CX80C

Midi Crawler Excavator

SERVICE MANUAL

Part number 47575340A
1st edition English
July 2013

CASE CONSTRUCTION

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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 genuine service parts.

When placing an order, check the parts catalog. It contains the CASE 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

WARNING:

This symbol indicates the need for caution.

Details are given concerning the safety of the operator and the surroundings.

Read all cautions carefully and understand them well before starting any work.

In order to prevent any accidents, always comply with warnings and cautions.

This section covers overall dangers.

Check if warning labels are installed.

Additional warning labels are available for order as a service part.

WARNING:

Read this operator's manual well to have a thorough understanding of how to control and operate this machine.

WARNING:

Always operate this machine from the seated position.

Any other method of operation has the danger of severe injury.

WARNING:

This machine is for only 1 person to ride on. Do not ride 2 people on this machine.

WARNING:

Before starting the engine, check the safety messages in this operator's manual.
Check all the warning labels on the machine.
Check that there is no one anywhere in or around the work range for the machine.
Check the operation methods in a safe location before starting the actual work.
Understand the operation of this machine well, then operate it according to service-related laws and ordinances.
The operator's manual and service manual can be ordered from any CASE CONSTRUCTION dealer.

WARNING:

Working in untidy work clothes or in clothes with which safety cannot be ensured leads to damage to the machine and injury of the operator themselves.
Always work dressed for safety.
In order to work more safely, it is recommended to wear additional safety gear.
(Helmet, safety shoes, earplugs, goggles, work clothes, and gloves)

WARNING:

Work with great care when the engine is running.

WARNING:

Check and verify hydraulic equipment.
Work according to the procedure.
Do not change the procedure.

WARNING:

When bleeding the pressure from hydraulic circuits to inspect the machine's hydraulic cylinders, make sure that there is no one in the vicinity before doing the work.

WARNING:

Use gloves when handling hot parts.

WARNING:

Lower the parts to the ground before inspecting or repairing attachments and lower parts.

WARNING:

Check that all hoses and tubes are securely connected.
Replace any damaged hose or tube.
Do not use your hands to check for oil leaks. Use a piece of cardboard or wood.

WARNING:

When removing an attachment pin or other hard pin, use a hammer with a soft head.

WARNING:

When installing a pin with a hammer and working with a grinder, wear protective eyewear.
At this time, use goggles or a protector that meets the standards.

WARNING:

When repairing or inspecting, stop the machine at a safe location.

WARNING:

When repairing the machine, protect the work site.
Check the oil, coolant, grease, and tools.
Collect materials and parts as necessary.
Pay careful attention to work safely.

WARNING:

Some of the machine's parts are extremely heavy.
In this case, use an appropriate crane.
For details on the weights and correct procedures, see the Service Manual.

WARNING:

Exhaust gas is harmful.
When working indoors or in any other enclosed space, always use good ventilation.

WARNING:

If battery solution is frozen, there is a danger of it exploding.

Safety rules – ROPS judgment method

1. Purpose

Check against the ROPS judgment criteria to judge whether the machine satisfies the ROPS criteria or not.

The weight and boom of the machine greatly effects whether the ROPS judgment criteria is satisfied or not.

The ROPS test assumes that the weight being used is the weight of the machine when the maximum number of selectable options are mounted (as of 2009).

However, depending on the derivative machinery or the order details, the weight and boom position may differ from the assumed weight or position.

2. Criteria for judging whether a machine satisfies the ROPS criteria

Weight

The weight must not be over the weight shown below for each class.

If the weight is exceeded, there is a danger that the cab could be damaged and the operator could die or sustain a serious injury when the machine falls over.

If the weight exceeds the stipulated weight, the machine will not satisfy the ROPS criteria.

- Weight (X3 model)

To satisfy the ROPS criteria, the weight must not be over the indicated weight. (The below weights are the weights indicated on the nameplate within the ROPS cab.)

Machine body total weight	Class
16000 kg (**35273.962 lb**) max.	CX75C CX80C CX145C
20500 kg (**45194.764 lb**) max.	CX130C CX160C
28000 kg (**61729.433 lb**) max.	CX235C
31000 kg (**68343.301 lb**) max.	CX210C CX250C CX250C LR CX300C
50000 kg (**110231.131 lb**) max.	CX470C

* The ROPS test assumes that the CX470C has a cage guard (alone).

