

Section II Troubleshooting of mechanism system

Symptom	Possible causes	How to solve
Noisy structural components	<ol style="list-style-type: none"> 1. The loose fasteners make noise. 2. Aggravated abrasion between bucket and end face of bucket rod 	<ol style="list-style-type: none"> 1. Inspect and tighten 2. Adjust the clearance to less than 1mm
Bucket teeth have dropped during operation	<ol style="list-style-type: none"> 1. Deformed spring and weakened elasticity of bucket tooth pin 2. Unmatched bucket tooth pin and seat 	Change the bucket tooth pin
The crawler has tangled up	<ol style="list-style-type: none"> 1. Loose crawler 2. The driving wheel moves fast in front on rugged road. 	<ol style="list-style-type: none"> 1. Tighten the crawler 2. The guide wheel shall move slowly in front on rugged road

Section III Troubleshooting of hydraulic system

Symptom	Possible causes	How to solve
The whole excavator does not move	Low oil level of hydraulic oil tank that the main pump sucks no oil	Add enough hydraulic oil
	Hydraulic oil filter clogged	Change the filter and clean the system
	Engine coupling is damaged (such as plastic plate, elastic plate)	Change
	The main pump is damaged	Change or repair the main pump
	The servo system pressure is low or zero	Adjust to regular pressure. If it fails to increase the pressure of servo overflow valve, disassemble to wash; if the spring is fatigue, add a washer or change the spring.
	The safety valve is set at low pressure or stuck.	Adjust to regular pressure. If it fails to increase the pressure, disassemble and wash. If the spring is fatigued, ass a washer or change the spring.
	Oil suction pipe of main pump explodes or comes off	Change with a new one

Symptom	Possible causes	How to solve
The unilateral crawler fails to move	There is a foreign object stuck in the track	Remove foreign body
	The main valve rod is stuck and the spring is broken	Repair or change
	Traveling motor is damaged	Change
	The upper and lower chambers of swivel joint are connected	Change the oil seal or clean the assembly
	Fuel pipe of traveling system explodes.	Change
The whole excavator moves slowly or powerless	Less hydraulic oil	Add enough hydraulic oil
	Low engine rpm	Adjust engine rpm
	Low system safety valve pressure	Adjust to specified pressure
	Serious leak inside the main pump	Change or repair the pump
	The traveling motor, rotation motor and cylinder are worn of different degree, which causes internal leak.	Change or repair the worn parts
	The aged sealing components, worn hydraulic elements, degraded oil of old excavator cause the operation speed becomes powerless along with the increase of temperature.	Change hydraulic oil, change sealing components of the whole machine, adjust the fit clearance and pressure of hydraulic components.
	The blocked engine filter causes serious decrease of loaded rpm and even flames out.	Change the element
	The blocked hydraulic filter accelerates abrasion of pump, motor and valve and leads to internal leak.	Clean and change the element according to the maintenance schedule.
The right and left traveling systems do not move (no other abnormalities)	Serious between main valve rod and valve hole causes serious internal leak	Repair the valve rod
	Central rotation connector is damaged.	Change the oil seal and change the groove if it is damaged
	The high pressure chamber and low pressure chamber of traveling operation valve is connected.	Change
	Serious leak inside the traveling operation valve	Change
	Low overloaded pressure of traveling valve of main valve or the valve rod is stuck.	Adjust and grind
	The left and right traveling reducers fail	Repair
	The left and right traveling motors fail	Repair
The oil pipe explodes	Change	
Deviation during traveling (no other abnormalities)	Wrong adjustment of variable point of main valve or serious internal leak of a pump	Adjust or repair
	Internal or external spring of one traveling valve core of main valve is damaged or tightened	Change
	The traveling motor leaks inside due to abrasion.	Repair or change

