

# CX33C Mini Excavator

## SERVICE MANUAL

Part number 48139719

English

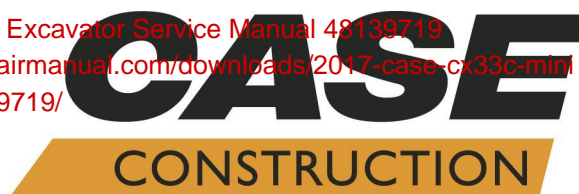
May 2017

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**CASE**  
CONSTRUCTION

Product: 2017 Case CX33C Mini Excavator Service Manual 48139719  
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## **SERVICE MANUAL**

**CX33C Canopy - Tier IV final engine**

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48139719 11/05/2017

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## INTRODUCTION

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## **Foreword - Important notice regarding equipment servicing**

All repair and maintenance work listed in this manual must be carried out only by qualified dealership personnel, strictly complying with the instructions given, and using, whenever possible, the special tools.

Anyone who performs repair and maintenance operations without complying with the procedures provided herein shall be responsible for any subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional, or local dealers, reject any responsibility for damages caused by parts and/or components not approved by the manufacturer, including those used for the servicing or repair of the product manufactured or marketed by the manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the manufacturer in case of damages caused by parts and/or components not approved by the manufacturer.

The manufacturer reserves the right to make improvements in design and changes in specifications at any time without notice and without incurring any obligation to install them on units previously sold. Specifications, descriptions, and illustrative material herein are as accurate as known at time of publication but are subject to change without notice.

In case of questions, refer to your CASE CONSTRUCTION Sales and Service Networks.

## Safety rules


### Personal safety





This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

 DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury.

 WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.

 CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

**FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.**

### Machine safety

**NOTICE:** Notice indicates a situation that, if not avoided, could result in machine or property damage.

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

### Information

**NOTE:** Note indicates additional information that clarifies steps, procedures, or other information in this manual.

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

## **Safety rules - General information**

### **Cleaning**

Clean the metal parts with cleaning solution that meets the standard and steam cleaning. (except for bearings)

After cleaning, dry well, and inject oil in all parts.

Also inject oil into the bearings after drying.

### **Inspection**

When disassembling parts, check all the parts.

If there are any worn or damaged parts, replace them.

Inspect carefully to prevent initial breakdowns.

### **Bearing**

Replace any loose bearings.

Air dry bearings before installing them.

### **Needle bearing**

When inserting needle bearings, be very careful not to damage them.

Apply grease to the section where the needle bearing will be inserted.

### **Gear**

Check that there is no wear and no damage.

### **Oil seal, O-ring, gasket**

Always install new oil seals, O-rings, and gaskets.

Apply grease to sections where oil seals and O-rings will be inserted.

### **Shaft**

Check that there is no wear and no damage.

Check the bearings and check for damaged oil seals on the shaft.

### **Service parts**

Install CASE CONSTRUCTION genuine service parts.

When placing an order, check the parts catalog. It contains the CASE CONSTRUCTION genuine part numbers.

Any breakdowns arising from the installation of non-genuine parts are not covered by the warranty.

### **Lubricants (fuel, hydraulic oil)**

Use the oil from the specified company or specified in the operator's manual or service Manual.

Any breakdowns arising from any fuel or hydraulic oil other than those specified are not covered by the warranty.

## Safety rules - Personal safety

### Preliminary warnings to maintenance operation

#### **⚠ WARNING**

**Avoid injury!**

**Shut off the engine, remove the key, and make sure all machine motion stops before you service the machine.**

**Failure to comply could result in death or serious injury.**

W1128B

#### **⚠ WARNING**

**Improper operation or service of this machine can result in an accident.**

**Assign a supervisor to direct worksite operations. Agree on all safety measures, procedures, and suitable hand signals.**

**Failure to comply could result in death or serious injury.**

W0287A

#### **⚠ CAUTION**

**Pinch hazard!**

**Always use suitable tools to align mating parts. DO NOT use your hand or fingers.**

**Failure to comply could result in minor or moderate injury.**

C0044A

### Personal Protective Equipment (PPE)

#### **⚠ WARNING**

**Avoid injury!**

**Use Personal Protective Equipment (PPE), including protective goggles, gloves, and safety footwear.**

**Failure to comply could result in death or serious injury.**

W1036A

### Lifting operation

#### **⚠ WARNING**

**Crushing hazard!**

**The lifting systems must be operated by qualified personnel who are aware of the correct procedures to follow. Make sure all lifting equipment is in good condition, and all hooks are equipped with safety latches.**

**Failure to comply could result in death or serious injury.**

W0256A

#### **⚠ WARNING**

**Heavy objects!**

**Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.**

**Failure to comply could result in death or serious injury.**

W0398A

#### **⚠ WARNING**

**Improper operation or service of this machine can result in an accident.**

**Raised equipment or machine movement without an operator can cause serious injury. Always do the following before performing any maintenance:**

**Park the machine on flat, level ground.**

**Lower the attachment to the ground.**

**Shut down the engine and remove the ignition key.**

**Lock the tracks.**

**Failure to comply could result in death or serious injury.**

W0944D

**⚠ WARNING**

Tip-over hazard!  
Only raise the track as little as necessary.  
Failure to comply could result in death or serious injury.

W0276A

**Hydraulic system**

**⚠ WARNING**

Burn hazard!  
Before performing any service on the hydraulic system, you must allow it to cool. Hydraulic fluid temperature should not exceed 40 °C (104 °F).  
Failure to comply could result in death or serious injury.

W0241A

**⚠ WARNING**

Pressurized fluid can penetrate the skin and cause severe injuries.  
The grease in the cylinder is under high pressure. Never loosen the grease fitting adaptor completely in order to speed up the flow of grease.  
Failure to comply could result in death or serious injury.

W0261A

**⚠ WARNING**

Pressurized system!  
Before attempting any service procedure, it is your responsibility to know the number of accumulators on the machine, and the correct procedure for releasing the pressure of each accumulator.  
Failure to comply could result in death or serious injury.

W0136A

**Battery**

**⚠ WARNING**

Battery acid causes burns. Batteries contain sulfuric acid.  
Avoid contact with skin, eyes or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately.  
Failure to comply could result in death or serious injury.

W0111A

**⚠ WARNING**

Battery gas can explode!  
To prevent an explosion: 1. Always disconnect the negative (-) battery cable first. 2. Always connect the negative (-) battery cable last. 3. Do not short circuit the battery posts with metal objects. 4. Do not weld, grind, or smoke near a battery.  
Failure to comply could result in death or serious injury.

W0011A

**Fluids**

**⚠ WARNING**

Hazardous chemicals!  
Coolant can be toxic. Avoid contact with skin, eyes, and clothing. Antidotes:  
EXTERNAL - Rinse thoroughly with water. Remove soiled clothing.  
INTERNAL - Rinse the mouth with water. DO NOT induce vomiting. Seek immediate medical attention.  
EYES - Flush with water. Seek immediate medical attention.  
Failure to comply could result in death or serious injury.

W0282A

**⚠ WARNING**

**Burn hazard!**

Hot coolant can spray and scald if you remove the radiator or deaeration tank cap while the system is hot. To remove the cap: allow the system to cool, turn the cap to the first notch, and wait for all pressure to release. Remove the cap only after all pressure has released.

Failure to comply could result in death or serious injury.

W0367A

**⚠ WARNING**

**Escaping fluid!**

Hydraulic fluid or diesel fuel leaking under pressure can penetrate the skin and cause infection or other injury. To prevent personal injury: Relieve all pressure before disconnecting fluid lines or performing work on the hydraulic system. Before applying pressure, make sure all connections are tight and all components are in good condition. Never use your hand to check for suspected leaks under pressure. Use a piece of cardboard or wood for this purpose. If injured by leaking fluid, see your doctor immediately.

