CTX8000 EXCAVATOR

OPERATING MANUAL

CTX8000 Excavator Manual

Preface

Chapter I: Usage Features and Performance Parameters of CTX8000 Excavator

Section I: Usage and Features

- The **CTX8000 Excavator** is a versatile machine, capable of multiple tasks such as **excavating**, **crushing**, **ditch cleaning**, **drilling**, and **bulldozing**.
- With **quick-hitched attachments**, the machine's utilization is significantly enhanced, offering adaptability to various tasks.
- The machine is designed for **easy operation** and **efficient transport**, making it ideal for **narrow or confined work sites**.

Section II: Main Performance Parameters

- **Hydraulic Type**: Single bucket
- **Engine Power**: [Insert engine power specifics here]
- **Operating Weight**: [Insert operating weight specifics here]
- **Max Excavation Depth**: [Insert depth specifics here]
- **Working Range**: [Insert working range specifics here]
- Additional performance parameters related to **hydraulic system** and **engine output** can be detailed in this section.

Chapter II: Basic Structures and Work Principle of CTX8000 Excavator

Section I: Overview

- This section provides a general introduction to the **key components** of the CTX8000 Excavator, highlighting the **structural design** and the **operational layout**.

Section II: Work Principle

- The **CTX8000 Excavator** operates based on the principles of **hydraulic power** for digging and lifting. It relies on advanced hydraulic components to ensure effective and powerful movement during operation.

Section III: Basic Structure of Mechanical System

- In this section, the **mechanical system** (including the **chassis**, **engine**, **undercarriage**, and **bucket** systems) will be explored. A focus will be placed on their roles in the excavation process and how they support the overall functionality of the machine.

Section IV: Basic Structure of Hydraulic System

- An in-depth look at the **hydraulic components** of the CTX8000 Excavator, detailing the **hydraulic cylinders**, **pumps**, and **valves**. This section will also explain the **fluid power** mechanism that drives the machine's movement and performance.

Chapter III: Service Technologies of CTX8000 Excavator

Section I: Basic Construction Knowledge

- Discusses the **construction principles**, **material handling**, and the **design features** that contribute to the durability and efficiency of the CTX8000 Excavator.

Section II: Preparation for Work

- Outlines the **pre-work checks** and **maintenance** steps needed before operating the machine, including:
  - **Checking hydraulic fluid levels**
  - **Inspecting the bucket and attachments**
  - **Ensuring machine stability and safety**

Section III: Operational Essentials

- Essential guidance for **starting up** and **operating** the CTX8000 safely and efficiently, including:
  - **Fuelling**
  - **Hydraulic system operation**
  - **Optimal operating speeds**

Section IV: Operational Precautions

- Important safety and operational warnings, including:
  - **Avoiding overloading**
  - **Safe manoeuvring in tight spaces**
  - **Maintaining proper engine and hydraulic fluid levels**

Chapter VI: Maintenance of CTX8000 Excavator

Section I: Daily Inspection

- Checklist of daily **inspections** and **maintenance tasks** to ensure smooth operation, such as:
  - **Checking engine oil and hydraulic fluid**
  - **Inspecting hoses and hydraulic lines for wear**

- **Cleaning air filters**

Section II: Periods of Overhaul, Medium, and Minor Repair

- Guidelines for when to perform more **in-depth repairs** or overhauls:
  - **Minor repair**: Quick fixes like replacing seals or cleaning filters.
  - **Medium repair**: Hydraulic and engine checks.
  - **Overhaul**: Complete inspections and replacements of major components after a specified number of operating hours.

Chapter VII: Troubleshooting of CTX8000 Excavator

Section I: General

- This section covers **general troubleshooting procedures** for diagnosing issues with the excavator, including machine failure to start or operational inconsistencies.

Section II: Troubleshooting of Mechanical System

- Focuses on common issues related to the **mechanical parts** such as the engine, undercarriage, and bucket attachments.

Section III: Troubleshooting of Hydraulic System

- Addresses problems such as **low pressure**, **leaks**, and **malfunctions** in the hydraulic system, along with steps to diagnose and resolve them.

Section IV: Troubleshooting of Electrical Control System

- Troubleshooting tips for the **electrical system**, including issues with the **battery**, **wiring**, and **electronic control units**.

Section V: Troubleshooting of Engine

- Diagnoses and solutions for **engine performance problems**, such as difficulty starting, poor fuel efficiency, and abnormal noises.

Section VI: Other

- Covers additional issues such as **unusual vibrations**, **excessive noise**, and **fuel system failures**.

Safety Rules and Regulations for Operating the Hydraform CTX 8000 Pro Excavator

Operating the **Hydraform CTX 8000 Pro Excavator** safely is essential to prevent accidents, injuries, and equipment damage. Below are key safety rules and regulations to follow:

1. Pre-Operational Checks

✅ Inspect the Excavator

- Check hydraulic lines, cylinders, and hoses for leaks or damage.
- Ensure all safety guards and covers are in place.
- Confirm that the tracks or wheels are free of obstructions and properly tensioned.
- Test the brakes, lights, and warning alarms.
- Check fluid levels: engine oil, coolant, hydraulic fluid, and fuel.

✅ Verify Worksite Safety

- Inspect the ground for **unstable surfaces, slopes, trenches, or underground utilities**.
- Establish a **safe working zone** with barricades and signs if needed.
- Ensure proper lighting and visibility for operations.

✅ Wear Proper PPE (Personal Protective Equipment)

- Hard hat, safety boots, gloves, and high-visibility vest.
- Safety goggles and hearing protection when required.
- Avoid loose clothing that can get caught in moving parts.

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2. Safe Operation Procedures

✅ Mounting and Dismounting

- Always use **three points of contact** when entering or exiting the cab.
- Avoid jumping off the machine.

✅ Starting the Excavator

- Start the machine only when seated properly with the **seatbelt fastened**.
- Check that the control levers are in **neutral** before starting the engine.
- Engage safety locks before moving.

✅ Excavating and Working Safely

- Keep **bystanders and unauthorized personnel** away from the work area.
- Never exceed the **load capacity** of the boom or bucket.
- Operate at a **controlled speed**, especially in rough or uneven terrain.
- Avoid **sudden stops and jerky movements** that could destabilize the excavator.
- **Do not swing the boom** over people, vehicles, or unstable structures.
- Maintain a safe **distance from trench edges, slopes, and drop-offs** to avoid tipping.

✅ Lifting and Loading

- Always check the **load chart** before lifting heavy objects.
- Keep loads **as low as possible** when transporting materials.

- Avoid **side-loading** the bucket—always lift directly in front of the machine.

✅ **Working on Slopes**

- **Move up and down slopes in a straight line**—never diagonally.
- Keep the **boom and arm low** when working on an incline.
- Use extra caution when turning on a slope to prevent rollovers.

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3. Shutdown and Post-Operation Safety

✅ **Proper Shutdown Procedure**

- Lower the bucket and attachments to the ground.
- Place all controls in **neutral**.
- Allow the engine to **idle for a few minutes** to cool down.
- Turn off the ignition and remove the key.

✅ **Parking and Storage**

- Always **park on level ground** to prevent accidental movement.
- Engage the **parking brake** and use chocks if necessary.
- Store attachments properly when not in use.

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4. Emergency Procedures

✅ **If the Machine Begins to Tip Over**

- **Do not jump**—stay inside the cab with your seatbelt on.
- Brace yourself and hold onto the controls.

✅ **Fire or Hydraulic Leak**

- Shut down the machine immediately.
- Use a **fire extinguisher** if needed.
- Report any hydraulic fluid leaks—hot fluid can cause severe burns.

✅ **Electrical Hazards**

- Keep a **safe distance** from power lines.
- If the machine contacts power lines, **stay inside** and call for help.

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5. Legal Compliance & Training