- Weight (X2 model)

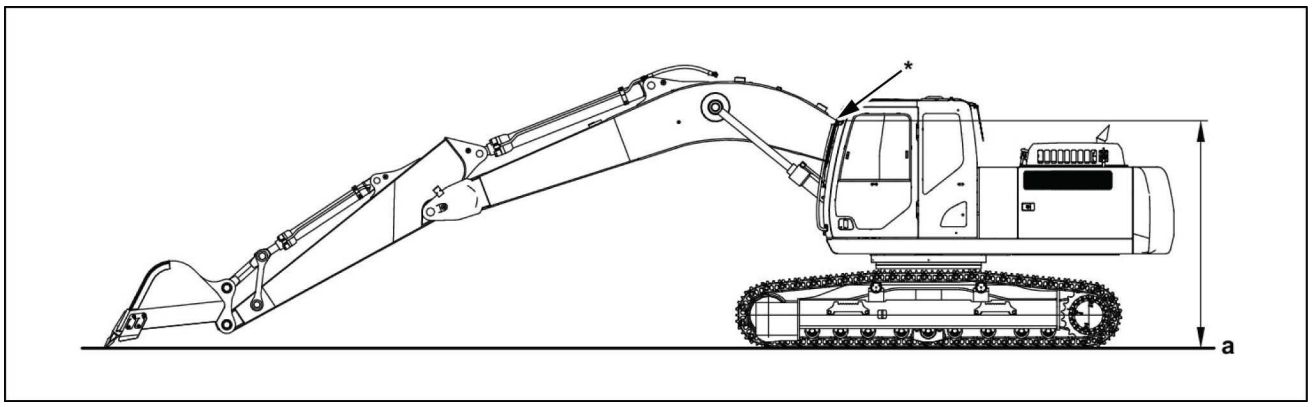
To satisfy the ROPS criteria, the weight must not be over the indicated weight. (The below weights are the weights indicated on the nameplate within the ROPS cab.)

Machine body total weight	Class
26600 kg (**58642.962 lb**) max.	CX130B CX160B CX180B CX210B CX240B

Boom position

⚠ WARNING:

- If the machine has been modified so that the boom position has been lowered, the machine will not satisfy the ROPS criteria.
- It is necessary to consult with our company if it is possible that the boom's position has been lowered by modification.
- The extent to which a boom position has moved cannot be determined in the same way for all machines.



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a. Ground point

With the tip of the bucket in contact with the ground surface at maximum work radius, if the position (* in the diagram) that overlaps with the cab when viewed from the side is markedly lower than that of a standard machine (standard arm), the machine will not satisfy the ROPS criteria.

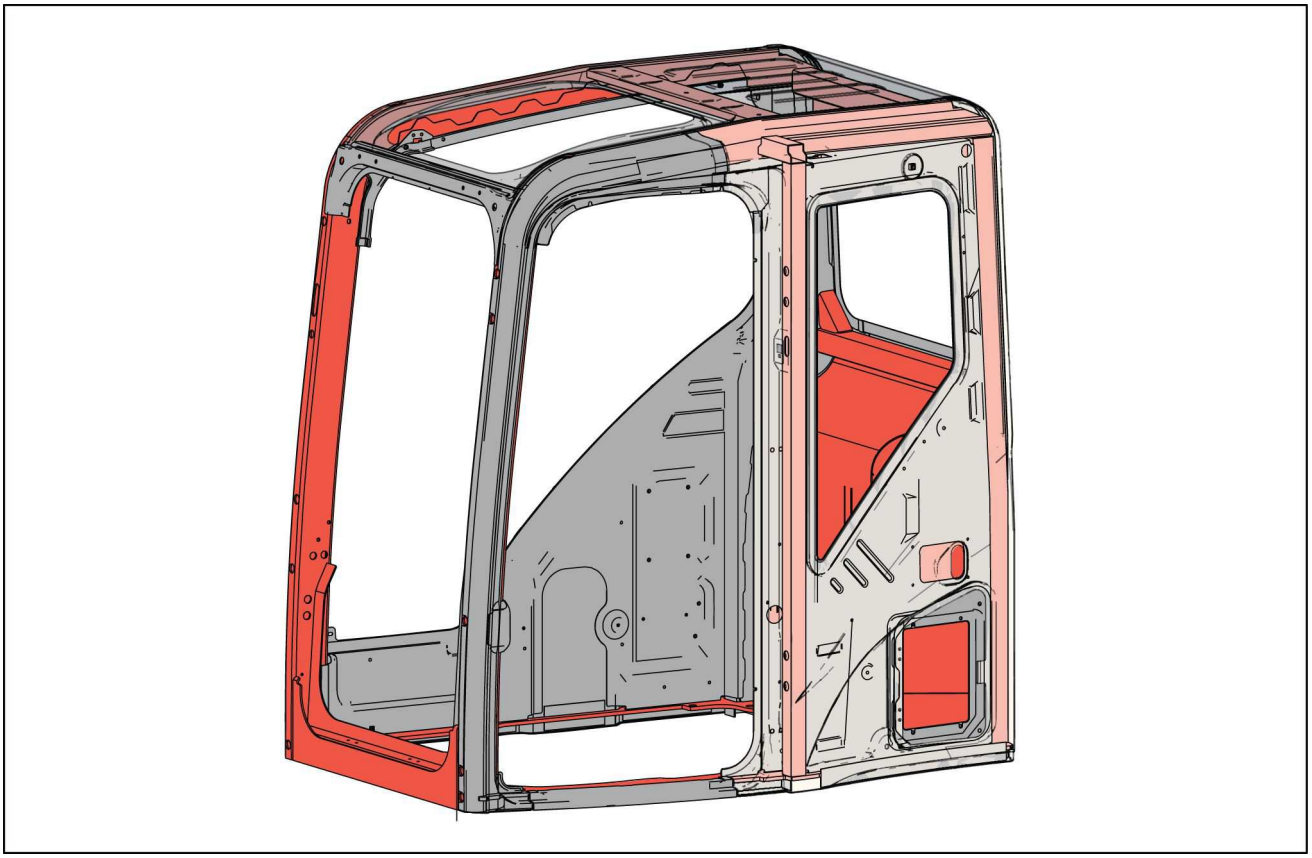
Also, with a machine body with a cab mounted that can withstand up to **31 t** (**68343.30 lb**), the effect of mounting a **24 t** (**52910.94 lb**) machine, which is near the restriction weight, and a **21 t** (**46297.08 lb**) machine to the same cab will not be the same.