Failure to comply could result in death or serious injury.

W0178A

**⚠ WARNING**

**Chemical hazard!**

When handling fuel, lubricants, and other service chemicals, follow the manufacturer's instructions. Wear Personal Protective Equipment (PPE) as instructed. Do not smoke or use open flame. Collect fluids in proper containers. Obey all local and environmental regulations when disposing of chemicals.

Failure to comply could result in death or serious injury.

W0371A

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## Safety rules - Ecology and the environment

Soil, air, and water quality is important for all industries and life in general. When legislation does not yet rule the treatment of some of the substances that advanced technology requires, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

Familiarize yourself with the relative legislation applicable to your country, and make sure that you understand this legislation. Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti-freeze, cleaning agents, etc., with regard to the effect of these substances on man and nature and how to safely store, use, and dispose of these substances.

### Helpful hints

- Avoid the use of cans or other inappropriate pressurized fuel delivery systems to fill tanks. Such delivery systems may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of these products contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when you drain fluids such as used engine coolant mixtures, engine oil, hydraulic fluid, brake fluid, etc. Do not mix drained brake fluids or fuels with lubricants. Store all drained fluids safely until you can dispose of the fluids in a proper way that complies with all local legislation and available resources.
- Do not allow coolant mixtures to get into the soil. Collect and dispose of coolant mixtures properly.
- The air-conditioning system contains gases that should not be released into the atmosphere. Consult an air-conditioning specialist or use a special extractor to recharge the system properly.
- Repair any leaks or defects in the engine cooling system or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding. Penetrating weld splatter may burn a hole or weaken hoses, allowing the loss of oils, coolant, etc.

### Battery recycling

Batteries and electric accumulators contain several substances that can have a harmful effect on the environment if the batteries are not properly recycled after use. Improper disposal of batteries can contaminate the soil, groundwater, and waterways. CASE CONSTRUCTION strongly recommends that you return all used batteries to a CASE CONSTRUCTION dealer, who will dispose of the used batteries or recycle the used batteries properly. In some countries, this is a legal requirement.



### Mandatory battery recycling

**NOTE:** *The following requirements are mandatory in Brazil.*

Batteries are made of lead plates and a sulfuric acid solution. Because batteries contain heavy metals such as lead, CONAMA Resolution 401/2008 requires you to return all used batteries to the battery dealer when you replace any batteries. Do not dispose of batteries in your household garbage.

Points of sale are obliged to:

- Accept the return of your used batteries
- Store the returned batteries in a suitable location
- Send the returned batteries to the battery manufacturer for recycling

## Torque - Standard torque settings

### BOLT AND NUT

Use following table for unspecified torque.

#### Coarse thread

Bolt size	Wrench	8 t	10 t
M6 x 1.0	10 mm	8.34 – 12.26 N·m (6.15 – 9.04 lb ft)	11.12 – 17.08 N·m (8.20 – 12.60 lb ft)
M8 x 1.25	13 mm	19.66 – 29.42 N·m (14.50 – 21.70 lb ft)	26.44 – 40.27 N·m (19.50 – 29.70 lb ft)
M10 x 1.5	17 mm	39.18 – 58.84 N·m (28.90 – 43.40 lb ft)	53.96 – 81.35 N·m (39.80 – 60.00 lb ft)
M12 x 1.75	19 mm	72.54 – 109.82 N·m (53.50 – 81.00 lb ft)	96.13 – 154.56 N·m (70.90 – 114.00 lb ft)
M14 x 2.0	22 mm	119.58 – 162.70 N·m (88.20 – 120.00 lb ft)	164.05 – 221.00 N·m (121.00 – 163.00 lb ft)
M16 x 2.0	24 mm	183.04 – 246.76 N·m (135.00 – 182.00 lb ft)	246.76 – 334.89 N·m (182.00 – 247.00 lb ft)
M18 x 2.5	27 mm	253.54 – 343.02 N·m (187.00 – 253.00 lb ft)	344.38 – 466.40 N·m (254.00 – 344.00 lb ft)
M20 x 2.5	30 mm	355.22 – 479.96 N·m (262.00 – 354.00 lb ft)	482.67 – 653.50 N·m (356.00 – 482.00 lb ft)
M22 x 2.5	32 mm	473.18 – 620.96 N·m (349.00 – 458.00 lb ft)	645.37 – 961.27 N·m (476.00 – 709.00 lb ft)
M24 x 3.0	36 mm	612.83 – 828.40 N·m (452.00 – 611.00 lb ft)	833.83 – 1128.04 N·m (615.00 – 832.00 lb ft)
M30 x 3.0	46 mm	1217.52 – 1645.96 N·m (898.00 – 1214.00 lb ft)	1658.17 – 2245.23 N·m (1223.00 – 1656.00 lb ft)
M36 x 4.0	55 mm	1709.69 – 2310.31 N·m (1261.00 – 1704.00 lb ft)	2451.32 – 3039.74 N·m (1808.00 – 2242.00 lb ft)

#### Fine thread

Bolt size	Wrench	8 t	10 t
M 8 x 1.0	13 mm	21.56 – 33.35 N·m (15.90 – 24.60 lb ft)	29.42 – 43.12 N·m (21.70 – 31.80 lb ft)
M10 x 1.2	17 mm	44.06 – 65.76 N·m (32.50 – 48.50 lb ft)	57.89 – 87.31 N·m (42.70 – 64.40 lb ft)
M12 x 1.25	19 mm	76.47 – 113.75 N·m (56.40 – 83.90 lb ft)	103.99 – 157.27 N·m (76.70 – 116.00 lb ft)
M14 x 1.5	22 mm	130.43 – 177.61 N·m (96.20 – 131.00 lb ft)	176.26 – 235.91 N·m (130.00 – 174.00 lb ft)
M16 x 1.5	24 mm	195.24 – 264.38 N·m (144.00 – 195.00 lb ft)	260.32 – 352.51 N·m (192.00 – 260.00 lb ft)
M18 x 1.5	27 mm	280.65 – 427.08 N·m (207.00 – 315.00 lb ft)	376.92 – 509.79 N·m (278.00 – 376.00 lb ft)
M20 x 1.5	30 mm	391.83 – 530.12 N·m (289.00 – 391.00 lb ft)	523.35 – 707.74 N·m (386.00 – 522.00 lb ft)
M22 x 1.5	32 mm	516.57 – 699.60 N·m (381.00 – 516.00 lb ft)	692.82 – 938.23 N·m (511.00 – 692.00 lb ft)
M24 x 2.0	36 mm	665.71 – 901.62 N·m (491.00 – 665.00 lb ft)	892.13 – 1206.68 N·m (658.00 – 890.00 lb ft)
M30 x 2.0	46 mm	1342.26 – 1815.44 N·m (990.00 – 1339.00 lb ft)	1781.54 – 2435.05 N·m (1314.00 – 1796.00 lb ft)
M36 x 3.0	55 mm	1884.59 – 2548.94 N·m (1390.00 – 1880.00 lb ft)	2567.92 – 3473.61 N·m (1894.00 – 2562.00 lb ft)

#### Pipe and hose (FLARE type)

Thread size (PF)	Wrench	Torque
1/4"	19 mm	39.18 N·m (28.90 lb ft)
3/8"	22 mm	49.08 N·m (36.20 lb ft)
1/2"	27 mm	93.14 N·m (68.70 lb ft)
3/4"	36 mm	176.26 N·m (130.00 lb ft)
1"	41 mm	206.08 N·m (152.00 lb ft)
1-1/4"	50 mm	343.02 N·m (253.00 lb ft)