Symptom	Possible causes	How to solve
	The sealing component of central rotation connector is aged and damaged.	Change the sealing component
	The left and right crawlers are of different tightening.	Adjust
Boom (bucket rod and bucket) move to one direction only.	Main valve core is stuck or valve rod spring breaks.	Repair or change
Boom (bucket rod and bucket) does not move.	Boom valve rod is stuck or of low overloaded pressure	Repair
	Fuel supply pipe leaks, detached, O ring damaged or pipe fitting is loose	Change the damaged component
	Sandstone in main valve or the low pressure chamber is connected to the high pressure chamber	Change
Boom (bucket rod and bucket) drops too quick or the cylinder drops at a certain height even it is not operated due to dead weight	Low overloaded valve pressure	Adjust
	Serious internal leak of cylinder	Change the sealing component, repair the inner wall or groove of cylinder or change the cylinder.
	Loose oil pipe fitting, damaged O ring	Change
Boom (bucket rod and bucket) works powerlessly	Serious internal leak of multi-way valve or sandstone inside it	Change
	Low overloaded pressure	Adjust
	Serious internal leak of oil cylinder	Change the oil seal
	The main valve is disabled due to internal leak.	Repair or change
Boom (bucket rod and bucket) moves even it is not operated	multi-way valve core is stuck or serious internal leak	Grind or change
	multi-way valve rod spring breaks	Change
	Leak of working cylinder, or the working device drops due to dead weight	Change the oil seal
	Low pressure of overload overflow valve or the spring breaks	Adjust to specified pressure. Change the spring if it is broken.
Hot hydraulic oil	Wrong grade of hydraulic oil for excavator	Change the hydraulic oil
	Hydraulic oil cooler surface is polluted by oil and dirt, which blocks the air hole.	Wash
	Low oil level of hydraulic oil tank	Add enough hydraulic oil
	The hydraulic components such as motor, main valve and oil cylinder or sealing components are seriously worn and cause internal leak, which increases the oil temperature. Traveling rotation and working device are delayed and powerless. The hot temperature degrades the hydraulic oil. The safety valve is of poor air tightness, which leads to overflow.	Change the elements in time
No action of rotation (no	Hydraulic oil pipe breaks	Change

Symptom	Possible causes	How to solve
other abnormalities)	Rotary valve rod on main valve is stuck.	Repair
	Rotary motor is damaged	Repair or change
	The rotation support is damaged.	Change
Indifferent left and right rotation speed (no other abnormalities)	The right and left rotation of multi-way valve is of different overloaded pressure	Adjust
	Rotation valve rod of multi-way valve is slightly stuck.	
Delayed or powered rotation (no other abnormalities)	Serious external leak of hydraulic oil pipe	Change pipe fitting and sealing components
	Low overloaded pressure for rotation of multi-way valve	Adjust
	Serious internal leak of rotary motor	Repair or change
	The high and low pressure chambers of multi-way valve are connected, sand hole on valve body due to casting, which causes one-way action or linked actions	Change
The rotation mechanism moves even it is operated	Main valve rod spring breaks	Change
The excavator makes abnormal noise and shakes during operation.	Low oil level of hydraulic oil tank	Add oil
	The oil contains too much moisture and air	Change
	Safety valve of multi-way valve makes noise	Adjust
	Damaged coupling	Change
	Vibration caused by loose pipe clamp	Adjust
	Blocked filter	Change
	Air exists in oil suction hose	Release the air
	Uneven engine rpm	Adjust
	The bearing of working device is not lubricated or scraped	Apply lubrication oil or change the shaft or sleeve
Powerless oil cylinder or oil leak	Damaged sealing components	Change the sealing components
	A groove is found on the piston rod due to abrasion or detachment of chromium coating of piston rod, which causes oil leak.	Coat, paint, repair or change
	The air in the cylinder causes shaking noise during operation	Release the air

Section IV Troubleshooting of electrical control system

Fault codes of electrical control system of excavator
The engine fails to start
The engine flames out during operation
The engine fails to flame out
Automatic slow-down does not work
Slewing and traveling of all working devices.

Principle diagram

1. The engine fails to start

Fault description	● The engine fails to start	
The fuel pump system does not supply fuel or supply less fuel	Low engine rpm	Adjust to regular rpm
	Pump fault	Change
	Less fuel in the tank	Add fuel
	Fuel tube breaks, tube connector is loose and O ring is damaged	Change

Possible causes		Standard value in regular condition and reference value of fault diagnosis		
1	Low battery	Battery voltage	Color of charge state densimeter	
		Above 12V	Green (if it is white, change the battery)	
2	Fuse F1 and F11 fail	In case the fuse is burnt, the GND fail may happen. If he monitoring indicator on the monitor panel is not illuminated, inspect the circuit between battery and specified fuse.		
3	Engine ignition switch fault	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		Ignition switch	Position	Resistance
		Between 30 and 17	OFF	1MΩ
Start	Below 1Ω			
4	Starter relay K3 fault	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		Pin		Resistance
		85-86		200-400Ω
		87-30		Above 1MΩ
5	Security lock switch fault (open circuit inside)	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
			Lock rod	Resistance