3. Prohibited items

- Modifications that reduce the strength of a platform that has a cab with a ROPS mounted to it. (Actions or modifications that reduce the functionality of the anchoring part at the left-rear of the cab)
- Modifications that effect the strength of the ROPS of a cab with a ROPS mounted to it.

Modification prohibited (red part)	All modifications (grinding, welding, drilling holes, removing, etc.) are prohibited
Modification permitted under conditions (gray part)	Removal of parts is prohibited Bar welding and making holes [up to diameter **20 mm** (**0.787 in**)] by drilling are possible

[X3 cab (CX75C/CX80C/CX145C)]



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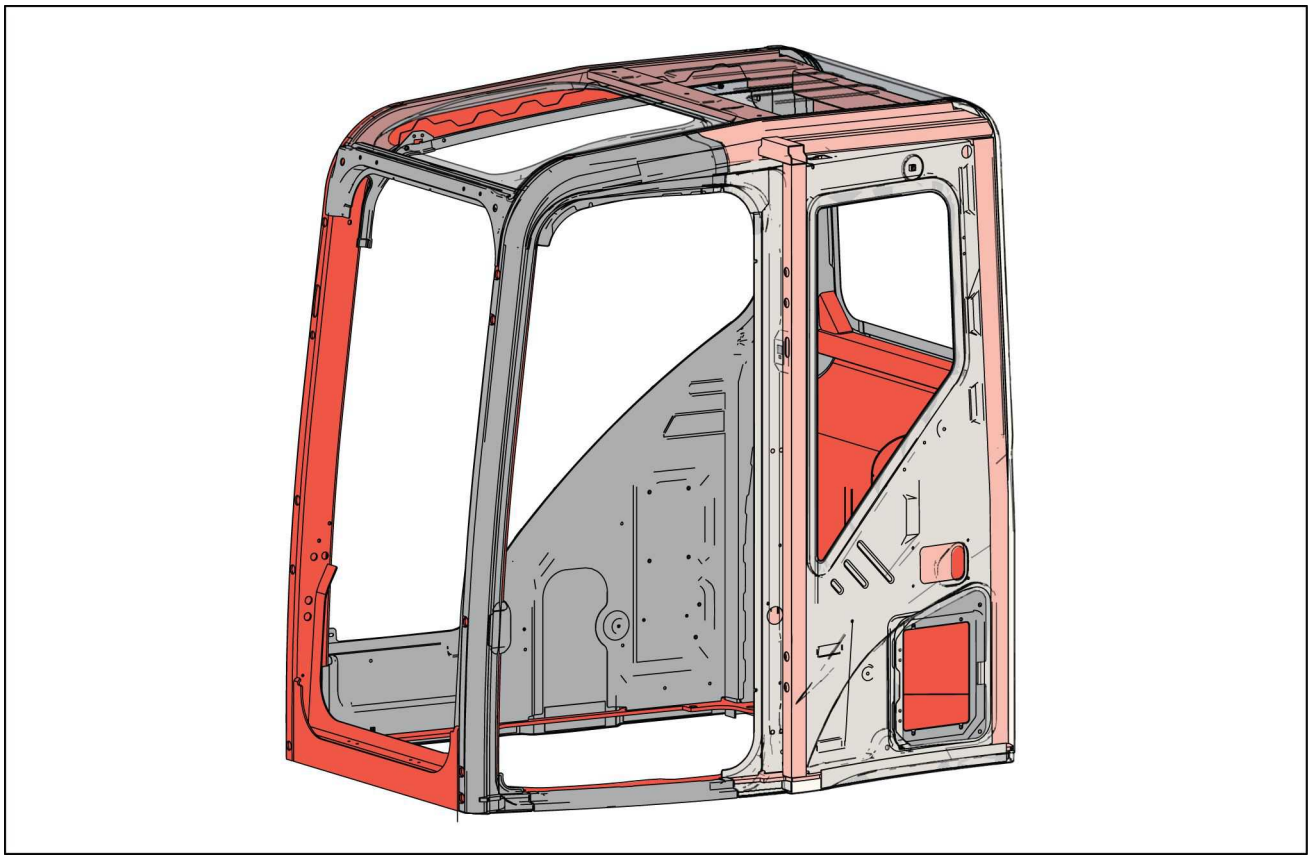
[X3 cab (CX235C)]