#### Pipe and hose (ORFS type)

Thread size (UNF)	Wrench	Torque
9/16-18	19 mm	39.18 N·m (28.90 lb ft)
11/16-16	22 mm	49.08 N·m (36.20 lb ft)
13/16-16	27 mm	93.14 N·m (68.70 lb ft)

## INTRODUCTION

<b>Thread size (UNF)</b>	<b>Wrench</b>	<b>Torque</b>
1-3/16-12	36 mm	176.26 N·m (130.00 lb ft)
1-7/16-12	41 mm	206.08 N·m (152.00 lb ft)
1-11/16-12	50 mm	343.02 N·m (253.00 lb ft)

### Fitting

<b>Thread size</b>	<b>Wrench</b>	<b>Torque</b>
1/4"	19 mm	39.18 N·m (28.90 lb ft)
3/8"	22 mm	49.08 N·m (36.20 lb ft)
1/2"	27 mm	93.14 N·m (68.70 lb ft)
3/4"	36 mm	176.26 N·m (130.00 lb ft)
1"	41 mm	206.08 N·m (152.00 lb ft)
1-1/4"	50 mm	343.02 N·m (253.00 lb ft)

## Torque - Special torque settings

Component		Bolt size	Torque setting
Engine	Engine mounting bolt (engine–bracket)	M12 x 1.75	<b>96.3 – 155.9 N·m (71.0 – 115.0 lb ft)</b>
		M12 x 1.75	<b>117.7 – 137.21 N·m (86.8 – 101.20 lb ft)</b>
	Engine mounting bolt (bracket-frame)	M10 x 1.5	<b>54.2 – 81.4 N·m (40.0 – 60.0 lb ft)</b>
	Radiator mounting bolt and nut	M12 x 1.75	<b>96.3 – 155.9 N·m (71.0 – 115.0 lb ft)</b>
	Coupling mounting bolt	M12 x 1.75	<b>72.3 – 110.2 N·m (53.3 – 81.3 lb ft)</b>
Hydraulic system	Main pump mounting bolt	M12 x 1.75	<b>74.6 – 112.5 N·m (55.0 – 83.0 lb ft)</b>
	Main control valve mounting bolt	M10 x 1.5	<b>54.0 – 81.4 N·m (39.8 – 60.0 lb ft)</b>
	Fuel tank mounting bolt	M6 x 1.0	<b>8.3 – 12.3 N·m (6.2 – 9.0 lb ft)</b>
		M8 x 1.25	<b>19.7 – 29.4 N·m (14.5 – 21.7 lb ft)</b>
		M12 x 1.75	<b>96.3 – 155.9 N·m (71.0 – 115.0 lb ft)</b>
	Hydraulic oil tank mounting bolt	M8 x 1.25	<b>19.7 – 29.42 N·m (14.5 – 21.70 lb ft)</b>
		M12 x 1.75	<b>96.3 – 155.9 N·m (71 – 115 lb ft)</b>
Turning joint mounting bolt and nut	M10 x 1.5	<b>54.0 – 81.4 N·m (39.8 – 60.0 lb ft)</b>	
Swing motor mounting bolt	M14 x 2.0	<b>164.1 – 221 N·m (121 – 163 lb ft)</b>	
Power train system	Swing bearing upper mounting bolt	M12 x 1.75	<b>115.9 – 155.2 N·m (85.5 – 114.5 lb ft)</b>
	Swing bearing lower mounting bolt	M12 x 1.75	<b>105.9 – 145.2 N·m (78.1 – 107.1 lb ft)</b>
	Travel motor mounting bolt	M12 x 1.75	<b>125.8 – 145.3 N·m (92.8 – 107.2 lb ft)</b>
	Sprocket mounting bolt	M12 x 1.75	<b>108.9 – 132.5 N·m (80.3 – 97.7 lb ft)</b>
Under-carriage	Carrier roller mounting bolt and nut	M12 x 1.75	<b>108.9 – 132.5 N·m (80.3 – 97.7 lb ft)</b>
	Track roller mounting bolt	M18 x 2.0	<b>366.2 – 444.6 N·m (270.1 – 327.9 lb ft)</b>
Other systems	Counterweight mounting bolt	M20 x 2.5	<b>482.8 – 653.4 N·m (356.1 – 481.9 lb ft)</b>
	Operator's seat mounting bolt	M8 x 1.25	<b>19.7 – 29.4 N·m (14.5 – 21.7 lb ft)</b>

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## Basic instructions - Shop and assembly

### Shimming

For each adjustment operation, select adjusting shims and measure the adjusting shims individually using a micrometer, then add up the recorded values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value shown on each shim.

### Rotating shaft seals

For correct rotating shaft seal installation, proceed as follows:

1. Before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
2. Thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
3. Position the sealing lip facing the fluid.

**NOTE:** *With hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will move the fluid towards the inner side of the seal.*

4. Coat the sealing lip with a thin layer of lubricant (use oil rather than grease). Fill the gap between the sealing lip and the dust lip on double lip seals with grease.
5. Insert the seal in its seat and press down using a flat punch or seal installation tool. Do not tap the seal with a hammer or mallet.
6. While you insert the seal, check that the seal is perpendicular to the seat. When the seal settles, make sure that the seal makes contact with the thrust element, if required.
7. To prevent damage to the seal lip on the shaft, position a protective guard during installation operations.

### O-ring seals

Lubricate the O-ring seals before you insert them in the seats. This will prevent the O-ring seals from overturning and twisting, which would jeopardize sealing efficiency.

### Sealing compounds

Apply a sealing compound on the mating surfaces when specified by the procedure. Before you apply the sealing compound, prepare the surfaces as directed by the product container.

### Spare parts

Only use CNH Original Parts or CASE CONSTRUCTION Original Parts.

Only genuine spare parts guarantee the same quality, duration, and safety as original parts, as they are the same parts that are assembled during standard production. Only CNH Original Parts or CASE CONSTRUCTION Original Parts can offer this guarantee.

When ordering spare parts, always provide the following information:

- Machine model (commercial name) and Product Identification Number (PIN)
- Part number of the ordered part, which can be found in the parts catalog

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## Protecting the electronic and/or electrical systems during charging and welding

To avoid damage to the electronic and/or electrical systems, always observe the following practices:

1. Never make or break any of the charging circuit connections when the engine is running, including the battery connections.
2. Never short any of the charging components to ground.
3. Always disconnect the ground cable from the battery before arc welding on the machine or on any machine attachment.
  - Position the welder ground clamp as close to the welding area as possible.
  - If you weld in close proximity to a computer module, then you should remove the module from the machine.
  - Never allow welding cables to lie on, near, or across any electrical wiring or electronic component while you weld.
4. Always disconnect the negative cable from the battery when charging the battery in the machine with a battery charger.

**NOTICE:** *If you must weld on the unit, you must disconnect the battery ground cable from the machine battery. The electronic monitoring system and charging system will be damaged if this is not done.*

5. Remove the battery ground cable. Reconnect the cable when you complete welding.

### WARNING

**Battery acid causes burns. Batteries contain sulfuric acid.**

**Avoid contact with skin, eyes or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately. Failure to comply could result in death or serious injury.**

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## Special tools

The special tools that CASE CONSTRUCTION suggests and illustrate in this manual have been specifically researched and designed for use with CASE CONSTRUCTION machines. The special tools are essential for reliable repair operations. The special tools are accurately built and rigorously tested to offer efficient and long-lasting operation.