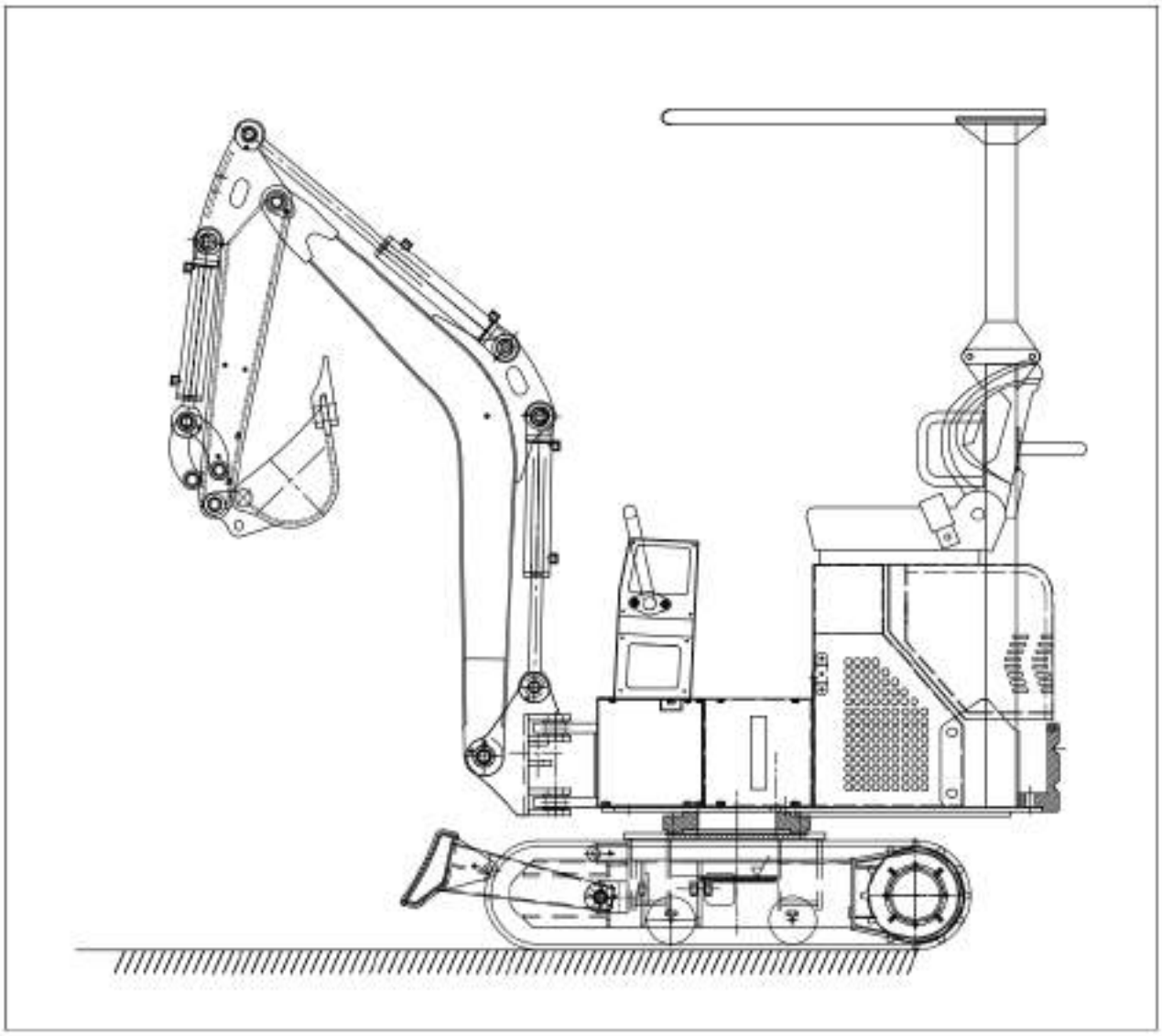
✅ **Follow Local Regulations**

- Adhere to **Occupational Safety and Health (OSHA)** and other local construction regulations.

- Only **licensed or trained operators** should use the CTX 8000 Pro.

✅ **Regular Maintenance & Inspections**

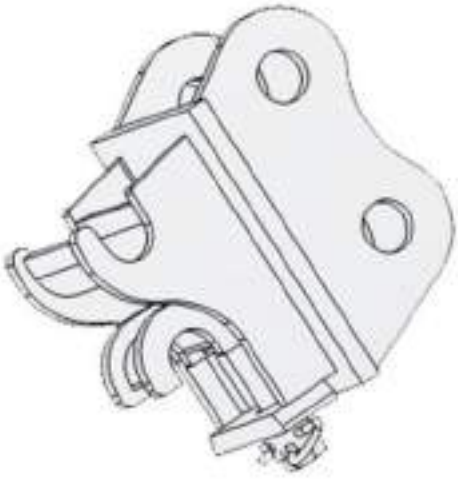
- Perform scheduled maintenance as per the **manufacturer's guidelines**.
- Keep a **logbook of inspections and repairs**.



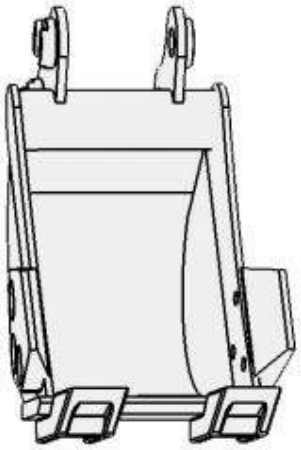
This type of excavator is primarily used for farming, landscaping, ditching, fertilization in gardens, vegetable greenhouses, agricultural transformation, indoor demolition, small earthworks, civil engineering, road recovery, basement and indoor construction, concrete breaking, burying cables, laying water supply lines, garden cultivation, desilting, and other tasks.

The Hydraform excavator is powered by a YANMAR 3-cylinder diesel engine and features hydraulic main pumps, rotary motors, and a drive motor, offering excellent performance, durability, and flexibility.

It can be equipped with various attachments, such as a quick hitch, log grab, ripper, levelling bucket, auger, and narrow bucket.

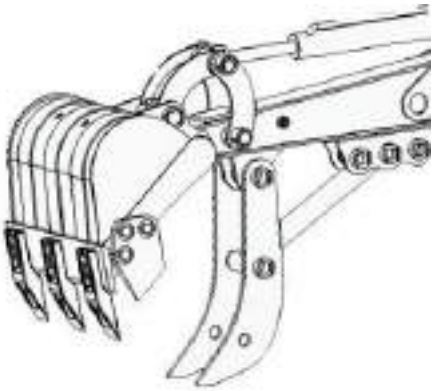


Quick hitch



Narrow bucket

Log grab



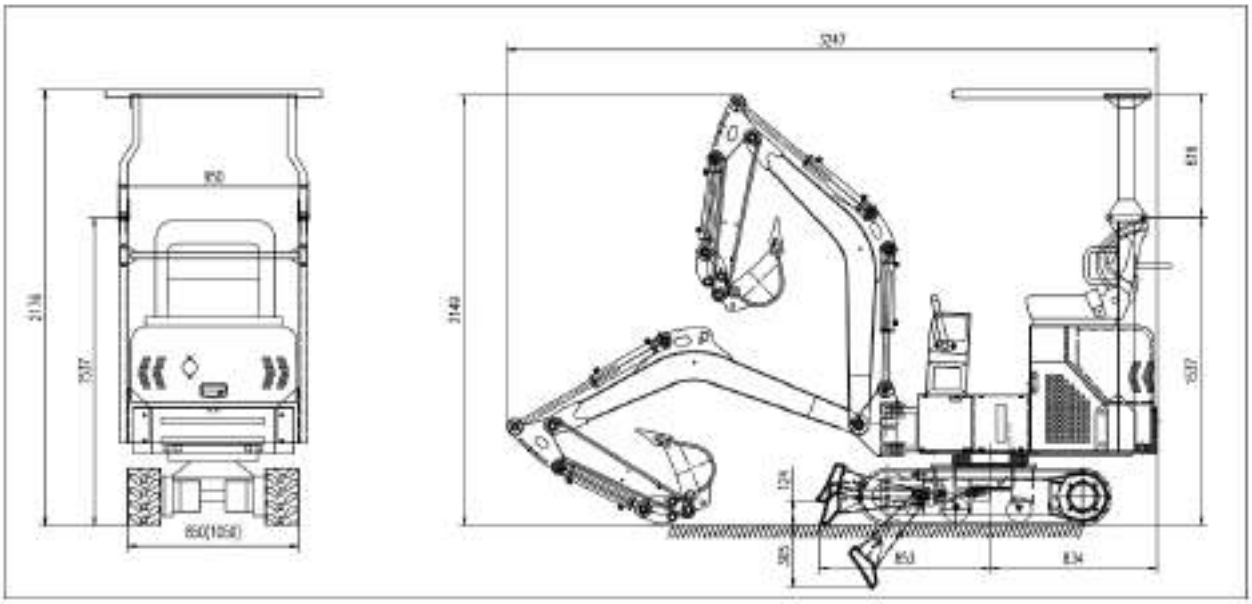
Mechanical thumb

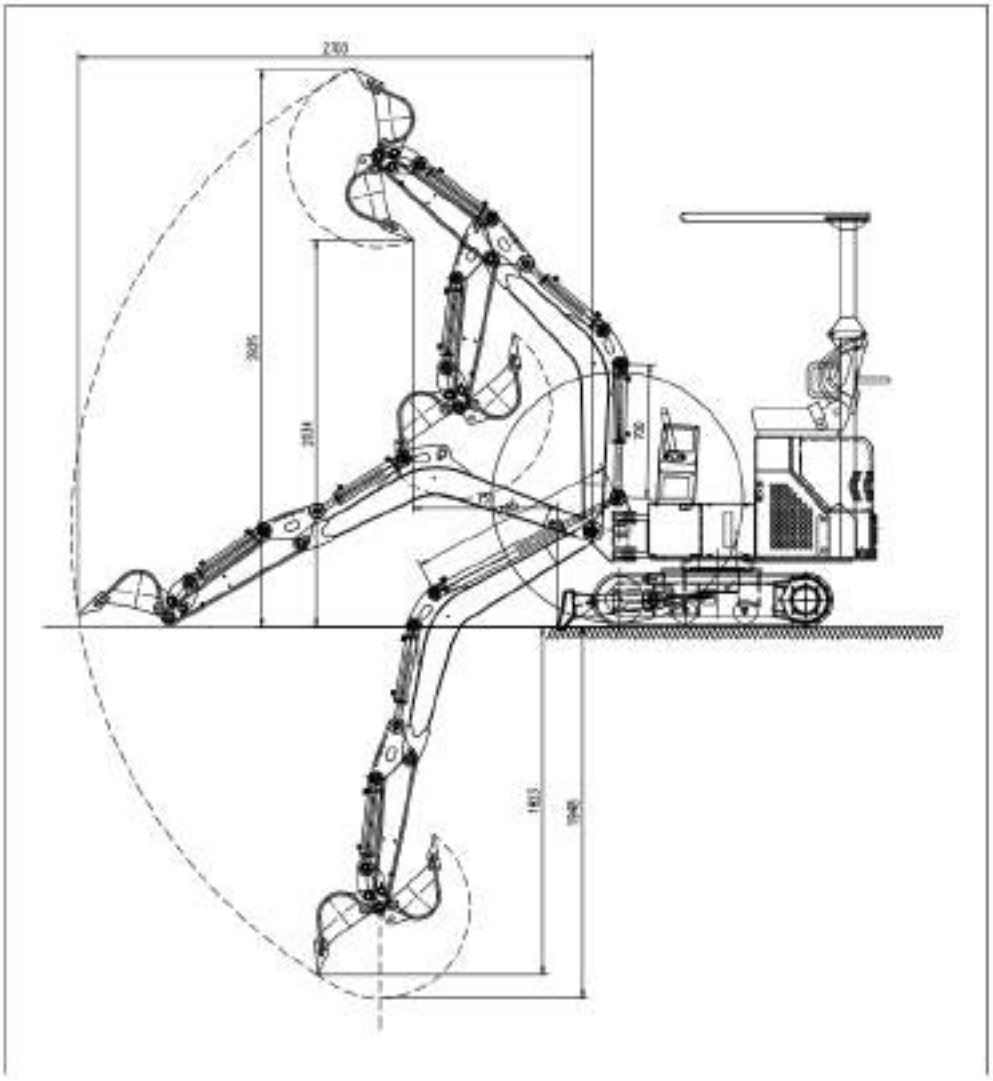
Auger

Ripper

Rake

Section II Main performance parameters





Overall dimensions	Unit: mm
A Wheel track	962
B Overall length of track	1282
C Ground clearance of platform	377.5
D Ground clearance of platform tail	843.5
E Chassis width	960
F Crawler width	161.12
H Crawler height	330.53
I Transportation length	2796.48
J Overall height	1155