The cab for the MSR model (CX235C) has 3 additional reinforcement parts that were added to the MSR model (CX75C/CX80C/CX145C) cab shown in the diagram.



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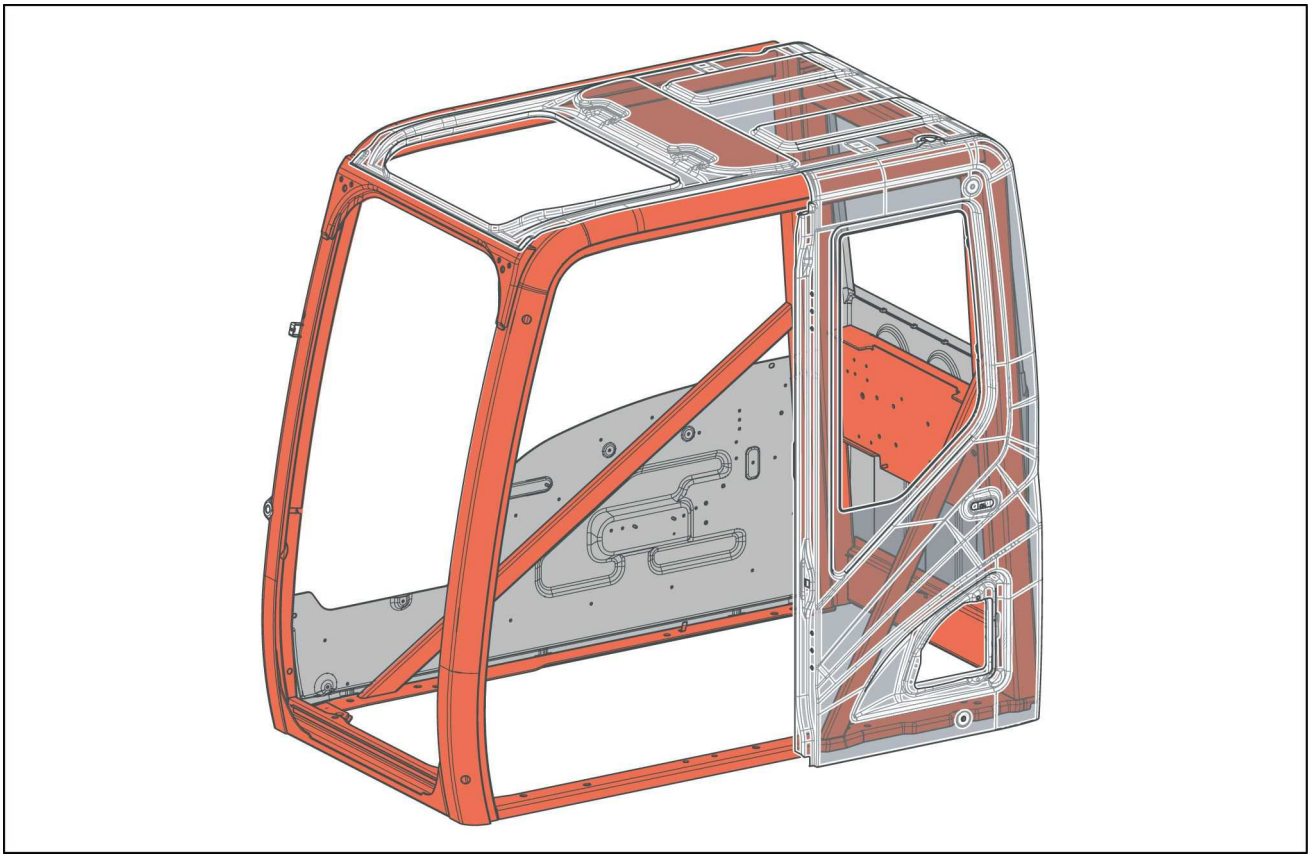