By using these tools, repair personnel will benefit from:

- Operating in optimal technical conditions
- Obtaining the best results
- Saving time and effort
- Working in safe conditions

## Machine specifications

### Engine

Model	Yanmar 3TNV88F-ESHYB
Type	4-cycle vertical overhead valve, diesel fuel
Cooling method	Water cooling
Number of cylinders and arrangement	3 cylinders, in-line
Firing order	1 - 3 - 2
Combustion chamber type	Direct injection type
Cylinder bore x stroke	<b>88 mm (3.46 in) x 90 mm (3.54 in)</b>
Piston displacement	<b>1642 cm<sup>3</sup> (100.2 in<sup>3</sup>)</b>
Compression ratio	19.1 : 1
Rated gross horse power ( SAE J1995)	<b>18.2 kW (24.7 Hp) at 2200 RPM</b>
Maximum torque at <b>1200 RPM</b>	<b>84.3 – 94.1 N·m (62.2 – 69.4 lb ft)</b>
Engine oil quantity	<b>6.7 L (1.8 US gal)</b>
Dry weight	<b>172 kg (379 lb)</b>
High idling speed	<b>2280 – 2380 RPM</b>
Low idling speed	<b>1150 – 1250 RPM</b>
Rated fuel consumption	177 g/Hp·hr at 2200 RPM
Starting motor	<b>12 V, 2.3 kW</b>
Alternator	<b>12 V, 55 A</b>
Battery	1 x <b>12 V x 70 A·h ( 20 h rating)</b>

### Main pump

Type	Variable displacement tandem axis piston pumps
Capacity	2 x <b>17 cm<sup>3</sup>/rev (1.0 in<sup>3</sup>/rev)</b>
Maximum pressure	<b>22553 kPa (3271 psi)</b>
Rated oil flow	2 x <b>37.4 L/min (9.9 US gpm)</b>
Rated speed	<b>2200 RPM</b>

### Gear pump

Type	Fixed displacement gear pump single stage
Capacity	<b>4.5 – 10.5 cm<sup>3</sup>/rev (0.3 – 0.6 in<sup>3</sup>/rev)</b>
Maximum pressure	<b>2944 – 20105 kPa (427 – 2916 psi)</b>
Rated oil flow	<b>9.9 – 23.1 L/min (2.6 – 6.1 US gpm)</b>

### Main control valve

Type	Sectional, 10 spools (11 blocks)
Operating method	Hydraulic pilot system
Main relief valve pressure : P1, P2 / P3	<b>20105 – 22553 kPa (2916 – 3271 psi)</b>
Overload relief valve pressure	<b>24518 kPa (3556 psi)</b>

**Swing motor**

Type	Fixed displacement axial piston motor
Capacity	<b>22 cm<sup>3</sup>/rev (1.3 in<sup>3</sup>/rev)</b>
Relief pressure	<b>19616 kPa (2845 psi)</b>
Braking system	Automatic, spring applied hydraulic released
Braking torque	<b>90.2 N·m (66.5 lb ft)</b>
Brake release pressure	<b>1958 – 6378 kPa (284 – 925 psi)</b>
Reduction gear type	2 - stage planetary

**Travel motor**

Type	Variable displacement axial piston motor
Relief pressure	<b>22553 kPa (3271 psi)</b>
Reduction gear type	2-stage planetary
Braking system	Automatic, spring applied hydraulic released
Brake release pressure	<b>1200 kPa (174 psi)</b>
Braking torque	<b>38 N·m (28 lb ft)</b>

**Remote control valve**

Type	Pressure reducing type	
Operating pressure	Minimum	<b>490 kPa (71 psi)</b>
	Maximum	<b>2013 kPa (292 psi)</b>
Single operation stroke	Lever	<b>637.42 – 833.58 kPa (92.45 – 120.90 psi)</b>

**Cylinder**

Boom cylinder	Bore diameter x Rod diameter x Stroke	<b>85 mm (3.3 in) x 45 mm (1.8 in) x 540 mm (21.3 in)</b>
	Cushion	Extend only
Arm cylinder	Bore diameter x Rod diameter x Stroke	<b>Ø 80 mm (3.1 in) x Ø 45 mm (1.8 in) x 585 mm (23.0 in)</b>
	Cushion	Extend and retract
Bucket cylinder	Bore diameter x Rod diameter x Stroke	<b>Ø 70 mm (2.8 in) x Ø 45 mm (1.8 in) x 510 mm (20.1 in)</b>
	Cushion	-
Boom swing cylinder	Bore diameter x Rod diameter x Stroke	<b>Ø 80 mm (3.1 in) x Ø 45 mm (1.8 in) x 400 mm (15.7 in)</b>
	Cushion	-
Dozer cylinder	Bore diameter x Rod diameter x Stroke	<b>Ø 95 mm (3.7 in) x Ø 50 mm (2.0 in) x 152 mm (6.0 in)</b>
	Cushion	-

**NOTE:** discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface.

Discoloration does not cause any harmful effect on the cylinder performance.

**Types of shoes – Steel double grouser**

Shoe width	<b>300 mm (11.8 in)</b>
Ground pressure	<b>28.3 kPa (4.1 psi)</b>
Overall width	<b>1550 mm (61.0 in)</b>

**Types of shoes – Rubber track**

Shoe width	<b>300 mm (11.8 in)</b>
Ground pressure	<b>27.6 kPa (4.0 psi)</b>
Overall width	<b>1550 mm (61.0 in)</b>

INTRODUCTION

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**Number of rollers and shoes on each side**

Upper roller	1
Lower roller	4
Track shoes	44

## Weights

### Machine

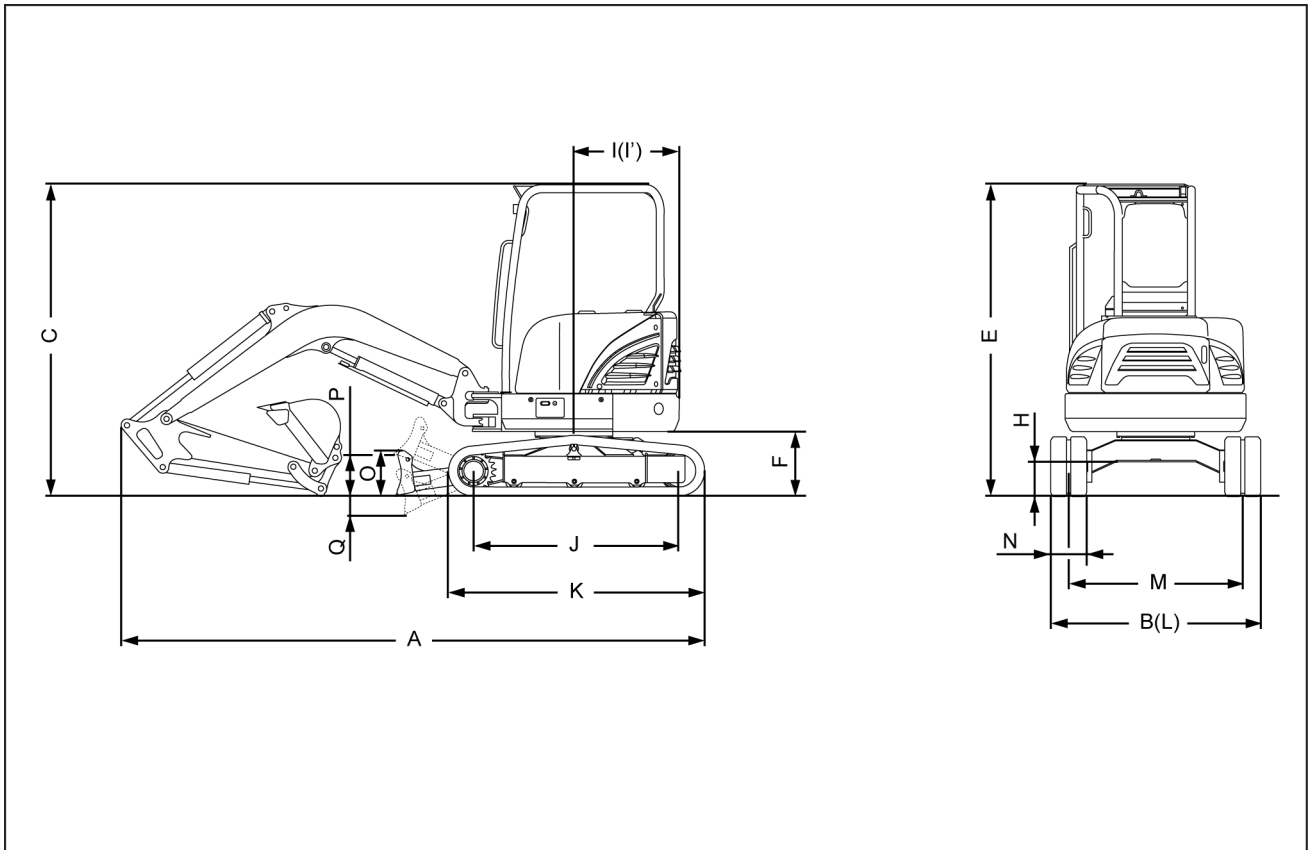
Operating weight (*)	<b>3220 kg (7099 lb)</b>
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### Components