Possible causes		Standard value in regular condition and reference value of fault diagnosis		
		Between 105 and GND	Unlocked	1MΩ
			Locked	Below 1Ω
6	Start motor fault (open circuit or short circuit inside)	★Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis. If all PS, GND, signals and engine start input are correct while engine start output is abnormal, the engine starter relay fails.		
		Engine or start motor	Engine start switch	Voltage
		PS; terminal B and GND	Start	20~30V
		Input of engine start, terminal C and GND		20~30V
7	Alternator fault	★Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
				Voltage
				Below 1V
8	Disconnected wire harness (disconnect from connector or poor contact)	★Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
			Resistance	Below 1
9	Poor GND of wire harness (contact with earth circuit)	★Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
			Resistance	Above 1M
10	Short circuit of wire harness (contact with 24V circuit)	★Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
			Voltage	Below 1V

2. Engine flames out during operation

Symptom		● Engine flames out during operation		
	Causes	Standard value in regular condition and reference value of fault diagnosis		
1	Disconnected wire harness (disconnect from connector or poor contact)	★Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		Between CN-12T ② and CN-132F ⑥	Resistance	Below 1
2	Poor GND of wire harness (contact with earth circuit)	★Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		Between CN-12T ② and CN-132F ⑥	Resistance	Above 1M

Section V Engine troubleshooting

1. Symptoms of failed startup of engine:

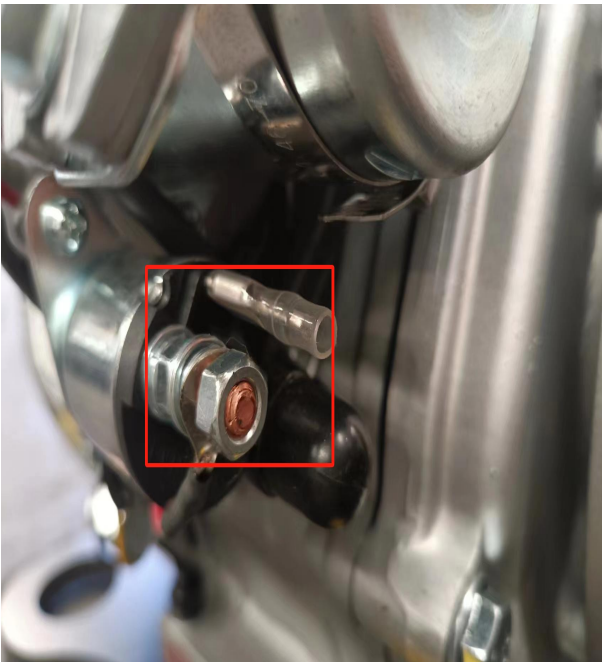
When starting the engine, the starter drives the engine but the engine fails to be started.

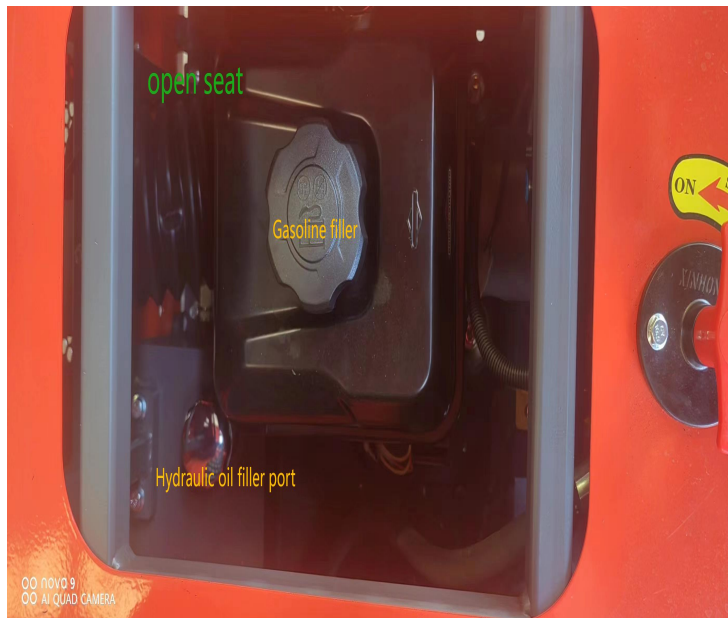
Possible causes:

- (1) Low battery;
- (2) Battery terminal is rusted or loose; Leading to poor line contact
- (3) Starter relay armature fails to disengage.
- (4) Ignition switch fault or starter fault;
- (5) The damper is not open
- (6) Carburetor clogged
- (7) Spark plug is aged or damaged