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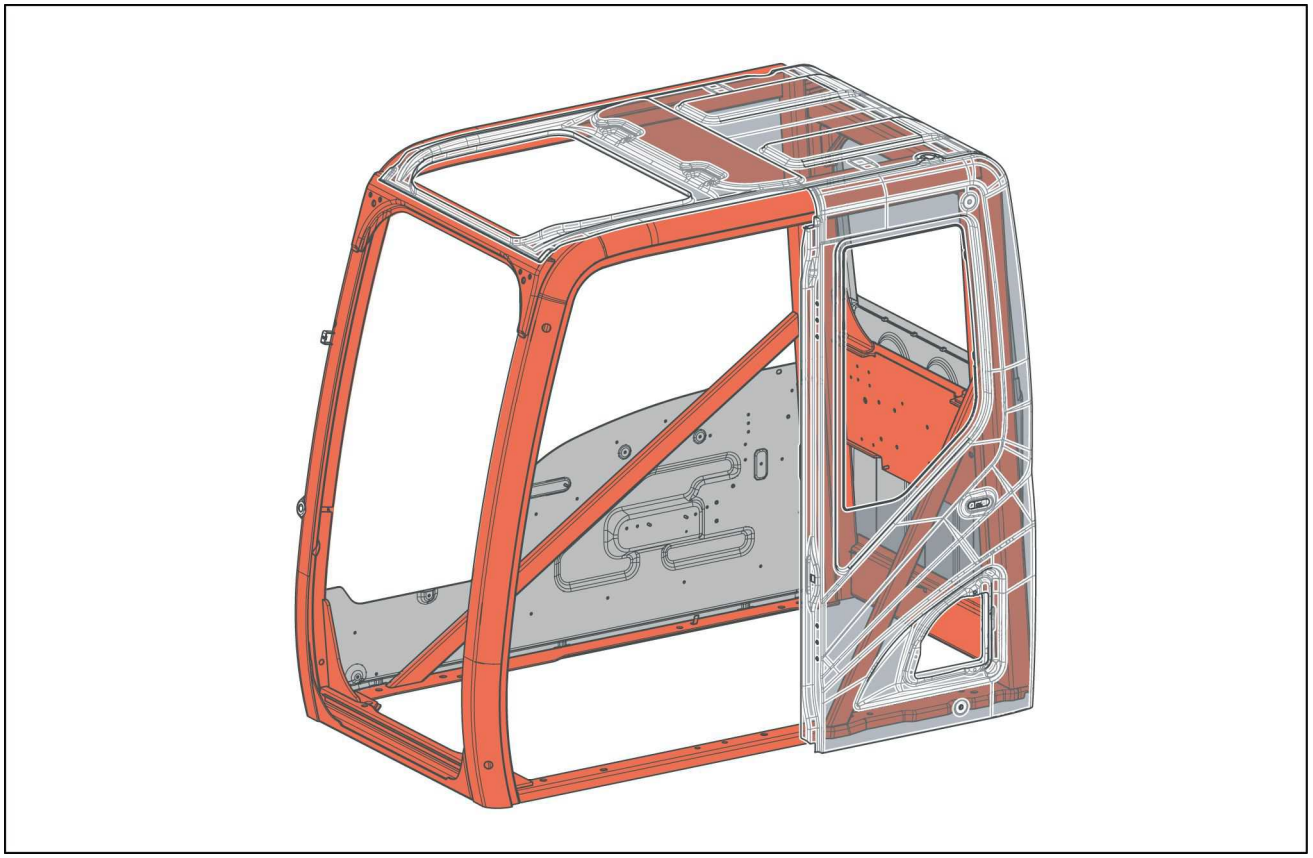
[X3 cab (CX210C/CX240C/CX290C)]