Upperstructure assembly	<b>1460 kg (3218.7 lb)</b>
Main frame weld assembly	<b>345 kg (760.6 lb)</b>
Engine assembly	<b>172 kg (379.2 lb)</b>
Main pump assembly	<b>19 kg (42 lb)</b>
Main control valve assembly	<b>25 kg (55 lb)</b>
Swing motor assembly	<b>40 kg (88.2 lb)</b>
Hydraulic oil tank assembly	<b>50 kg (110 lb)</b>
Fuel tank assembly	<b>30 kg (66 lb)</b>
Boom swing post	<b>80 kg (176.4 lb)</b>
Counterweight	<b>220 kg (485.0 lb)</b>
Cab assembly	<b>210 kg (463 lb)</b>
Canopy assembly	<b>100 kg (220.5 lb)</b>
Lower chassis assembly	<b>1150 kg (2535.3 lb)</b>
Track frame weld assembly	<b>345 kg (760.6 lb)</b>
Swing bearing	<b>50 kg (110.2 lb)</b>
Travel motor assembly	<b>40 kg (88.2 lb)</b>
Turning joint	<b>15 kg (33.1 lb)</b>
Track recoil spring	<b>33.3 kg (73.4 lb)</b>
Idler	<b>22.4 kg (49.4 lb)</b>
Carrier roller	<b>7 kg (15.4 lb)</b>
Track roller	<b>11.5 kg (25.4 lb)</b>
Sprocket	<b>7 kg (15 lb)</b>
Rubber track ( <b>300 mm (11.8 in)</b> )	<b>160 kg (352.7 lb)</b>
Dozer blade assembly	<b>135 kg (297.6 lb)</b>
Front attachment assembly ( <b>2.38 m (93.701 in)</b> boom, <b>1.3 m (51.181 in)</b> arm, <b>0.09 m<sup>3</sup> (0.118 yd<sup>3</sup>)</b> SAE heaped bucket)	<b>485 kg (1069.2 lb)</b>
<b>2.38 m (93.701 in)</b> boom assembly	<b>140 kg (308.6 lb)</b>
<b>1.3 m (51.181 in)</b> arm assembly	<b>80 kg (176.4 lb)</b>
<b>0.09 m<sup>3</sup> (0.118 yd<sup>3</sup>)</b> SAE heaped bucket	<b>80 kg (176.4 lb)</b>
Boom cylinder assembly	<b>40 kg (88.2 lb)</b>
Arm cylinder assembly	<b>40 kg (88.2 lb)</b>
Bucket cylinder assembly	<b>30 kg (66.1 lb)</b>
Bucket control link assembly	<b>20 kg (44 lb)</b>
Dozer cylinder assembly	<b>30 kg (66.1 lb)</b>
Boom swing cylinder assembly	<b>30 kg (66.1 lb)</b>

(\*) Canopy, boom, arm, bucket, lubricant, coolant, full fuel and hydraulic oil, without quick coupler system, rubber track. Weight tolerance:  $\pm 3\%$ .

## Dimensions



SMIL16MEX1545FA 1

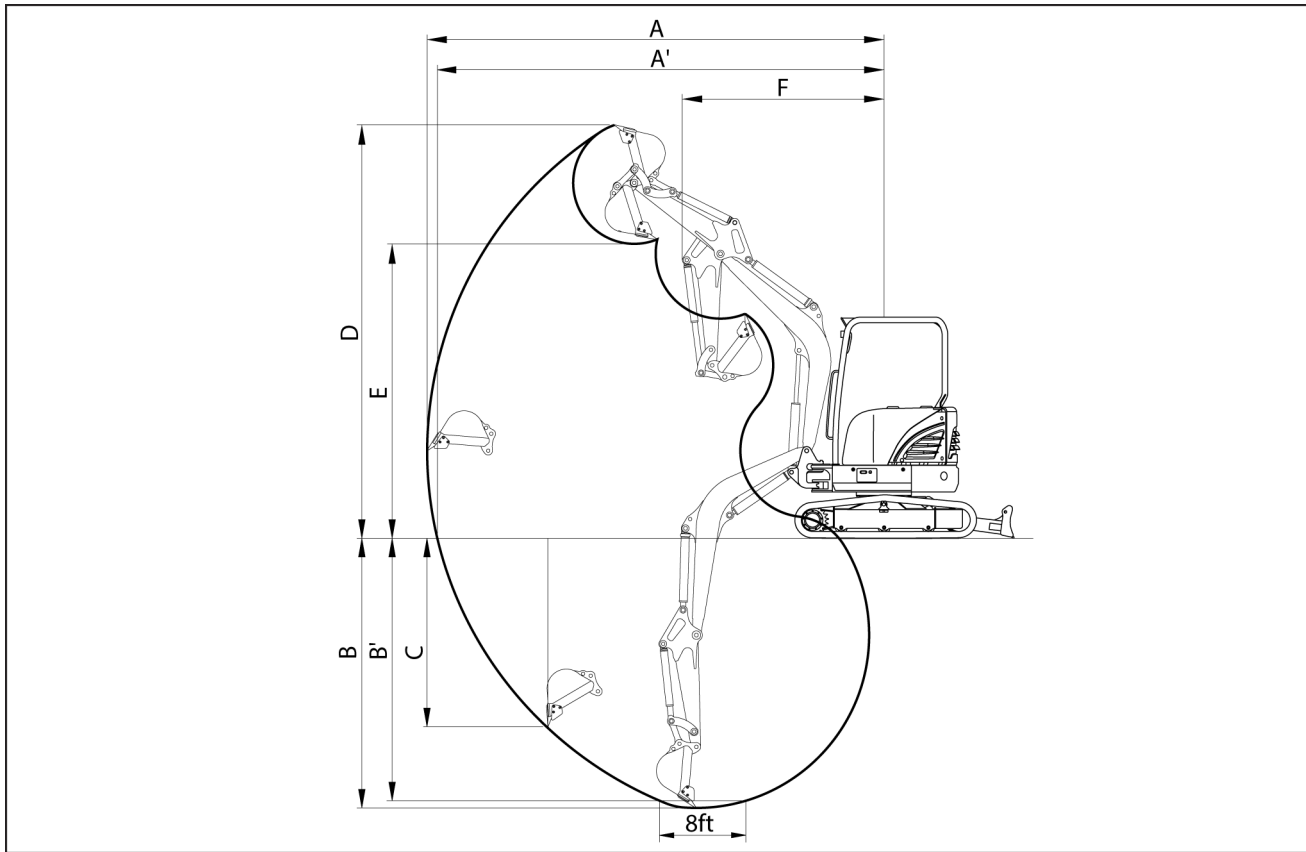
<b>(A)</b> Overall length	<b>4640 mm (182.7 in)</b>
<b>(B)</b> Overall width, with <b>300 mm (11.8 in)</b> shoe	<b>1550 mm (61.0 in)</b>
<b>(C)</b> Overall height	<b>2500 mm (98.4 in)</b>
<b>(E)</b> Overall height of cab	<b>2500 mm (98.4 in)</b>
<b>(F)</b> Ground clearance of counterweight	<b>540 mm (21.3 in)</b>
<b>(H)</b> Minimum ground clearance	<b>290 mm (11.4 in)</b>
<b>(I)</b> Rear-end distance	<b>775 mm (30.5 in)</b>
<b>(I')</b> Rear-end swing radius	<b>775 mm (30.5 in)</b>
<b>(J)</b> Distance between tumbler	<b>1700 mm (66.9 in)</b>
<b>(K)</b> Undercarriage length	<b>2130 mm (83.9 in)</b>
<b>(L)</b> Undercarriage width	<b>1550 mm (61.0 in)</b>
<b>(M)</b> Track gauge	<b>1250 mm (49.2 in)</b>
<b>(N)</b> Track shoe width, standard	<b>300 mm (11.8 in)</b>
<b>(O)</b> Height of blade	<b>330 mm (13.0 in)</b>
<b>(P)</b> Ground clearance of blade up	<b>400 mm (15.7 in)</b>
<b>(Q)</b> Depth of blade down	<b>435 mm (17.1 in)</b>