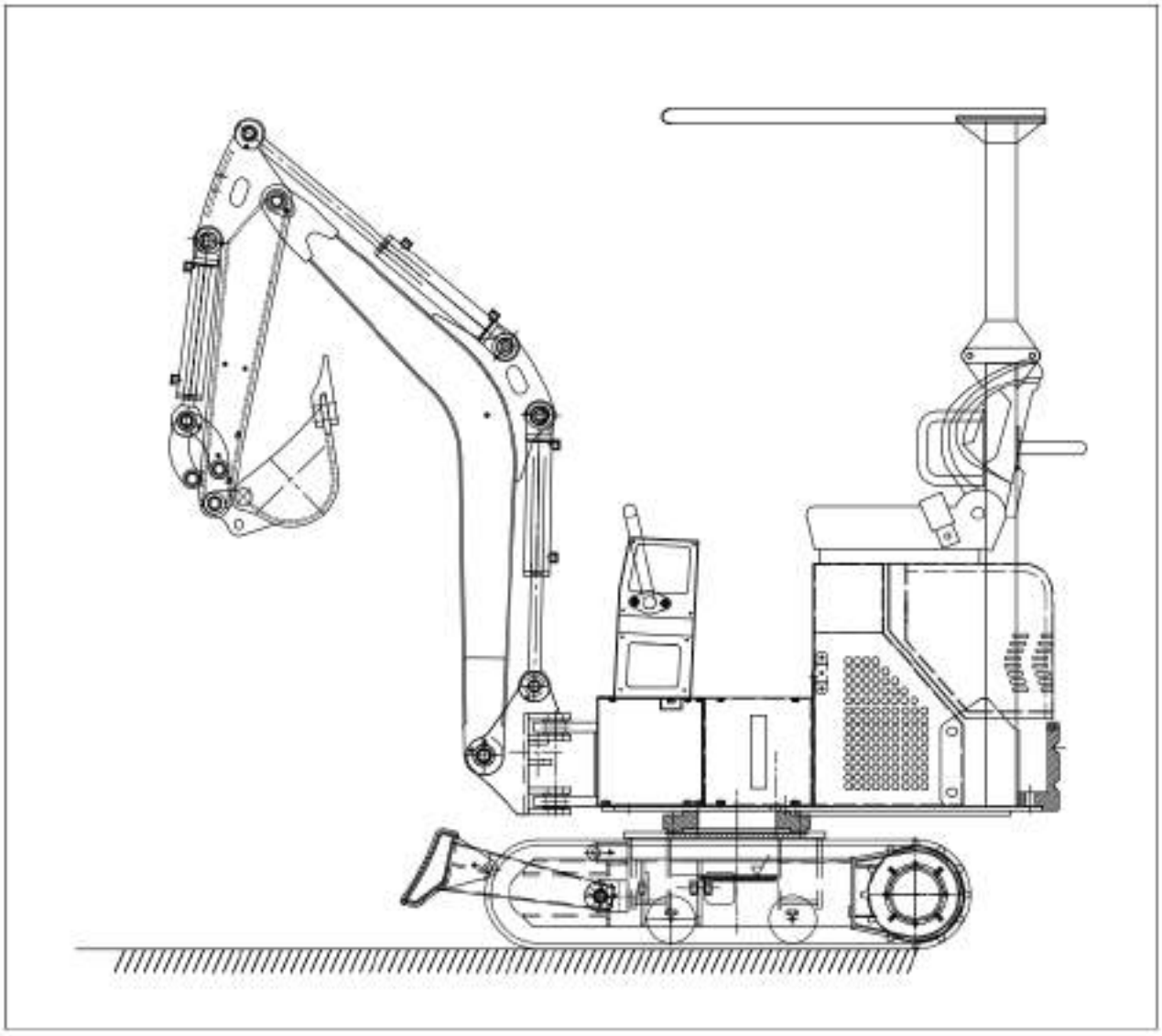
Work range	Unit: mm
A Max. digging radius on ground	3017.16
B Max. digging depth	1745.55
C Max. digging height	2842
D Max. unloading height	1919.82
E Max. vertical digging depth	1371.51
F Min. swing radius	1292.67
G Max. lifting height of dozer blade	347
H Max. digging depth of dozer blade	255

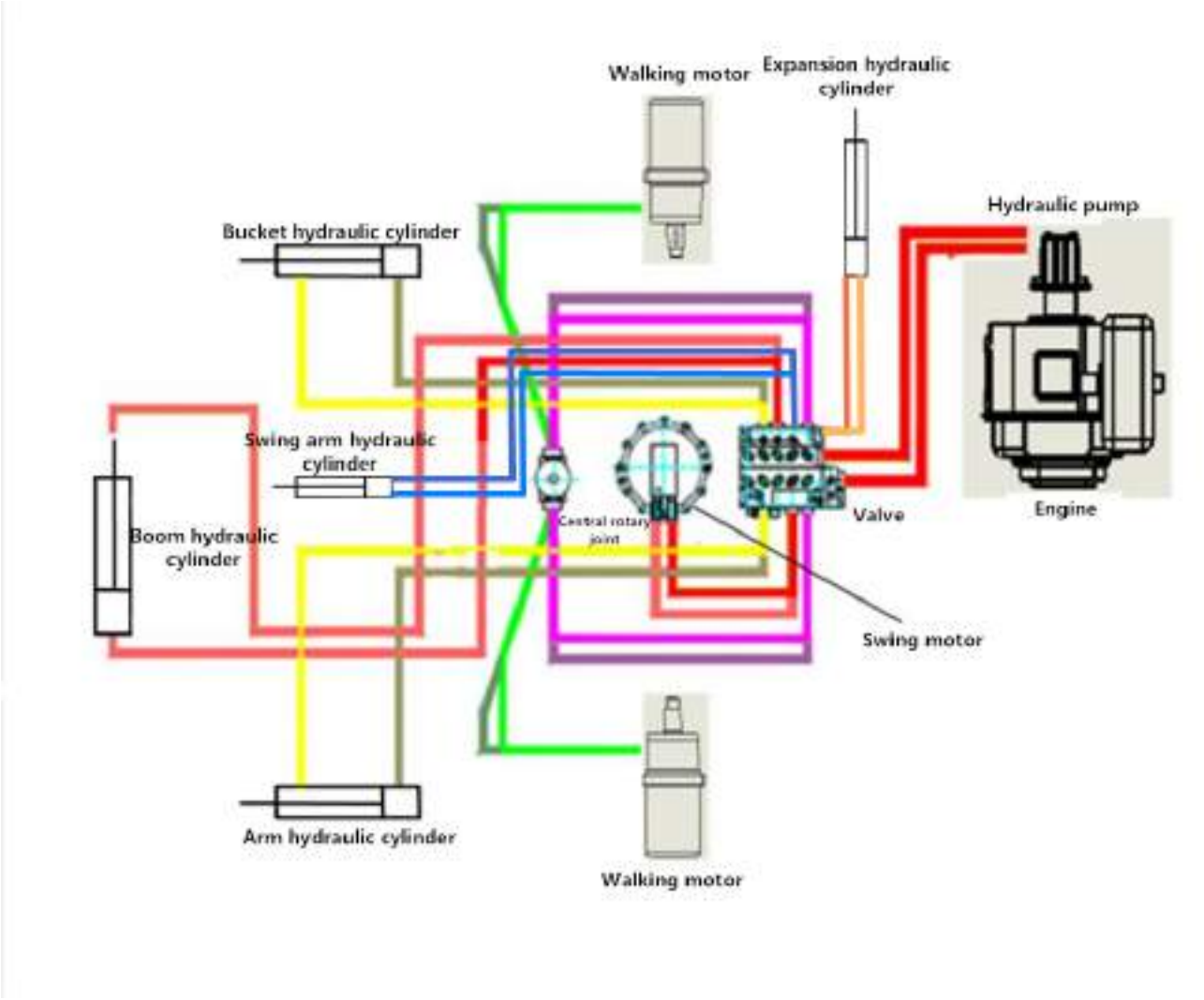
Performance parameters	
Weight of complete machine kg	1000
Standard bucket capacity m^3	0.025
Rated power kw	7.5

Chapter II Basic Structures and Work Principle of CTX8000 Excavator

Section I Overview on CTX8000 Excavator

CTX8000 Excavator is composed of power train, work equipment, swing mechanism, control mechanism, drive system, drive mechanism and auxiliary equipment, as shown in fig. 1-1. Mounted on the rotary table are the regular full-swing type hydraulic excavators, main components of drive system, swing mechanism and auxiliary devices, which are referred to as upper rotary. Therefore, a CTX8000 Excavator is divided into work equipment, upper rotary and drive mechanism.





Section II: Work Principle of Excavators

The work principle of the CTX8000 Excavator involves a sequence of energy transformations that enable the machine to perform various tasks:

1. **Diesel Engine Power:**
   - The **diesel engine** converts the **chemical energy** of diesel fuel into **mechanical energy**. This mechanical energy powers the hydraulic system.
2. **Hydraulic Energy Generation:**
   - The mechanical energy from the engine is transferred to a **hydraulic gear pump**, which converts this mechanical energy into **hydraulic energy**.
3. **Distribution of Hydraulic Energy:**
   - The hydraulic energy is then distributed by the **hydraulic pump** to various actuating elements, including the **hydraulic cylinders**, **swing motor**, and **drive motor**.
4. **Conversion Back to Mechanical Energy:**
   - These actuating elements (such as the cylinders and motors) convert the **hydraulic energy** back into **mechanical energy**.
5. **Movement and Functioning:**
   - The mechanical energy generated by the actuating elements is used to drive the **work equipment** (such as the boom, arm, and bucket) and operate the **rotary mechanism** and **drive system**. This enables the excavator to perform tasks such as digging, lifting, and rotating.