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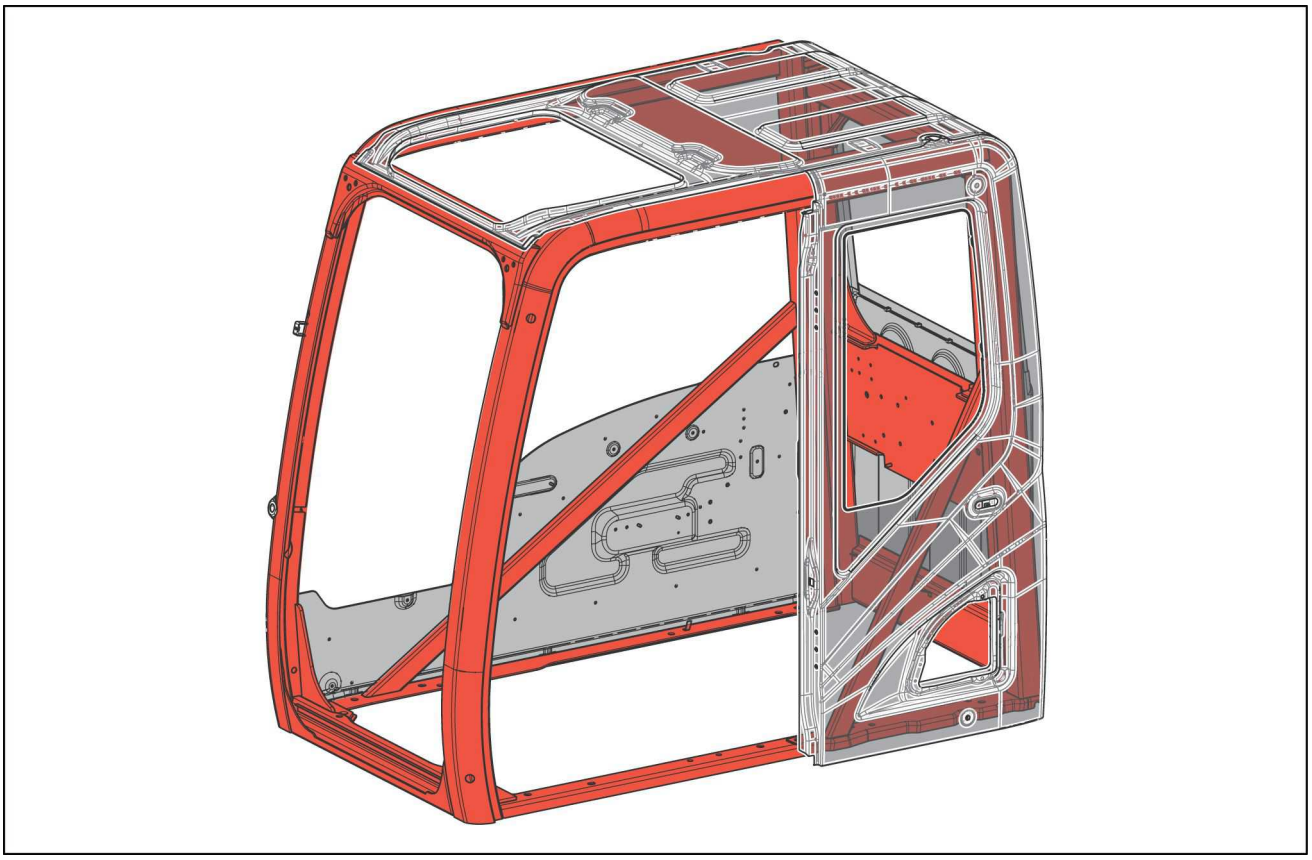
[X3 cab (CX350C)]

The cab for the large-sized model (CX350C) is the cab of the medium-sized model on the diagram (CX210C - CX290C) with reinforcement materials added in 7 locations.