Boom length: **2.38 m (93.701 in)**

Arm length: **1.3 m (51.181 in)**

With boom swing post

**Working range**



SMIL16MEX2310FA 2

<b>(A)</b> Maximum digging reach		<b>5180 mm (203.9 in)</b>
<b>(A')</b> Maximum digging reach on ground		<b>5060 mm (199.2 in)</b>
<b>(B)</b> Maximum digging depth		<b>3035 mm (119.5 in)</b>
<b>(B')</b> Maximum digging depth (8ft level)		<b>2555 mm (100.6 in)</b>
<b>(C)</b> Maximum vertical wall digging depth		<b>2030 mm (79.9 in)</b>
<b>(D)</b> Maximum digging height		<b>4650 mm (183.1 in)</b>
<b>(E)</b> Maximum dumping height		<b>3275 mm (128.9 in)</b>
<b>(F)</b> Minimum swing radius		<b>2290 mm (90.2 in)</b>
Boom swing radius (left-hand/right-hand)		<b>75° / 50°</b>
Bucket digging force	SAE	<b>27.4 kN (6159.8 lb)</b>
	ISO	<b>30.7 kN (6901.6 lb)</b>
Arm crowd force	SAE	<b>18.9 kN (4248.9 lb)</b>
	ISO	<b>19.5 kN (4383.8 lb)</b>

Boom length: **2.38 m (93.701 in)**

Arm length: **1.3 m (51.181 in)**

With boom swing post

## Conversion factors

### Unit conversion rate

Gravitational unit	- x → ← ÷ -	SI unit
kgf	9.807	N
lbf	4.448	N
kgf·cm	0.0981	N·m
lbf·ft	1.356	N·m
lbf·in	0.113	N·m
kgf/cm <sup>2</sup>	0.0981	MPa
atm	0.1013	MPa
lbf/in <sup>2</sup>	0.0069	MPa
mm Hg	133.3	Pa
in Hg	3386	Pa
kgf· m/s	0.00981	kW
lbf·ft/s	0.00136	kW
PS	0.7355	kW
HP	0.746	kW
kgf·m	9.807	J
kcal	4186	J
kgf·s/cm <sup>2</sup>	98067	Pa·s
cP	0.001	Pa·s
P	0.1	Pa·s
cSt	1 x 10 <sup>-6</sup>	m <sup>2</sup> /s
St	0.0001	m <sup>2</sup> /s

### Length

#### Millimeters to inches

mm	In.	mm	In.	mm	In.	mm	In.
1	0.0394	26	1.0236	51	2.0079	76	2.9921
2	0.0787	27	1.0630	52	2.0472	77	3.0315
3	0.1181	28	1.1024	53	2.0866	78	3.0709
4	0.1575	29	1.1417	54	2.1260	79	3.1102
5	0.1969	30	1.1811	55	2.1654	80	3.1496
6	0.2362	31	1.2205	56	2.2047	81	3.1890
7	0.2756	32	1.2598	57	2.2441	82	3.2283
8	0.3150	33	1.2992	58	2.2835	83	3.2677
9	0.3543	34	1.3386	59	2.3228	84	3.3071
10	0.3937	35	1.3780	60	2.3622	85	3.3465
11	0.4331	36	1.4173	61	2.4016	86	3.3858
12	0.4724	37	1.4567	62	2.4409	87	3.4252
13	0.5118	38	1.4961	63	2.4803	88	3.4646
14	0.5512	39	1.5354	64	2.5197	89	3.5039
15	0.5906	40	1.5748	65	2.5591	90	3.5433
16	0.6299	41	1.6142	66	2.5984	91	3.5827
17	0.6693	42	1.6535	67	2.6378	92	3.6220
18	0.7087	43	1.6929	68	2.6772	93	3.6614
19	0.7480	44	1.7323	69	2.7165	94	3.7008
20	0.7874	45	1.7717	70	2.7559	95	3.7402
21	0.8268	46	1.8110	71	2.7953	96	3.7795
22	0.8661	47	1.8504	72	2.8346	97	3.8189
23	0.9055	48	1.8898	73	2.8740	98	3.8583
24	0.9449	49	1.9291	74	2.9134	99	3.8976
25	0.9843	50	1.9685	75	2.9528	100	3.9370

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**Inches to millimeters**

in.	mm	in.	mm	in.	mm	in.	mm
1/64	0.3969	17/64	6.7469	33/64	13.0969	49/64	19.4469
1/32	0.7938	9/32	7.1438	17/32	13.4938	25/32	19.8438
3/64	1.1906	19/64	7.5406	35/64	13.8906	51/64	20.2406
1/16	1.5875	5/16	7.9375	9/16	14.2875	13/16	20.6375
5/64	1.9844	21/64	8.3344	37/64	14.6844	53/64	21.0344
3/32	2.3813	11/32	8.7313	19/32	15.0813	27/32	21.4313
7/64	2.7781	23/64	9.1281	39/64	15.4781	55/64	21.8281
1/8	3.1750	3/8	9.5250	5/8	15.8750	7/8	22.2250
9/64	3.5719	25/64	9.9218	41/64	16.2719	57/64	22.6219
5/32	3.9688	13/32	10.3188	21/32	16.6688	29/32	23.0188
11/64	4.3656	27/64	10.7156	43/64	17.0656	59/64	23.4156
3/16	4.7625	7/16	11.1125	11/16	17.4625	15/16	23.8125
13/64	5.1594	29/64	11.5094	45/64	17.8594	61/64	24.2094
7/32	5.5563	15/32	11.9063	23/32	18.2563	31/32	24.6063
15/64	5.9531	31/64	12.3031	47/64	18.6531	63/64	25.0031
1/4	6.3500	1/2	12.7000	3/4	19.0500	1	25.4000