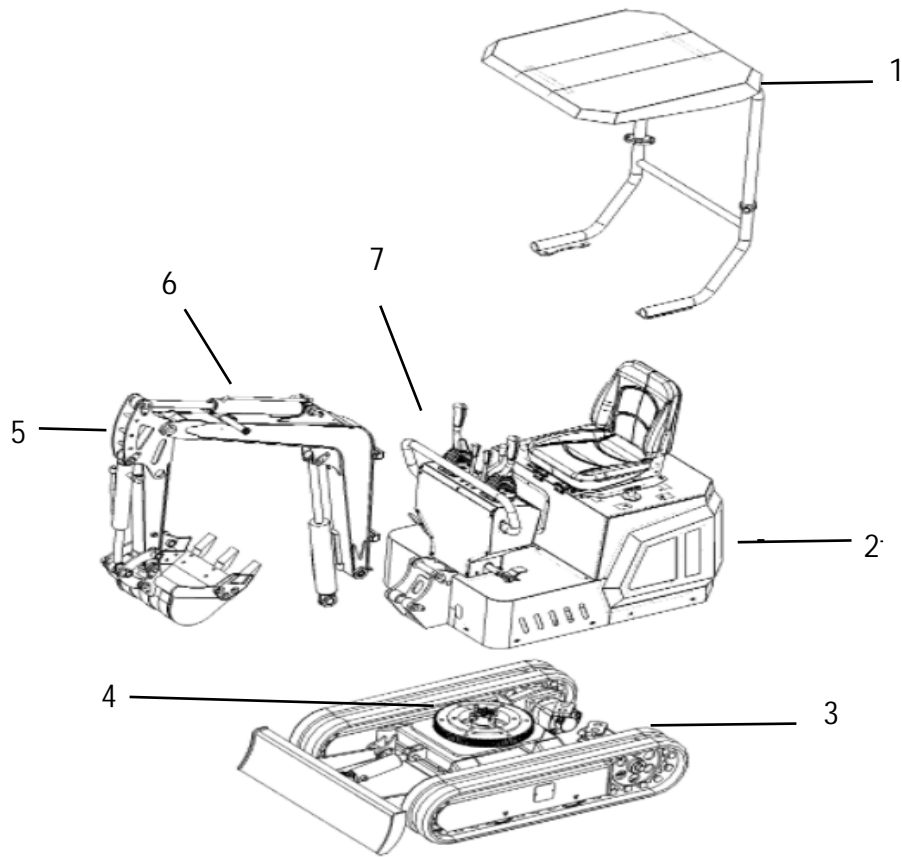
How to solve:

- 1: Charge the battery or check whether the battery is damaged
- 2: Clean the battery column fastening clamp
- 3: Check the starting relay
- 4: Check whether the starting switch is normal, short-circuit the starter test
- 5: Check the damper
- 6: Drain the fuel in the carburetor and check if there is any foreign matter
- 7: Replace the spark plug