Thus, the excavator operates as an efficient system of energy transformation, where the diesel engine powers the hydraulic system, and the hydraulic system, in turn, drives the various mechanical components of the machine.

The movement and power transmission route of the excavator are as follows:

1. **Drive Power Route**:
   Diesel engine → Coupler → Hydraulic pump (mechanical energy converted to hydraulic energy) → Distributor valve → Central swing joint → Drive motor (hydraulic energy converted to mechanical energy) → Sprocket → Rubber crawler → Drive initiation.
2. **Expandable Track Route**:
   Diesel engine → Coupler → Hydraulic pump (mechanical energy converted to hydraulic energy) → Distributor valve → Electromagnetic valve → Central swing joint → Telescopic oil cylinder (hydraulic energy converted to mechanical energy) → Chassis expands outwards.
3. **Rotation Power Route**:
   Diesel engine → Coupler → Hydraulic pump (mechanical energy converted to hydraulic energy) → Distributor valve → Rotation motor (hydraulic energy converted to mechanical energy) → Bearing → Rotation movement.
4. **Boom Power Route**:
   Diesel engine → Coupler → Hydraulic pump (mechanical energy converted to hydraulic energy) → Distributor valve → Boom cylinder (hydraulic energy converted to mechanical energy) → Boom movement.
5. **Swing Arm Route**:
   Diesel engine → Coupler → Hydraulic pump (mechanical energy converted to hydraulic energy) → Distributor valve → Electromagnetic valve → Swing arm cylinder → Swing arm movement.
6. **Arm Power Route**:
   Diesel engine → Coupler → Hydraulic pump (mechanical energy converted to hydraulic energy) → Distributor valve → Arm cylinder (hydraulic energy converted to mechanical energy) → Arm movement.
7. **Bucket Power Route**:
   Diesel engine → Coupler → Hydraulic pump (mechanical energy converted to hydraulic energy) → Distributor valve → Bucket cylinder (hydraulic energy converted to mechanical energy) → Bucket movement.

Section III: Basic Structure of CTX8000 Excavator Mechanical System

1. **Power System**
   The CTX8000 Excavator is equipped with a Yanmar 3-cylinder, water-cooled diesel engine.
2. **Drive System**
   The drive system of the CTX8000 Excavator transfers the output power from the diesel engine through the hydraulic system to work equipment, the swing mechanism, and the drive mechanism.
3. **Swing Mechanism**
   The swing mechanism rotates the work equipment and the upper rotary part left and right, enabling excavating and unloading. The rotation mechanism fixes the rotary table to the frame and allows it to rotate 360 degrees. The excavator is equipped with a rotation support and a rotation drive (providing power for the turntable's rotation), forming the complete rotation mechanism.

   3.1 Rotation Support
   The rotary table of the CTX8000 Excavator is supported by a roller bearing, enabling the rotation of the upper part.

   3.2 Rotary Drive
   The excavator uses a direct drive type for its rotary drive system.

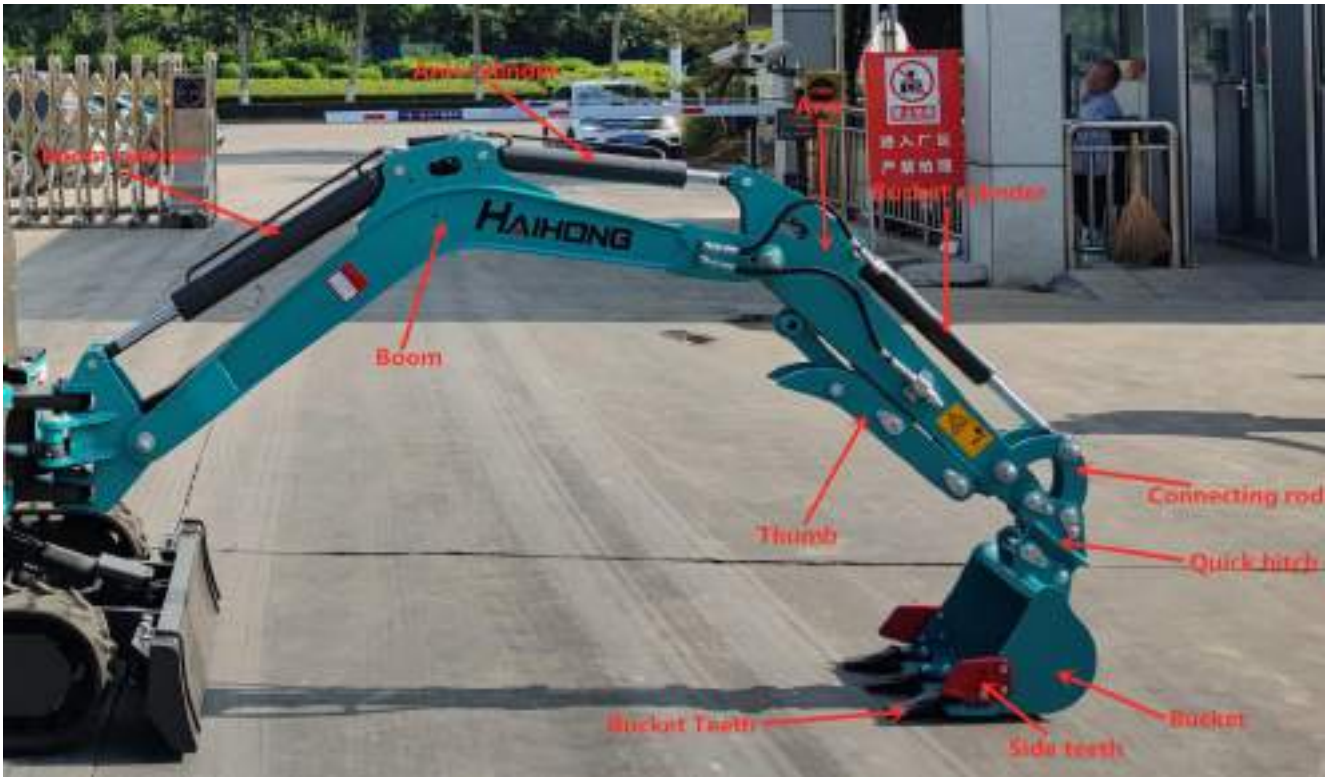
4. **Drive Mechanism**
   The CTX8000 Excavator features a crawler drive mechanism, similar to other crawler machines, with one hydraulic motor driving each track. The excavator uses a low-speed, high-torque motor.
   - When both motors run in the same direction, the excavator moves straight forward.
   - When one motor is supplied with oil and the other is braked, the excavator steers around the braked track.
   - When both motors run in reverse, the excavator rotates.

   Each part of the drive mechanism is mounted on an integral drive frame. The hydraulic oil pressure from the pump flows through the multi-way directional valve and the central swing joint to the hydraulic drive motor, converting the pressure energy into output torque. This torque is then transferred to the sprocket, causing the excavator to move.

   The sprockets on the CTX8000 Excavator are castings and located at the rear part of the machine, which helps reduce the tensioner part and minimizes track abrasion, wear, and power consumption. Each track is equipped with a tensioner to adjust track tension and reduce track vibration, noise, abrasion, wear, and power loss.

5. **Work Equipment**
   The CTX8000 Excavator is capable of using various attachments. The excavator features an articulated boom, arm, and bucket that work together.

   5.1 Boom
   The boom is a key component of the backhoe work equipment. The CTX8000 Excavator uses an integrated skewed boom, which is a popular choice. This boom design allows the excavator to dig deeper and lower the unloading depth, fulfilling backhoe operational requirements.



1.1 Bucket

1.1.1 Basic Requirements

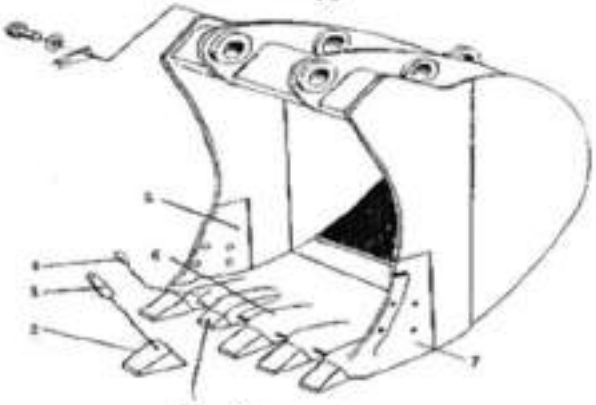
1. The shape of the bucket is designed to facilitate the smooth flow of material while minimizing loading resistance, allowing the bucket to fill efficiently.
2. Bucket teeth are mounted to enhance the linear pressure exerted by the bucket onto the material. This reduces the cutting resistance and aids in soil penetration and breaking. The teeth are also wear-resistant and easy to replace.
3. The bucket is designed for quick unloading, reducing the unloading time and increasing its effective capacity.

1.1.2 Structure

The shape and size of the bucket used in backhoe operations are closely related to the type of material being excavated. To accommodate various excavation tasks, the excavator can be equipped with different types of buckets.

The bucket is connected to the hydraulic cylinder via a linkage mechanism, with the bucket directly articulated to the hydraulic cylinder. This design reduces the rotation angle of the bucket while allowing the work torque to vary significantly

Bucket type



Bucket structure

Chapter III: Service Technologies of CTX8000 Excavator

The CTX8000 Excavator operates under high temperatures and pressures, with hydraulic oil temperatures reaching up to 85°C, engine silencer temperatures up to 700°C, and pressures between 16-18 MPa. For safety and efficiency, operators must be specially trained, obtain the necessary certifications, and thoroughly understand the contents of this manual prior to operation. Additionally, all maintenance and repairs must follow the prescribed guidelines to avoid accidents.

Section I: Basic Operating Knowledge

The excavator performs four basic movements:

- **Bucket rotation**
- **Arm stretching/retracting**
- **Boom lifting/lowering**
- **Turntable swinging**

The operation of these movements, including the pulling/pushing of hydraulic cylinders and rotation of the hydraulic motor, is controlled by a three-way axial slide valve. The oil flow direction and the work speed are controlled by the operator or auxiliary devices, in accordance with the valve's openness within the quantitative system.