**Feet to meters**

ft.	0	1	2	3	4	5	6	7	8	9	ft.
	m	m	m	m	m	m	m	m	m	m	
----		0.305	0.610	0.914	1.219	1.524	1.829	2.134	2.438	2.743	----
10	3.048	3.353	3.658	3.962	4.267	4.572	4.877	5.182	5.486	5.791	10
20	6.096	6.401	6.706	7.010	7.315	7.620	7.925	8.230	8.534	8.839	20
30	9.144	9.449	9.754	10.058	10.363	10.668	10.973	11.278	11.582	11.887	30
40	12.192	12.497	12.802	13.106	13.411	13.716	14.021	14.326	14.630	14.935	40
50	15.24	15.545	15.850	16.154	16.459	16.764	17.069	17.374	17.678	17.983	50
60	18.288	18.593	18.898	19.202	19.507	19.812	20.117	20.422	20.726	21.031	60
70	21.336	21.641	21.946	22.250	22.555	22.860	23.165	23.470	23.774	24.079	70
80	24.384	24.689	24.994	25.298	25.603	25.908	26.213	26.518	26.822	27.127	80
90	27.432	27.737	28.042	28.346	28.651	28.956	29.261	29.566	29.870	30.175	90
100	30.480	30.785	31.090	31.394	31.699	32.004	32.309	32.614	32.918	33.223	100

**Meters to feet**

m	0	1	2	3	4	5	6	7	8	9	m
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	
----		3.2808	6.5617	9.8425	13.1234	16.4042	19.685	22.9659	26.2467	29.5276	----
10	32.8084	36.0892	39.3701	42.6509	45.9318	49.2126	52.4934	55.7743	59.0551	62.3360	10
20	65.6168	68.8976	72.1785	75.4593	78.7402	82.0210	85.3018	88.5827	91.8635	95.1444	20
30	98.4252	101.706	104.986	108.267	111.5486	114.829	118.1102	121.391	124.671	127.952	30
40	131.233	134.514	137.795	141.076	144.357	147.637	150.918	154.199	157.480	160.761	40
50	164.042	167.322	170.603	173.884	177.165	180.446	183.727	187.007	190.288	193.569	50
60	196.850	200.131	203.412	206.692	209.973	213.254	216.535	219.816	223.097	226.378	60
70	229.658	232.939	236.220	239.501	242.782	246.063	249.343	252.624	255.905	259.186	70
80	262.467	265.748	269.028	272.309	275.590	278.871	282.152	285.433	288.713	291.994	80
90	295.275	298.556	301.837	305.118	308.399	311.679	314.960	318.241	321.522	324.803	90
100	328.084	331.364	334.645	337.926	341.207	344.488	347.769	351.049	354.330	357.611	100

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**Miles to kilometers**

miles	0	1	2	3	4	5	6	7	8	9	miles
	km	km	km	km	km	km	km	km	km	km	
----		1.609	3.219	4.828	6.437	8.047	9.656	11.265	12.875	14.484	----
10	16.093	17.703	19.312	20.921	22.531	24.140	25.750	27.359	28.968	30.578	10
20	32.187	33.796	35.406	37.015	38.624	40.234	41.843	43.452	45.062	46.671	20
30	48.280	49.890	51.499	53.108	54.718	56.327	57.936	59.546	61.155	62.764	30
40	64.374	65.983	67.592	69.202	70.811	72.420	74.030	75.639	77.249	78.858	40
50	80.467	82.077	83.686	85.295	86.905	88.514	90.123	91.733	93.342	94.951	50
60	96.561	98.170	99.779	101.39	102.998	104.607	106.217	107.826	109.435	111.045	60
70	112.654	114.263	115.873	117.482	119.091	120.701	122.310	123.919	125.529	127.138	70
80	128.748	130.357	131.966	133.576	135.185	136.794	138.404	140.013	141.622	143.232	80
90	144.841	146.450	148.060	149.669	151.278	152.888	154.497	156.106	157.716	159.325	90
100	160.934	162.544	164.153	165.762	167.372	168.981	170.590	172.200	173.809	175.418	100

**Kilometers to miles**

km	0	1	2	3	4	5	6	7	8	9	km
	miles	miles	miles	miles	miles	miles	miles	miles	miles	miles	
----		0.621	1.243	1.864	2.485	3.107	3.728	4.350	4.971	5.592	----
10	6.214	6.835	7.456	8.078	8.699	9.321	9.942	10.563	11.185	11.806	10
20	12.427	13.049	13.670	14.292	14.913	15.534	16.156	16.777	17.398	18.020	20
30	18.641	19.263	19.884	20.505	21.127	21.748	22.369	22.991	23.612	24.233	30
40	24.855	25.476	26.098	26.719	27.340	27.962	28.583	29.204	29.826	30.447	40
50	31.069	31.690	32.311	32.933	33.554	34.175	34.797	35.418	36.040	36.661	50
60	37.282	37.904	38.525	39.146	39.768	40.389	41.010	41.632	42.253	42.875	60
70	43.496	44.117	44.739	45.360	45.981	46.603	47.224	47.846	48.467	49.088	70
80	49.710	50.331	50.952	51.574	52.195	52.817	53.438	54.059	54.681	55.302	80
90	55.923	56.545	57.166	57.788	58.409	59.03	59.652	60.273	60.894	61.516	90
100	62.137	62.758	63.380	64.001	64.623	65.244	65.865	66.487	67.108	67.729	100

**Area**

**Square inches to square centimeters**

in <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	in <sup>2</sup>
	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	
----		6.452	12.903	19.355	25.806	32.258	38.710	45.161	51.613	58.065	----
10	64.516	70.968	77.419	83.871	90.323	96.774	103.226	109.677	116.129	122.581	10
20	129.032	135.484	141.935	148.387	154.839	161.290	167.742	174.194	180.645	187.097	20
30	193.548	200.000	206.452	212.903	219.355	225.806	232.258	238.710	245.161	251.613	30
40	258.065	264.516	270.968	277.419	283.871	290.323	296.774	303.226	309.677	316.129	40
50	322.581	329.032	335.484	341.935	348.387	354.839	361.290	367.742	374.194	380.645	50
60	387.097	393.548	400.000	406.452	412.903	419.355	425.806	432.258	438.710	445.161	60
70	451.613	458.065	464.516	470.968	477.419	483.871	490.323	496.774	503.226	509.677	70
80	516.129	522.581	529.032	535.484	541.935	548.387	554.839	561.290	567.742	574.194	80
90	580.645	587.097	593.548	600.000	606.452	612.903	619.355	625.806	632.258	638.710	90
100	645.161	651.613	658.065	664.516	670.968	677.419	683.871	690.323	696.774	703.226	100

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**Square centimeters to square inches**

cm <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	cm <sup>2</sup>
	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	in <sup>2</sup>	
----		0.155	0.310	0.465	0.620	0.775	0.930	1.085	1.240	1.395	----
10	1.550	1.705	1.860	2.015	2.170	2.325	2.480	2.635	2.790	2.945	10
20	3.100	3.255	3.410	3.565	3.720	3.875	4.030	4.185	4.340	4.495	20
30	4.650	4.805	4.960	5.115	5.270	5.425	5.580	5.735	5.890	6.045	30
40	6.200	6.355	6.510	6.665	6.820	6.975	7.130	7.285	7.440	7.595	40
50	7.750	7.905	8.060	8.215	8.370	8.525	8.680	8.835	8.990	9.145	50
60	9.300	9.455	9.610	9.765	9.920	10.075	10.230	10.385	10.540	10.695	60
70	10.850	11.005	11.160	11.315	11.470	11.625	11.780	11.935	12.090	12.245	70
80	12.400	12.555	12.710	12.865	13.020	13.175	13.330	13.485	13.640	13.795	80
90	13.950	14.105	14.260	14.415	14.570	14.725	14.880	15.035	15.190	15.345	90
100	15.500	15.655	15.810	15.965	16.120	16.275	16.430	16.585	16.740	16.895	100