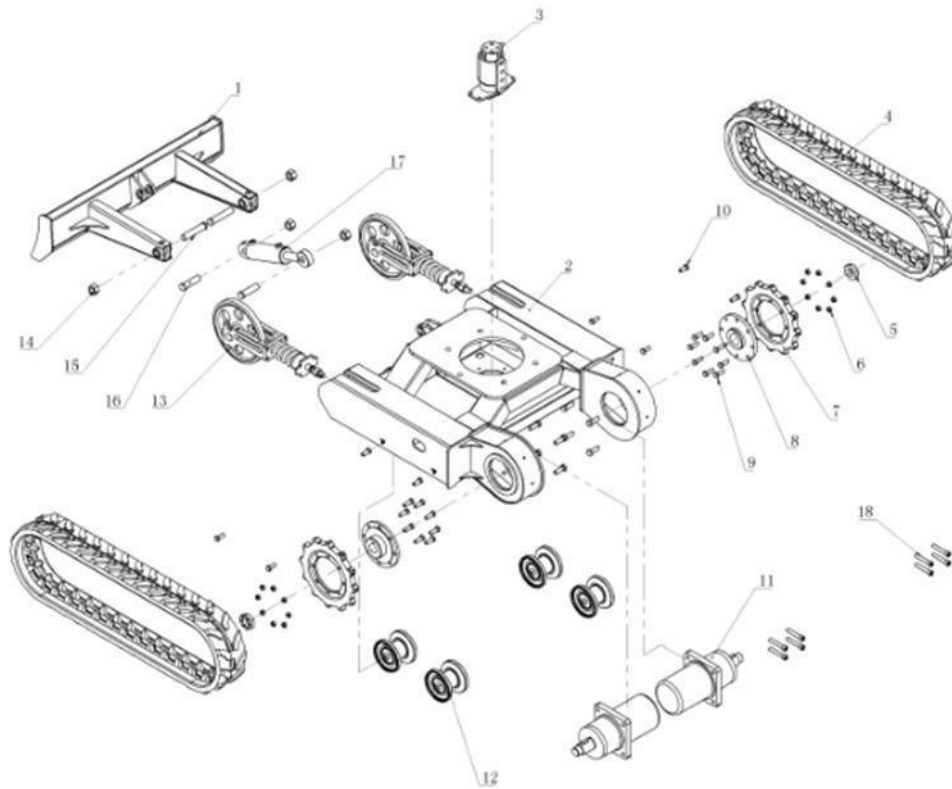




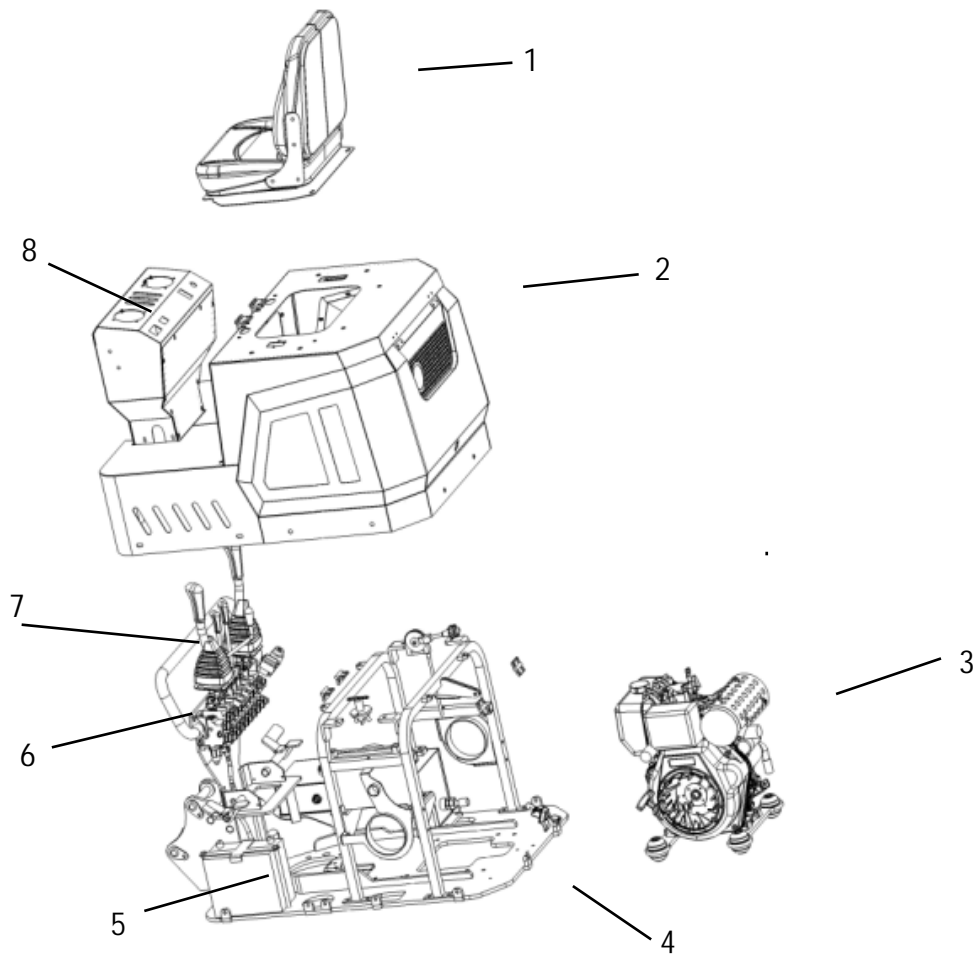
Attachment: BOM of vehicle parts



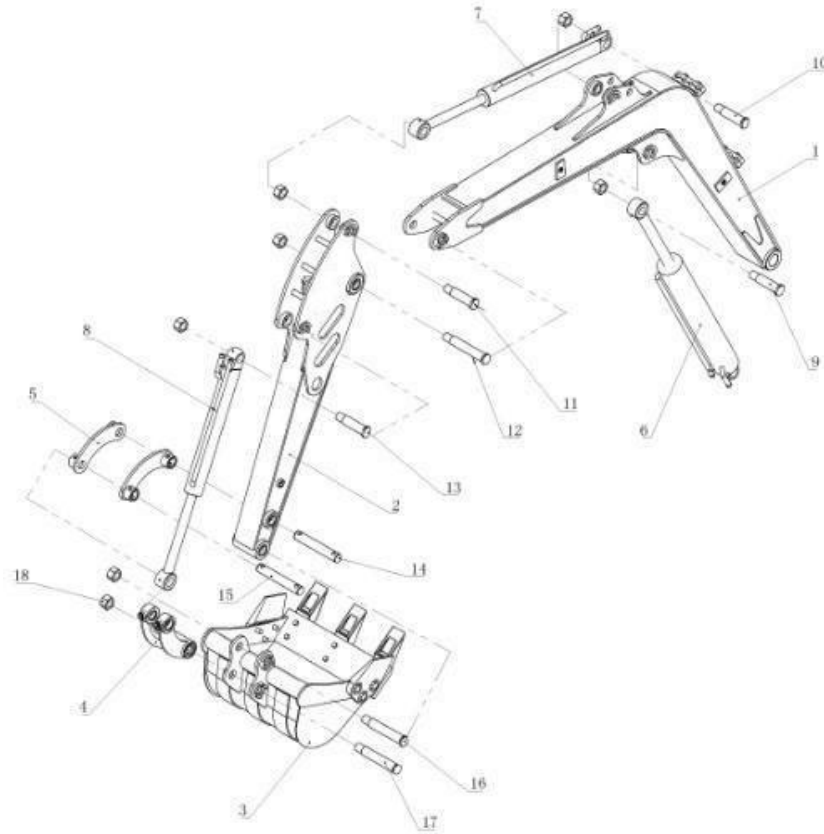
Exploded drawing of 1 . 0 T excavator assembly			
S/N	Name	Quantity	Remark
1	carport	1	
2	Upper fuselage	1	
3	lower fuselage	1	
4	slewing mechanism	1	
5	forearm	1	
6	Boom	1	
7	console	1	



1 Lower frame				
S/N	Part No.	Part Name	Quantity	Remark
1	1.1	Welded dozer shovel	1	
2	1.2	Welded lower frame	1	
3	1.3	Slewing joint	1	
4	1.4	Rubber crawler	2	
5	1.5	Lock nut	2	
6	1.6	Sprocket nuts	16	
7	1.7	Drive wheel	2	
8	1.8	Connecting disc	2	
9	1.9	Sprocket bolts	16	
10	1.10	Bolts fixing the track roller	8	
11	1.11	Traveling motor	2	
12	1.12	Track roller	4	
13	1.13	Idler assembly	2	
14	1.14	Pivot nuts	4	
15	1.15	Connecting shaft of dozer shovel	2	
16	1.16	Connecting shaft of cylinder	2	
17	1.17	Cylinder of dozer shovel	1	