1.1 Basic Requirements for the Control System:

- The control system is centralized in the driving area of the upper rotary unit.
- Startup and stop must be smooth, with speed and force under control. Simultaneous movements should also be smooth and controlled.
- Operations should be easy to handle, with no more than 17 cm of travel required on the levers.
- The design minimizes deformation of the levers during controlled operation.

Section II: Preparation for Work

Inspection Before Startup:
To ensure optimal performance and extend the lifespan of the excavator, perform the following checks before starting the machine:

1. Inspect for dirt around or beneath the machine, check for loose bolts, oil leaks, and any damaged or worn parts.
2. Check all switches, lamps, and the fuse box.
3. Ensure that the work equipment and hydraulic parts are functioning correctly.
4. Verify that engine oil levels and fuel levels are adequate.
   These checks must be performed routinely.

Maintenance Before Startup:
Before starting the machine, grease the 26 designated greasing points around the work equipment and slewing bearing (grease nipple points).

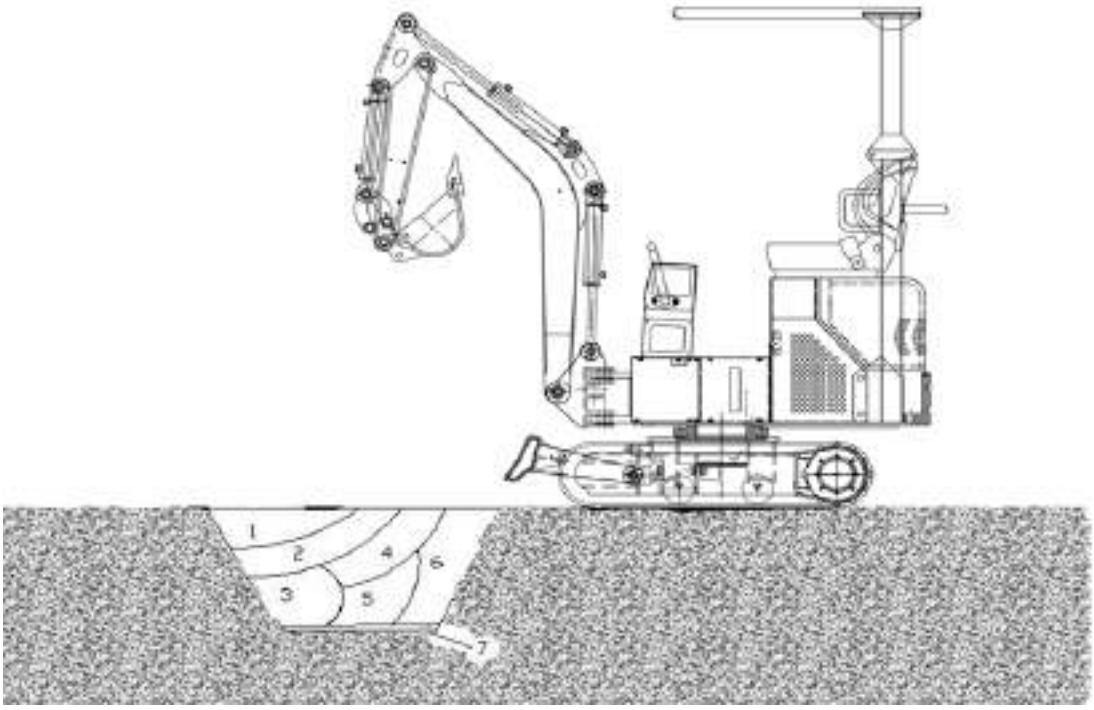
Preheating of the Machine on Cold Days:
If the weather is cold, the engine may be difficult to start, and the fuel and hydraulic oil may become more viscous.
When hydraulic oil is below 25°C, the hydraulic system may operate sluggishly, which could lead to accidents. It's crucial to warm up the excavator gradually.

Warmup Procedure:

1. Set the manual accelerator to run the diesel engine at medium speed. Slowly move the bucket back and forth for 5 minutes.
   Caution: Do not operate any actuators other than the bucket.
2. Set the manual accelerator to run the engine at high speed, then move the boom, arm, and bucket for 3 to 5 minutes.
   Caution: Limit operations to the boom, arm, and bucket. Do not rotate the machine or drive the excavator.
3. Complete a few cycles of each action on the excavator to fully warm up the system and prepare it for work.

Section III Operational essentials

2.4 Basic Excavation



1. Excavating with Maximum Force:

- Before beginning excavation, set the **arm cylinder** at a **90° angle** to the arm, and position the **bucket** to make a **30° angle** with the ground to be excavated. This positioning allows the cylinders to generate maximum excavation force.
- This setup is ideal for excavating relatively hard soil, as it reduces the resistance during the excavation process.

2. Excavating Soft Soil:

- For soft soil, adjust the bucket to an angle of **60°** with respect to the soil. This will help increase work efficiency by optimizing the excavation process for softer materials.

1.2 Lower Excavation:

- During lower excavation, maintain the **bucket base** at a **30°** angle with the bevel. Retract the arm to start the excavation work, allowing for effective and efficient digging.

1.3 Upper Excavation:

- For upper excavation, position the **bucket blade** so it is **vertical** to the ground. Retract the arm to begin the excavation process, ensuring that the bucket efficiently moves the material.

1.4 Ditching Process:

- Ditching is carried out in **7 steps**, as shown in the figure above. This process outlines the sequential approach to digging and shaping ditches effectively.

Section IV: Operational Precautions

To ensure safety and efficiency, please observe the following instructions and recommendations:

1. **Terrain Awareness**: Be cautious of landslides, ground movement, and falling debris, including rocks and loose materials.
2. **Collision Prevention**: Avoid driving or striking the bucket against other construction equipment.
3. **Safe Bucket Operation**: Ensure the bucket does not collide with any part of the vehicle, pass over another vehicle's cab, or pose a risk to personnel.
4. **Ground Stability**: Prevent the excavator from sinking into soft ground or wetlands.
5. **Obstacle Avoidance**: When driving, steer clear of large obstacles such as boulders.
6. **Water Depth Limitations**: Do not operate in water deeper than the allowable limit.
7. **Handling Heavy Materials**: When loading or unloading large stones, handle them with care to prevent accidental falls.
8. **Cold Weather Precautions**:
    - Park on solid ground to prevent tracks from freezing.
    - Remove debris from the tracks and frame.
    - If the tracks freeze to the ground, use the boom to lift them and move the machine carefully to avoid damaging the sprockets and tracks.
9. **Machine Movement**: Before moving, confirm that the drive direction aligns with the control handle. When the drive motor is positioned at the rear, push the drive handle forward to move the machine forward.
10. **Long-Distance Travel**: For extended travel, allow a 5-minute rest period after every 20 minutes of operation to prevent drive motor damage.
11. **Slope Safety**: Do not attempt to cross slopes steeper than 15 degrees to avoid the risk of overturning.
12. **Reversing & Rotating Safety**: Exercise caution to prevent accidents when reversing or rotating the machine.
13. **Digging Precautions**: Avoid completely excavating the soil beneath the machine to maintain stability.
14. **Avoiding Collapse**: Do not operate on high dams or steep slopes, as these may lead to machine instability, sliding, or collapse, potentially causing severe accidents.
15. **Underground Facility Awareness**: Be cautious of buried cables, gas pipes, and other underground utilities. Accidental damage can result in explosions, fires, or serious injury.
16. **Overhead Facility Awareness**:
    - Avoid colliding with bridges or other overhead structures to prevent injury.
    - Ensure that the boom and arm do not come into contact with any elevated structures.
17. **Power Line Safety**:
    - Maintain a safe distance of at least **twice the required clearance (minimum 3 meters)** from power lines.
    - Adhere to all local safety regulations and laws.
    - Exercise extra caution in wet conditions, as the risk of electric shock increases.
    - Restrict access to the work area for unauthorized personnel.

By following these precautions, operators can minimize risks and ensure safe machine operation.

Chapter VI Maintenance of CTX8000 Excavator

Section I Daily inspection and maintenance

S/N	Item	Quantity	Interval (h)		Remark
			10	50	
	Check the engine oil level in sump	1	★		
	Check the hydraulic oil level in hydraulic oil tank	1	★		
	Check the fuel level in tank	1		★	
	Check the fuel pipe for cracks and leaks	All	★		
	Check if the fuel pipe is bent.	All	★		
	Check the work equipment pivots	All	★		
	Check the hydraulic hoses for leaks	All	★		
	Check if the bucket teeth are worn or loos	4		★	
	Check the seatbelt	1	★		
	Check all bolts and nuts for tightening torque	All	YES	YES●	
n					

Section II Periods of overhaul, medium and minor repair

S/N	Item	Quantity	Interval (h)								Remark
			100	250	500	1000	1500	2000	2500	4000	
1	Greasing of slewing bearing			★							
2	Greasing of slewing bearing gears		★								
3	Change the engine oil		●	▲	★						
4	Change the hydraulic oil.						△	★	△		
5	Change the hydraulic oil suction filter elements					★					
6	Check if the fuel pipe is cracked or bent.			★							
7	Change the Diesel filter				★						
8	Check the fuel hose for leakage / crack			★							
9	Check the fuel hose for crack / leakage			★							
10	Change the bucket										
11	Connection of bucket										
12	Remove the drive handle										
13	Replace the seatbelt										
14	Check the defection of track				★						
15	Maintenance of tensioner				★ ★						

Note: ★: Maintenance interval under normal conditions

▲: Maintenance interval of engine oil

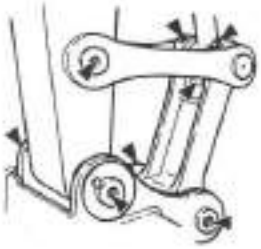
△: Change interval of hydraulic oil is dependent on the work oil type.

☆: Under the dusty environment, shorten the maintenance interval.