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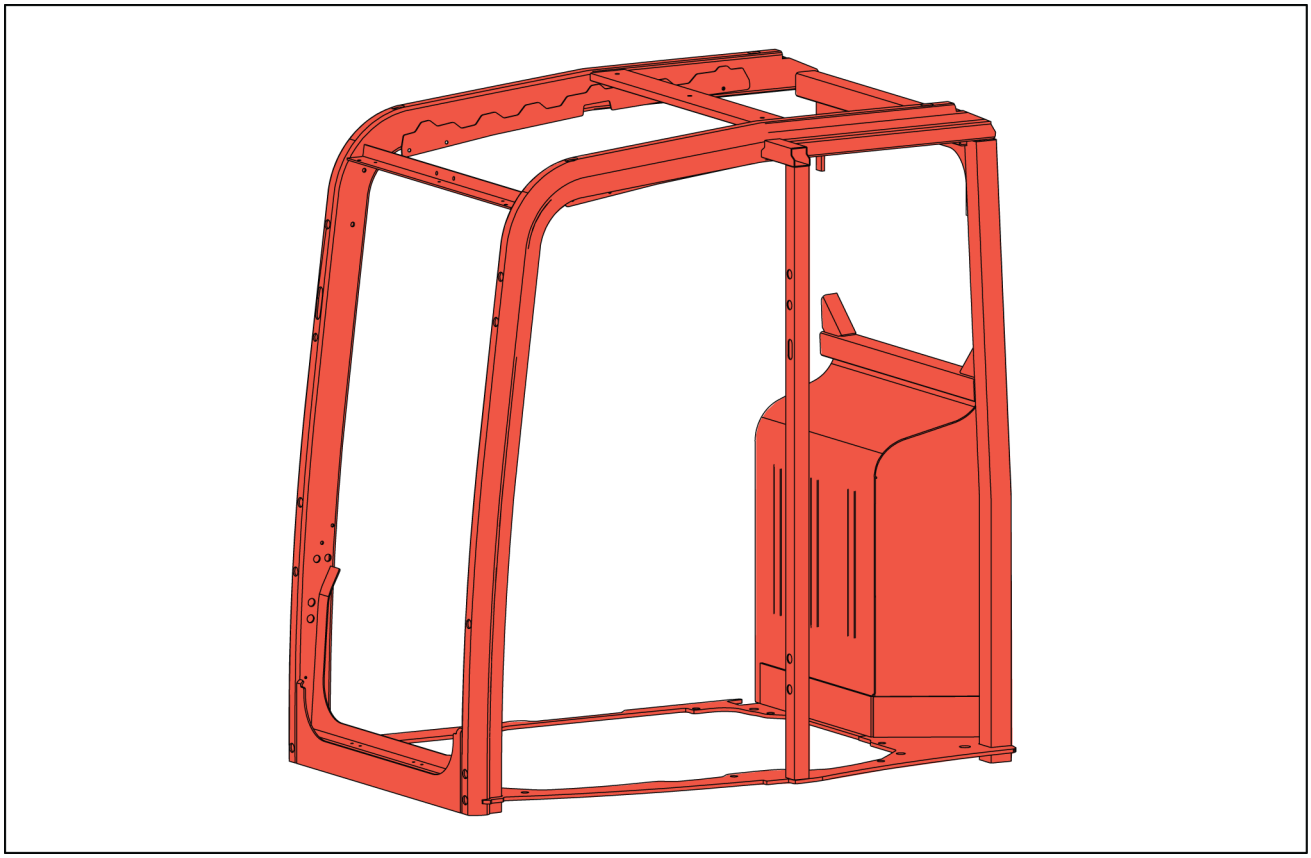
[X3 cab members that cannot be modified (CX75C/CX80C/CX145C/CX235C)]



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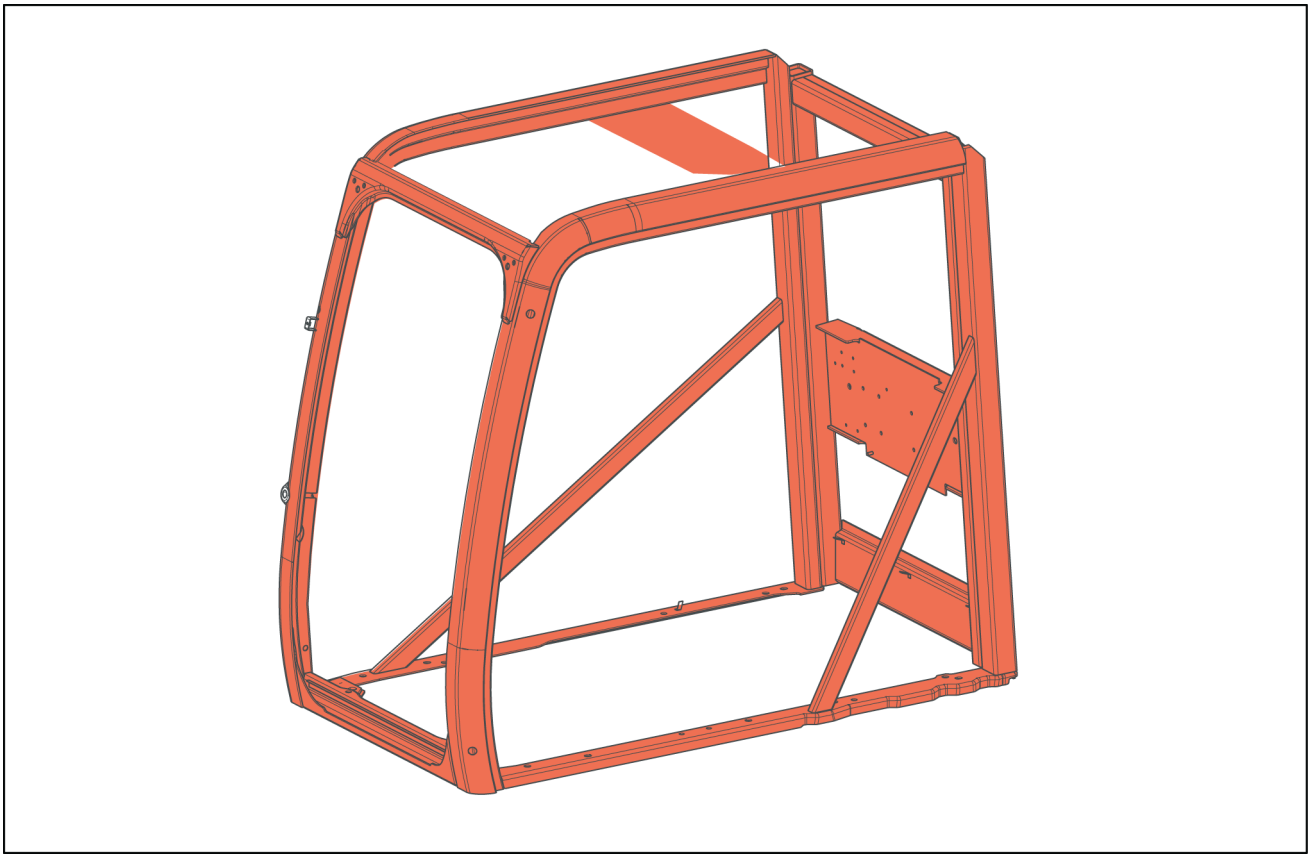
[X3 cab; members that cannot be modified (CX210C/CX240C/CX290C)]