18	1.18	Bolts fixing idler assembly	8	



2 Upper frame assembly				
S/N	Part No.	Part Name	Quantity	Remark
1	2.1	seat	1	
2	2.2	Upper body panel	1	
3	2.3	Engine assembly	1	
4	2.4	upper body bracket	1	
5	2.5	battery	1	
6	2.6	Multi-way valve main valve	1	
7	2.7	Operating handle	1	
8	2.8	console cover	1	



3. Front work equipment				
S/N	Part No.	Part Name	Quantity	Remark
1	3.1	Boom	1	
2	3.2	Arm	1	
3	3.3	Bucket	1	
4	3.4	Connecting rod	1	
5	3.5	Push rod	1	
6	3.6	Boom cylinder	1	
7	3.7	Arm cylinder	1	
8	3.8	Bucket cylinder	1	
9	3.9	Medium shaft of boom	1	
10	3.10	Rear shaft of arm cylinder	1	
11	3.11	Front shaft of arm cylinder	1	
12	3.12	Front shaft of boom	1	
13	3.13	Rear shaft of bucket cylinder	1	
14	3.14	Medium shaft of arm	1	
15	3.15	Front shaft of bucket cylinder	1	
16	3.16	Front shaft of arm	1	
17	3.17	Connecting shaft between bucket and connecting rod	1	
18	3.18	Shaft locker sleeve	7	