A Grease									
Parts		Quantity	Interval (h)						
			10	50	100	250	500	1000	2000
1. Lubrication of work equipment pins	Pivot at base of boom Pivot at base of boom cylinder Pivots of bucket and connecting rod	10	★						
	Others:	6	★						
2. Lubrication of slewing bearing		2				★			
3. Lubrication of external meshing gear of slewing bearing		1					★		
Note: it is recommended to use the lithium grease. ★ Maintenance interval under normal conditions									

1. Maintenance and lubrication of work equipment pivots

- Pivot between bucket and connecting rod



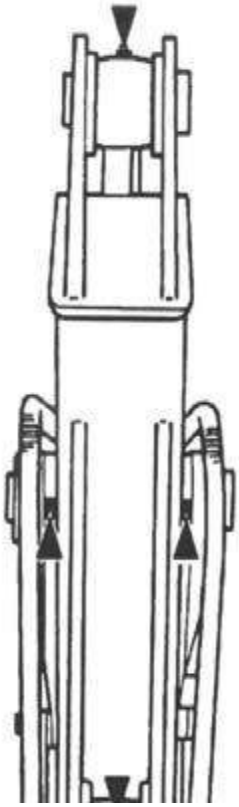
- Pivot at base of boom

- Pivot at base of boom cylinder

- Expandable track

- Others

Pivot between boom and arm; pivot of arm cylinder plunger; pivot at base of bucket cylinder.



Rotation Bearing - Every 100 Hours

1. Park the machine on level ground.
2. Lower the bucket to the ground.
3. Let the engine idle at low speed for 5 minutes.
4. Turn the ignition switch to OFF and remove the key.
5. With the upper structure stationary, apply grease to the two grease nipples.
6. Start the engine, lift the bucket off the ground, and rotate the upper structure by 45 degrees (1/8 cycle).
7. Lower the bucket back to the ground.

3. External meshing gear 45 of slewing bearing ---- every 500h

1. Park machine on level ground.
2. Lower the bucket onto ground.
3. Idle engine at low speed for 5min.
4. Turn the ignition switch to OFF and then take off the key.
5. The grease has to be stored on the top of external meshing gear of slewing bearing, free of any sand or other dirt
6. Add approximate 0.5kg of grease if needed.
   Any dirty and old grease must be replaced with new grease.

B. Engine oil

Parts	Quantity	Interval (h)						
		10	50	100	250	500	1000	2000
Engine oil	1			●	▲	★		
Engine oil filter	1			●	▲	★		

According to the temperature range during the interval, select the viscosity of oil listed in the table below:

Recommended engine oil brand: 15W—40 engine oil

Engine Oil Maintenance

Daily Inspection:

- Check the engine oil level.

Scheduled Maintenance:

- Change the engine oil every **500 hours**.
- Replace the engine oil filter every **500 hours**.

Oil Change Procedure:

1. Start the engine and allow it to warm up properly.
2. Park the machine on level ground.
3. Lower the bucket to the ground.
4. Let the engine idle at low speed for **5 minutes**.
5. Turn the ignition switch to **OFF** and remove the key.
6. Remove the drain plug and allow the oil to pass through a **clean cloth** into a **2L container**.
7. Inspect the cloth for metal debris or contaminants.
8. Reinstall and tighten the drain plug.
9. Loosen the drain plug to drain oil from the filter cylinder into a container.
10. Remove the screws securing the engine oil filter with a screwdriver and take out the filter element.
11. Install a new filter and securely tighten the screws.
12. Remove the oil filler cap and add the **recommended engine oil**. Wait **15 minutes**, then check if the oil level is between the circular markers.
13. Reinstall the oil filler cap.
14. Shut down the engine and unplug the ignition key.
15. Check for any oil leaks around the drain plug.
16. Verify the oil level using the dipstick.

Caution:

- Keep your body and face away from the **breather**.
- If the **gear oil is still hot**, allow it to cool before **slowly releasing** the breather pressure.

C. Hydraulic system

Parts	Quantity	Interval (h)								
		10	50	100	250	500	1000	1500	2500	4000
Check the hydraulic oil level	1	★								
Clean the drain pipe of hydraulic oil reservoir	1				★					
Change the hydraulic oil.	16.5L								★	
Change the hydraulic oil suction filter elements	1						★			

Check the hose and pipeline	--	★									
	--				★						
Change the hose		39									★
Note: ★ normal maintenance interval											

Inspection and Maintenance of Hydraulic System

⚠ **Caution:** The hydraulic system can become extremely hot during operation. Always allow the machine to cool down before performing any inspection or maintenance.

1. General Safety Precautions

- Ensure the machine is parked on a flat and solid surface before conducting maintenance.
- Lower the bucket to the ground and shut down the engine.
- Do not begin maintenance until the hydraulic system, hydraulic oil, and lubricants have fully cooled down. The system remains hot and pressurized immediately after operation.

2. Releasing Pressure Before Maintenance

a. Drain the air from the hydraulic oil reservoir to release internal pressure.
b. Allow the machine to cool down.

⚠ **Caution:** Inspecting or maintaining hot and pressurized components may cause hydraulic oil or parts to spray out, leading to serious injury.

3. Handling Pressurized Components

- When loosening bolts or nuts, avoid positioning your body directly in front of them, as hydraulic parts can still retain pressure even after cooling.
- Never check the drive or slewing motor circuits while on a slope, as the dead weight of the components may keep them pressurized.

4. Connecting Hydraulic Hoses and Pipelines

- Ensure all sealing surfaces remain clean and free from dirt or damage. Follow these best practices:
  a. Clean the hoses, pipelines, and the inside of the hydraulic oil tank with detergent, then dry them thoroughly.
  b. Use only O-rings that are in perfect condition—free from cracks or defects.
  c. Avoid twisting pressure hoses during installation, as this significantly reduces their lifespan.
  d. Carefully tighten low-pressure hose clamps to prevent leaks.

5. Hydraulic Oil Requirements

- Only use hydraulic oil of the same grade; **do not mix different grades**.
- The hydraulic oil is pre-filled before delivery—always use the recommended oil.
- When replacing oil, **change all the oil in the system at once** to prevent contamination.

6. Engine Start Precaution

⚠ **Never start the engine without hydraulic oil in the system.**

Hydraulic Oil Level Inspection - Daily

Important:

- **Never start the engine without hydraulic oil!**

Procedure:

1. Park the machine on level ground.
2. Fully retract the arm cylinder and extend the bucket cylinder to position the machine correctly.
3. Lower the bucket to the ground.
4. Let the engine idle at low speed for **5 minutes**.
5. Shut down the engine and remove the ignition key.
6. Check the oil level in the **hydraulic oil tank** using the dipstick. Ensure the level is between the markers. If needed, add hydraulic oil.

Caution:

- The **hydraulic oil tank is pressurized**. **Slowly open** the cap to release pressure before adding oil.

7. Open the hydraulic oil tank, add the required oil, and check the oil level again.
8. Securely put the cap back on the hydraulic oil tank.

III.

IV. Change the hydraulic oil ---2000 h

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

Hydraulic Oil Replacement Procedure

Caution:

- Do **not** perform this procedure until the hydraulic oil has **cooled down**, as it may be extremely hot.
- The **hydraulic oil tank is pressurized**. Slowly open the hydraulic oil cap to release pressure before removing it.

Step-by-Step Procedure:

1. Park the machine on level ground.
2. Fully retract the arm cylinder and extend the bucket cylinder to position the machine.
3. Lower the bucket to the ground.
4. Let the engine idle at low speed for **5 minutes**.
5. Shut down the engine and remove the ignition key.
6. Remove the covers.
7. Clean the hydraulic oil reservoir to **prevent dirt from entering the system**.
8. Remove all screws securing the reservoir.
9. **Slowly open** the hydraulic oil cap to release internal pressure.
10. Loosen and remove the **oil-pickup filter element cap**.
11. Loosen and remove the **drain plug** at the bottom of the hydraulic oil tank to drain the oil.
12. Take out the **oil-pickup filter** and levers.

Caution:

- The **hydraulic oil tank is pressurized**. **Slowly open** the cap to release pressure before removing it.

13. Clean the **filter** and the **inside of the hydraulic tank**.
14. Use an **oil pickup pump** to remove any remaining oil residue from the bottom of the hydraulic oil tank.
15. Reinstall the **filter and levers**, ensuring the filter is properly secured onto the outlet.
16. Clean and reinstall the **drain plug** at the bottom of the tank.
17. Add **hydraulic oil** until the level is between the markers on the dipstick.
18. Secure the **oil-pickup filter element cap**, ensuring the filter and levers are correctly positioned, then tighten the bolts to **49 N·m**.

Important:

- **Never start the engine without oil in the hydraulic pump**, as this can cause severe damage to the pump.

19. Tighten the **oil tank cap** securely.
20. With the engine idling at low speed, **slowly and steadily** operate the control lever for **15 minutes** to remove air from the hydraulic system.

1. Fully retract the arm cylinder and extend the bucket cylinder to position the machine correctly.
2.

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 otherwise may lead to gangrene.

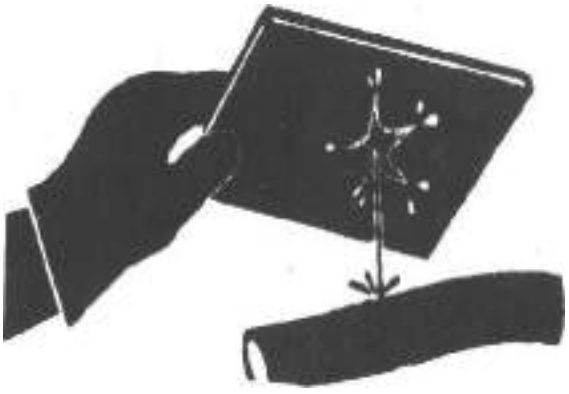
Caution: leaked hydraulic oil and lubricant may lead to fire or personal casualty!

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.