**Volume**

**Cubic inches to cubic centimeters**

in <sup>3</sup>	0	1	2	3	4	5	6	7	8	9	in <sup>3</sup>
	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	cm <sup>3</sup> (cc)	
----		16.387	32.774	49.161	65.548	81.936	98.323	114.710	131.097	147.484	----
10	163.871	180.258	196.645	213.032	229.419	245.807	262.194	278.581	294.968	311.355	10
20	327.742	344.129	360.516	376.903	393.290	409.678	426.065	442.452	458.839	475.226	20
30	491.613	508.000	524.387	540.774	557.161	573.549	589.936	606.323	622.710	639.097	30
40	655.484	671.871	688.258	704.645	721.033	737.420	753.807	770.194	786.581	802.968	40
50	819.355	835.742	852.129	868.516	884.904	901.291	917.678	934.065	950.452	966.839	50
60	983.226	999.613	0	7	5	2	9	6	1114.323	0	60
70	1147.09	1163.48	1179.87	1196.25	1212.64	1229.03	1245.42	1261.80	1278.19	1294.58	70
	7	4	1	8	6	3	0	7	4	1	
80	1310.96	1327.35	1343.74	1360.13	1376.51	1392.90	1409.29	1425.67	1442.06	1458.45	80
	8	5	2	0	7	4	1	8	5	2	
90	1474.83	1491.22	1507.61	1524.00	1540.38	1556.77	1573.16	1589.54	1605.93	1622.32	90
	9	6	3	1	8	5	2	9	6	3	
100	1638.71	1655.09	1671.48	1687.87	1704.25	1720.64	1737.03	1753.42	1769.80	1786.19	100
	0	7	4	2	9	6	3	0	7	4	

**Cubic centimeters to cubic inches**

cm <sup>3</sup> (cc)	0	1	2	3	4	5	6	7	8	9	cm <sup>3</sup> (cc)
	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	in <sup>3</sup>	
----		0.0610	0.1220	0.1831	0.2441	0.3051	0.3661	0.4272	0.4882	0.5492	----
10	0.6102	0.6713	0.7323	0.7933	0.8543	0.9154	0.9764	1.0374	1.0984	1.1594	10
20	1.2205	1.2815	1.3425	1.4035	1.4646	1.5256	1.5866	1.6476	1.7087	1.7697	20
30	1.8307	1.8917	1.9528	2.0138	2.0748	2.1358	2.1968	2.2579	2.3189	2.3799	30
40	2.4409	2.5020	2.5630	2.6240	2.6850	2.7461	2.8071	2.8681	2.9291	2.9902	40
50	3.0512	3.1122	3.1732	3.2343	3.2953	3.3563	3.4173	3.4784	3.5394	3.6004	50
60	3.6614	3.7224	3.7835	3.8445	3.9055	3.9665	4.0276	4.0886	4.1496	4.2106	60
70	4.2717	4.3327	4.3937	4.4547	4.5157	4.5768	4.6378	4.6988	4.7598	4.8209	70
80	4.8819	4.9429	5.0039	5.0650	5.1260	5.1870	5.2480	5.3091	5.3701	5.4311	80
90	5.4921	5.5531	5.6142	5.6752	5.7362	5.7972	5.8583	5.9193	5.9803	6.0413	90
100	6.1024	6.1634	6.2244	6.2854	6.3465	6.4075	6.4685	6.5295	6.5905	6.6516	100

INTRODUCTION

Product: 2017 Case CX33C Mini Excavator Service Manual 48139719

Full Download: <https://www.arepairmanual.com/downloads/2017-case-cx33c-mini>

~~[excavator service manual 48139719/](https://www.arepairmanual.com/downloads/2017-case-cx33c-mini-excavator-service-manual-48139719/)~~

**Gallons (U.S) to liters**

U.S.-gal.	0	1	2	3	4	5	6	7	8	9	U.S.-gal.
	liters	liters	liters	liters	liters	liters	liters	liters	liters	liters	
----		3.7853	7.5707	11.3560	15.1413	18.9266	22.7120	26.4973	30.2826	34.0680	----
10	37.8533	41.6386	45.4239	49.2093	52.9946	56.7799	60.5653	64.3506	68.1359	71.9213	10
20	75.7066	79.4919	83.2772	87.0626	90.8479	94.6332	98.4186	102.203	105.989	109.774	20
30	113.559	117.345	121.130	124.915	128.701	132.486	136.271	140.057	143.842	147.627	30
	9	2	5	9	2	5	8	2	5	8	
40	151.413	155.198	158.983	162.769	166.554	170.339	174.125	177.910	181.695	185.481	40
	2	5	8	1	5	8	1	5	8	1	
50	189.266	193.051	196.837	200.622	204.407	208.193	211.978	215.763	219.549	223.334	50
	5	8	1	4	8	1	4	8	1	4	
60	227.119	230.905	234.690	238.475	242.261	246.046	249.831	253.617	257.402	261.187	60
	7	1	4	7	1	4	7	0	4	7	
70	264.973	268.758	272.543	276.329	280.114	283.899	287.685	291.470	295.255	299.041	70
	0	4	7	0	3	7	0	3	7	0	
80	302.826	306.611	310.397	314.182	317.967	321.753	325.538	329.323	333.109	336.894	80
	3	6	0	3	6	0	3	6	0	3	
90	340.679	344.464	348.250	352.035	355.820	359.606	363.391	367.176	370.962	374.747	90
	6	9	3	6	9	3	6	9	2	6	
100	378.532	382.318	386.103	389.888	393.674	397.459	401.244	405.030	408.815	412.600	100
	9	2	6	9	2	5	9	2	5	9	

**Liters to gallons (U.S)**

liters	0	1	2	3	4	5	6	7	8	9	liters
	U.S.gal.	U.S.gal.	U.S.gal.	U.S.gal.	U.S.gal.	U.S.gal.	U.S.gal.	U.S.gal.	U.S.gal.	U.S.gal.	
----		0.2642	0.5284	0.7925	1.0567	1.3209	1.5851	1.8492	2.1134	2.3776	----
10	2.6418	2.9060	3.1701	3.4343	3.6985	3.9627	4.2268	4.4910	4.7552	5.0194	10
20	5.2836	5.5477	5.8119	6.0761	6.3403	6.6044	6.8686	7.1328	7.3970	7.6612	20
30	7.9253	8.1895	8.4537	8.7179	8.9820	9.2462	9.5104	9.7746	10.0388	10.3029	30
40	10.5671	10.8313	11.0955	11.3596	11.6238	11.8880	12.1522	12.4164	12.6805	12.9447	40
50	13.2089	13.4731	13.7372	14.0014	14.2656	14.5298	14.7940	15.0581	15.3223	15.5865	50
60	15.8507	16.1148	16.3790	16.6432	16.9074	17.1716	17.4357	17.6999	17.9641	18.2283	60
70	18.4924	18.7566	19.0208	19.2850	19.5492	19.8133	20.0775	20.3417	20.6059	20.8700	70
80	21.1342	21.3984	21.6626	21.9268	22.1909	22.4551	22.7193	22.9835	23.2476	23.5118	80
90	23.7760	24.0402	24.3044	24.5685	24.8327	25.0969	25.3611	25.6252	25.8894	26.1536	90
100	26.4178	26.6820	26.9461	27.2103	27.4745	27.7387	28.0028	28.2670	28.5312	28.7954	100

Sample manual. Download All pages at:

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