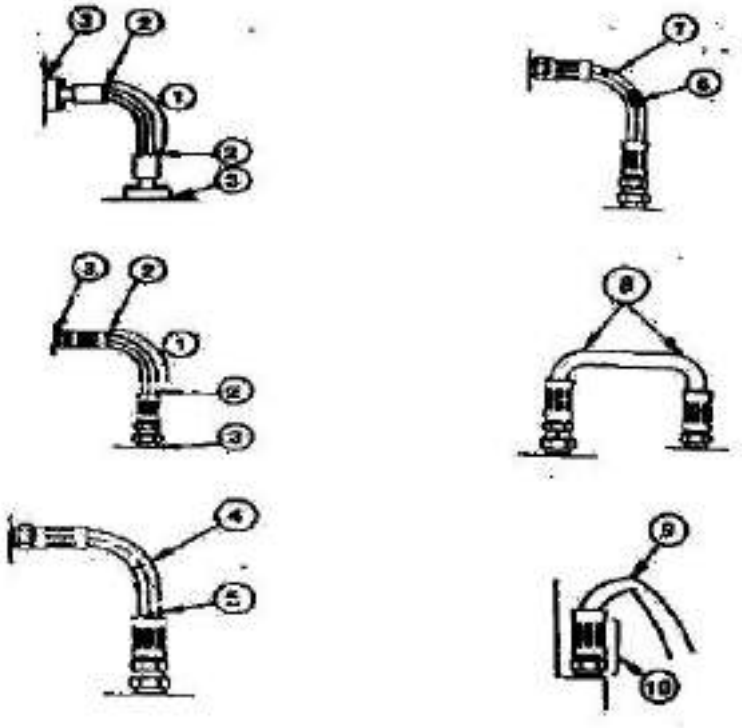
Never install any bent or damaged hose or pipeline.

Caution: related positions of check points and the abnormalities



Please use the genuine Hydraform 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: 7L

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

Recommended Fuel & Refuelling Procedure

Recommended Fuel

- Use only **high-quality diesel**. The appropriate fuel grade should be selected based on environmental temperature.

Refuelling Procedure

1. Park the machine on flat, stable ground.
2. Lower the bucket to the ground.
3. Let the engine idle at low speed for **5 minutes**.
4. Shut down the engine and **remove the ignition key**.

⚠ Caution:

- Always handle fuel with care.
- Shut down the engine before refuelling.
- **No smoking** near the fuel system or while refuelling.

5. Check the fuel gauge and **add fuel if necessary**.
   - **Important:** Prevent dirt, dust, water, or any foreign material from entering the fuel system.
6. When refuelling, ensure fuel is added properly and **not sprayed onto the machine**.
7. Securely **replace the fuel filler cap** to prevent loss or damage.

Inspection of Diesel filter ---every 200h

Diesel filter ① is used to separate the water or sediment from fuel. Ensure the quality of diesel fuel entering the diesel engine and prolong the service life of the diesel engine When the working time of the diesel filter element is up and it needs to be replaced, please change a new diesel filter ①.

Filter Replacement Procedure

1. Removing the Old Filter

- Use a filter wrench to clamp the bottom of the filter element.
- Rotate it counterclockwise to remove it.

2. Preparing the New Filter

- Apply a thin, even layer of diesel to the sealing ring of the new filter.

3. Installing the New Filter

- Use the filter wrench to tighten the new filter securely.
- Start the engine and check for leaks around the seal.
- If oil leakage is detected, remove and reinstall the filter properly.

⚠ **Caution:**

- After draining the system, ensure all air is removed from the fuel system to allow the engine to start normally.

Electrical system - Battery

- Check the battery electrolyte level and the terminals.

Battery Safety, Maintenance, and Replacement

⚠ Caution: Battery Safety

- The gas inside the battery is highly explosive—keep sparks, flames, and smoking materials away.
- Use a flashlight instead of an open flame to check the electrolyte level.
- Battery electrolyte contains sulfuric acid, which can burn skin, damage clothing, and cause blindness.

To minimize risks, follow these safety measures:

1. Battery Handling Precautions

1. Perform battery refilling in a well-ventilated area.
2. Wear goggles and plastic gloves to protect against acid exposure.
3. Be cautious to prevent electrolyte from spilling or spraying.
4. When jump-starting a battery, use proper procedures to avoid damage or injury.

2. Emergency Measures for Acid Contact

- If acid touches the skin, rinse immediately with water.
- If acid spills, neutralize it using baking soda or lime.
- If acid enters the eyes, rinse continuously with water for 10–15 minutes and seek medical attention immediately.

3. Battery Terminal Handling

- Disconnect the negative (-) terminal first when removing the battery.
- Reconnect the negative (-) terminal last when installing the battery.
- Keep battery terminals clean and free of corrosion.
- Ensure terminals are secure and rust-free.
- Apply petroleum jelly (Vaseline) to the terminals to prevent corrosion.

Battery & Fuse Replacement

1. Battery Replacement

- The system uses a 12V battery with a grounded negative (-) pole.
- If the battery fails to hold a charge, replace it with a battery of the same model and specifications.

2. Fuse Replacement

- If an electrical device is not functioning, check the fuse first.
- Important: Always install a fuse with the correct amperage to prevent electrical system damage from overload.

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 drive 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 and the A/C generator	—						⇘		

Check the bolts and nuts for tightening torque	—		℘		★				

Note:
★ Maintenance interval under normal conditions
℘ Maintenance needed at the first inspection
⍂ Contact dealers or Rhinoceros.

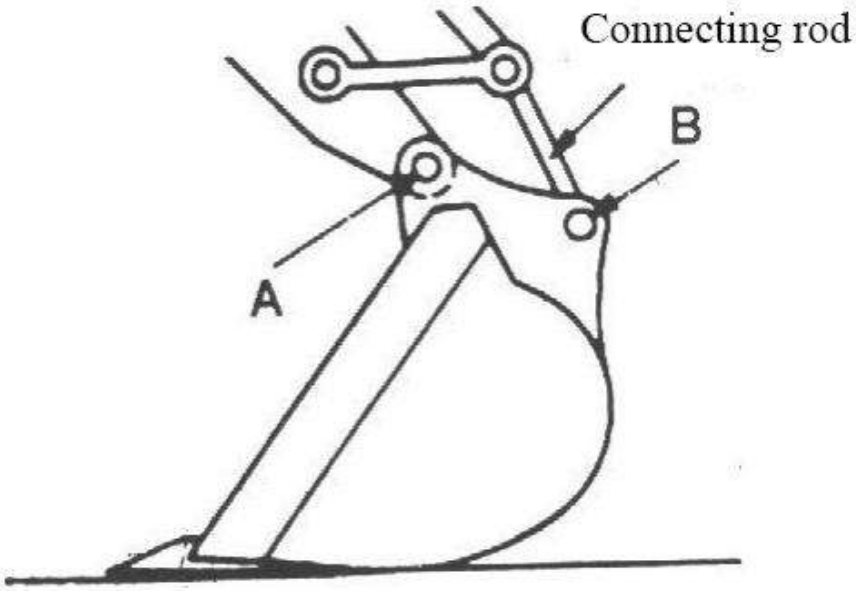
Check the bucket teeth --- each day

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

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

Bucket tooth dimensions mm

New	Service limit
190	130



Bucket Replacement Procedure

⚠ **Caution:**

- Metal scraps may fly out during pin removal, causing serious injury.
- Always wear goggles, safety glasses, or other appropriate protective equipment.

1. Preparation

1. Park the machine on flat, stable ground.
2. Lower the flat surface of the bucket onto the ground to prevent movement after pin removal.

2. Removing the Old Bucket

3. Slide out the O-ring as shown in the reference diagram.
4. Remove bucket pins A and B to detach the bucket from the arm.
5. Clean the pins and pin holes thoroughly, then apply grease to prevent wear.

3. Installing the New Bucket

6. Align the arm and the new bucket properly, ensuring the bucket remains stable and does not roll away.
7. Insert bucket pins A and B securely.
8. Attach the locker and ring onto pins A and B.
9. Adjust the connection clearance at pin A (refer to bucket connection clearance adjustment guidelines).
10. **Grease** pins A and B to ensure smooth operation.

4. Final Check

11. Start the engine and run it at low speed.
12. Slowly rotate the bucket in both directions to check for any movement interference.
13. If any interference is detected, stop the machine immediately and correct the issue before operation.

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 drive 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 as to 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:

$$1m \times 12kgf = 12kgf.m$$

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

Needed force: $y = 12kgf.m / 0.25m = 48kgf$

Maintenance under the special cases

Operational conditions	Precautions for maintenance
soft land, wet and rainy	Before operation, check all the drain plugs are tightened up. 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	Before operation, check all the drain plugs are tightened up. 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 Radiator: clean the oil cooler screen to avoid any blockage. Fuel system: clean the filter and its element periodically or at shorter interval. Electrical devices: periodically clean it, especially 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.

Machine Storage Guidelines

1. Maintenance Before Storage

- Inspect and repair or replace any worn or damaged parts.
- Clean the primary air filter elements.
- If possible, fully retract all hydraulic cylinders. If not, grease all exposed plungers to prevent rust.
- Lubricate all grease points.

2. Proper Positioning & Cleaning

- Place the tracks on a solid, long pad to prevent sinking or damage.
- Thoroughly clean the machine, especially in winter, paying extra attention to the tracks.

3. Battery Storage

- Ensure the battery is fully charged and stored in a dry, safe location.
- If the battery cannot be removed, disconnect the negative (-) terminal.

4. Rust Prevention & Protection

- Repaint any areas where paint has worn off to prevent rust.
- Store the machine in a dry, secure location.
- If stored outdoors, cover it with a waterproof tarp for protection.

5. Long-Term Storage Precautions

- If the machine will be stored for an extended period, start and run it at least once per month to keep components functional.

Chapter XII Troubleshooting

Section I General

Maintenance Overview

To ensure optimal performance of the Hydraform excavator, all components and parts are manufactured to high-quality standards. However, the machine's performance and service life depend not only on manufacturing and assembly quality but also on proper maintenance.

Both the marketing representative and service engineer should emphasize to users that preventive maintenance is the simplest and most cost-effective way to ensure long-term reliability.

Maintenance is categorized based on frequency and includes:

- **Daily Inspections**
- **Short-Term Maintenance**
- **Medium-Term Maintenance**
- **Long-Term Maintenance**

Regular and proper maintenance will significantly **extend the machine's service life and efficiency**.

Section II Troubleshooting of mechanism system

Symptom	Possible causes	How to solve
Noisy structural components	1. The loose fasteners make noise. 2. Aggravated abrasion between bucket and end face of bucket rod	1. Inspect and tighten 2. Adjust the clearance to less than 1mm
Bucket teeth have dropped during operation	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	1. Loose crawler 2. The driving wheel moves fast in front on rugged road.	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
	Oil filter is blocked	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	The main pump supplying fuel to unilateral crawler is damaged.	Change
	The main valve rod is stuck and the spring is broken	Repair or change
	Drive 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 drive system explodes.	Change
The whole excavator moves slowly or powerless	Less oil in hydraulic oil tank	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 drive 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.
	Serious between main valve rod and valve hole causes serious internal leak	Repair the valve rod
The right and left drive systems do not move (no other abnormalities)	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 drive operation valve is connected.	Change
	Serious leak inside the drive operation valve	Change
	Low overloaded pressure of drive valve of main valve or the valve rod is stuck.	Adjust and grind
	The left and right drive reducers fail	Repair
	The left and right drive motors fail	Repair
	The oil pipe explodes	Change
Deviation during drive (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 drive valve core of main valve is damaged or tightened	Change
	The drive 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 multiway 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	Multiway valve core is stuck or serious internal leak	Grind or change
	Multiway 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. Drive 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 multiway valve is of different overloaded pressure	Adjust
	Rotation valve rod of multiway 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 multiway valve	Adjust
	Serious internal leak of rotary motor	Repair or change
	The high and low pressure chambers of multiway 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 multiway 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 drive 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
		87a-30		Below 1Ω
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: Troubleshooting the Diesel Engine

1. Engine Fails to Start

Symptoms:

- The starter turns the engine, but the engine does not start.

Possible Causes & Solutions:

1. **Low battery:**
   - The battery may have drained due to electrical appliances left on overnight.
   - Charge the battery properly while the machine is in use.
   - If the battery is too low, replace it or connect an additional battery pack in parallel.
2. **Battery terminal is rusted or loose:**
   - Clean the battery terminals.
   - Secure the wire clips for reliable contact.
3. **Faulty battery ground connection:**
   - Clean and tighten the ground wire terminals.
   - Ensure a secure engine ground connection.
4. **Starter relay malfunction:**
   - Repair or replace the starter relay.
5. **Faulty ignition switch or starter:**
   - Inspect and repair the ignition switch and starter.
6. **Battery internal resistance increase:**
   - Over time, battery resistance may rise, reducing efficiency.
   - Properly charge the battery or replace it if necessary.

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2. Fuel-Related Startup Issues

Symptoms:

- The starter runs at the correct RPM, but the engine does not start.

Possible Causes & Solutions:

1. **Empty fuel tank:**
   - Refill the fuel tank with the correct grade of diesel.
   - Run the engine to ensure fuel reaches the carburetor.
2. **Fuel supply system blockage or failure:**
   - Inspect fuel lines, filters, and the fuel pump.
   - Replace any blocked or damaged components.
3. **Air, water, or contaminants in the fuel system:**
   - Bleed the fuel system to remove air.
   - Drain water from the fuel system.
4. **Faulty fuel pump:**
   - Inspect and repair or replace the fuel pump.
5. **Engine-related mechanical issues:**

- If all fuel-related components function correctly, inspect the engine for faults.

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3. Hard-to-Start Engine

Symptoms:

- The starter runs correctly but struggles to start the engine.
- The engine is difficult to start in cold or hot conditions.

Possible Causes & Solutions:

1. **Clogged fuel filter:**
   - Inspect and replace the fuel filter.
2. **Faulty fuel pump:**
   - Inspect and repair or replace the fuel pump.
3. **Incorrect fuel injection timing:**
   - Adjust fuel injection timing as needed.
4. **Low oil or intake air temperature:**
   - Ensure proper preheating in cold weather.
5. **Blocked air filter:**
   - Inspect and replace the air filter element.
6. **Fuel line leaks:**
   - Check for and repair leaks in the fuel system.
7. **Starter malfunction:**
   - Inspect the starter and replace it if necessary.
8. **Incorrect starting procedure:**
   - Follow the recommended starting process.
9. **Wrong fuel grade:**
   - Use only the recommended fuel grade.
   - Drain and replace contaminated or incorrect fuel.
10. **Engine-related issues:**

- If all other components are functioning properly, have the engine inspected and repaired.

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4. Starter Fails to Engage the Engine

Symptoms:

- The ignition switch is turned on, but the starter does not engage.
- The starter’s driving gears fail to engage or disengage.
- Engine RPM is low or uneven.

Possible Causes & Solutions:

1. **Battery is not fully charged:**
   - Check and charge the battery as needed.
   - Replace the battery if necessary.
2. **Loose battery terminals:**

    - Securely tighten battery connections.
3. **Loose battery ground wire:**
    - Check and repair the ground wire connection.
4. **Faulty start circuit:**
    - Inspect and repair wiring to ensure proper power delivery to the starter.
5. **Faulty starter relay:**
    - Test the relay for proper function; replace if necessary.
6. **Starter malfunction:**
    - Inspect and repair the starter motor.
7. **Starter drive gear stuck in the flywheel gear ring:**
    - Attempt to re-engage the starter.
    - Inspect and repair if the issue persists.
8. **Bearing issues in the starter motor:**
    - Inspect and replace bearings if needed.
9. **Starter torque too low:**
    - Replace the starter if it cannot generate sufficient torque.
10. **Underlying engine faults:**

- If starter issues are ruled out, inspect and repair engine components as necessary.

CTX 8000 PRO EXCAVATOR - DAILY SAFETY CHECKLIST

📅 **Date:** _____
👷 **Operator Name:** _____
🔢 **Machine Serial Number:** _____

✅ 1. Pre-Start Inspection
☐ Check for leaks (engine oil, hydraulic fluid, coolant).
☐ Inspect hydraulic hoses and connections for wear or damage.
☐ Ensure track tension and rollers are in good condition.
☐ Check boom, arm, and bucket for cracks or damage.
☐ Test lights, horn, and alarms.
☐ Verify seatbelt condition and function.
☐ Ensure safety guards and covers are secure.

✅ 2. Fluid Levels
☐ Engine oil ✅ Full ☐ Low
☐ Coolant ✅ Full ☐ Low
☐ Hydraulic fluid ✅ Full ☐ Low
☐ Fuel ✅ Full ☐ Low

✅ 3. Operator Safety Gear
☐ Hard hat
☐ Safety boots
☐ High-visibility vest
☐ Gloves
☐ Hearing protection (if required)

✅ 4. Start-Up & Operational Check
☐ Ensure all controls are in **neutral** before starting.
☐ Start engine and **allow warm-up** before operation.
☐ Test **brakes** and ensure proper function.
☐ Test **boom, arm, and bucket movement**.
☐ Confirm safety lock is engaged before moving.

✅ 5. Safe Operation Practices

☐ Clear work area of unauthorized personnel.
☐ Avoid sudden movements and excessive speeds.
☐ Keep bucket load within capacity limits.
☐ Avoid working near trenches, edges, or slopes.
☐ Always face downhill when operating on a slope.
☐ Never swing boom over people or vehicles.
☐ Stay clear of power lines and underground utilities.

✅ 6. Shutdown & Post-Operation Check

☐ Park on level ground, lower bucket, and disengage controls.
☐ Allow engine to cool before shutting down.
☐ Turn off ignition and remove key.
☐ Check for leaks or damage after use.
☐ Clean tracks and remove debris.
☐ Lock up and store the excavator securely.

⚠️ REPORT ANY DAMAGE OR FAULTS IMMEDIATELY

📝 **Notes / Issues Found:**

📌 **Supervisor Signature:** _____
📌 **Operator Signature:** _____

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CERTIFICATE

Certificat - Certificado- Сертификат - Zertifikat - 證書

1) **APPLICANT:** (who finally puts the product on the market)
Shandong Haihong Heavy Industry Co.,Ltd
Dongjing Road,Economic Zone,Qingzhou,Shandong,China
2) **CERTIFICATE NO.:** I/ISETC.000120190509
FILE REFERENCE: TCF-20190507-ME-T
3) **ISET MARK:**

4) **CAUTION ABOUT CE MARKING** (Instruction for the Applicant who puts the product on the EU market):
The label of the CE Marking on the left side should be not less than 5mm height. CE Marking and EC Declaration of Conformity are duties for the manufacturer or its applicant who puts the product on the market. This one is responsible to start the CE marking and certification procedure as required by the legislation in force. Only for the products which are compulsorily included into specific Directives or Regulations will be necessary to appoint a Notified Body.
5) **TYPE OF PRODUCT:** EXCAVATOR
MODEL(S): CTX8006,CTX8008,CTX8009,CTX8010,CTX8012,CTX8016,CTX8018,CTX8020,CTX8022,CTX8025, CTX8028,CTX8029,CTX8030,CTX8036,CTX8050,CTX8055,CTX8060 ,CTX8066,CTX8068,CTX8070, CTX8080,CTX8088,CTX8090,CTX8095,CTX8100,CTX 8110,CTX8120,CTX8150
6) **LIST OF DIRECTIVES / REGULATIONS /STANDARDS** (as declared by the manufacturer itself)
Machinery Directive 2006/42/EC, Electromagnetic Compatibilaty 2014/30/EU
EN ISO 12100:2010, EN 474-1:2006+A4:2013/AC:2014, EN 474-5:2006+A3:2013, EN 13309:2010
7) **NOTE:** The applicant is aware about the contents and information included in the ModCOM04.06 Regulation for this type of Certificate that is considered totally accepted. The latest revision of the Regulation is available and can be downloaded from the website www.iset-italia.eu. This document is not referred to any evaluation that could be considered as included in the scope of the activities covered by the standard BS EN ISO/IEC 17065:2012 or European Regulation 765/2008.
8) **REMARK:** Certificate is issued on voluntary application from the Client and it gives to the applicant the right to use and affix the ISET Mark (at point 3) on their products, even if it doesn't imply any assessment on the safety and compliance of the product. ISET declares that the only scope of the assessment is to verify the existence of the declaration issued by the manufacturer or an applicant under its own responsibilities.
9) **DATE OF ISSUE:** 09/05/2019 **EXPIRY DATE:** 08/05/2024
10) **SIGNATURE:** Miriam Camplone
(On behalf of the Legal representative)

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