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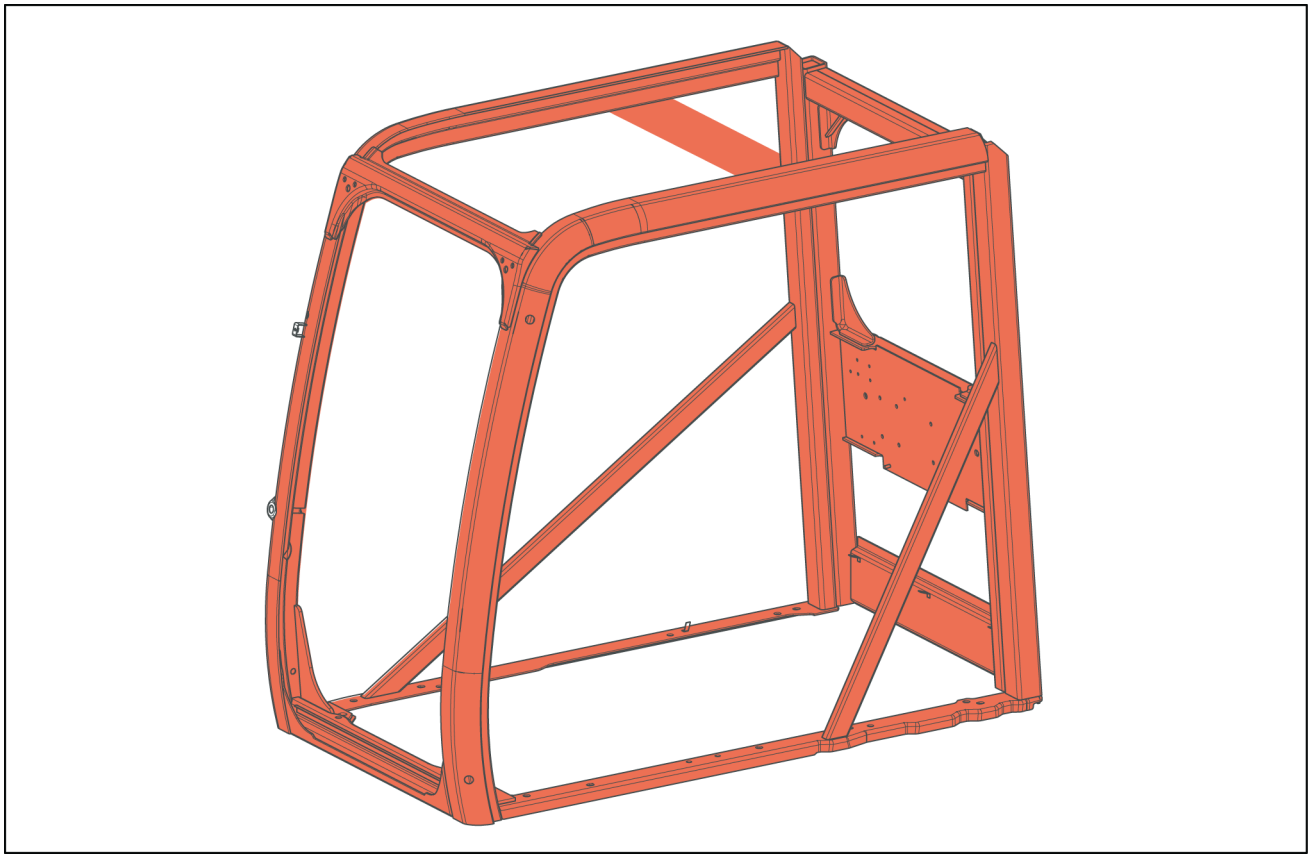
[X3 cab; members that cannot be modified (CX210C/CX240C/CX290C/CX350C)]



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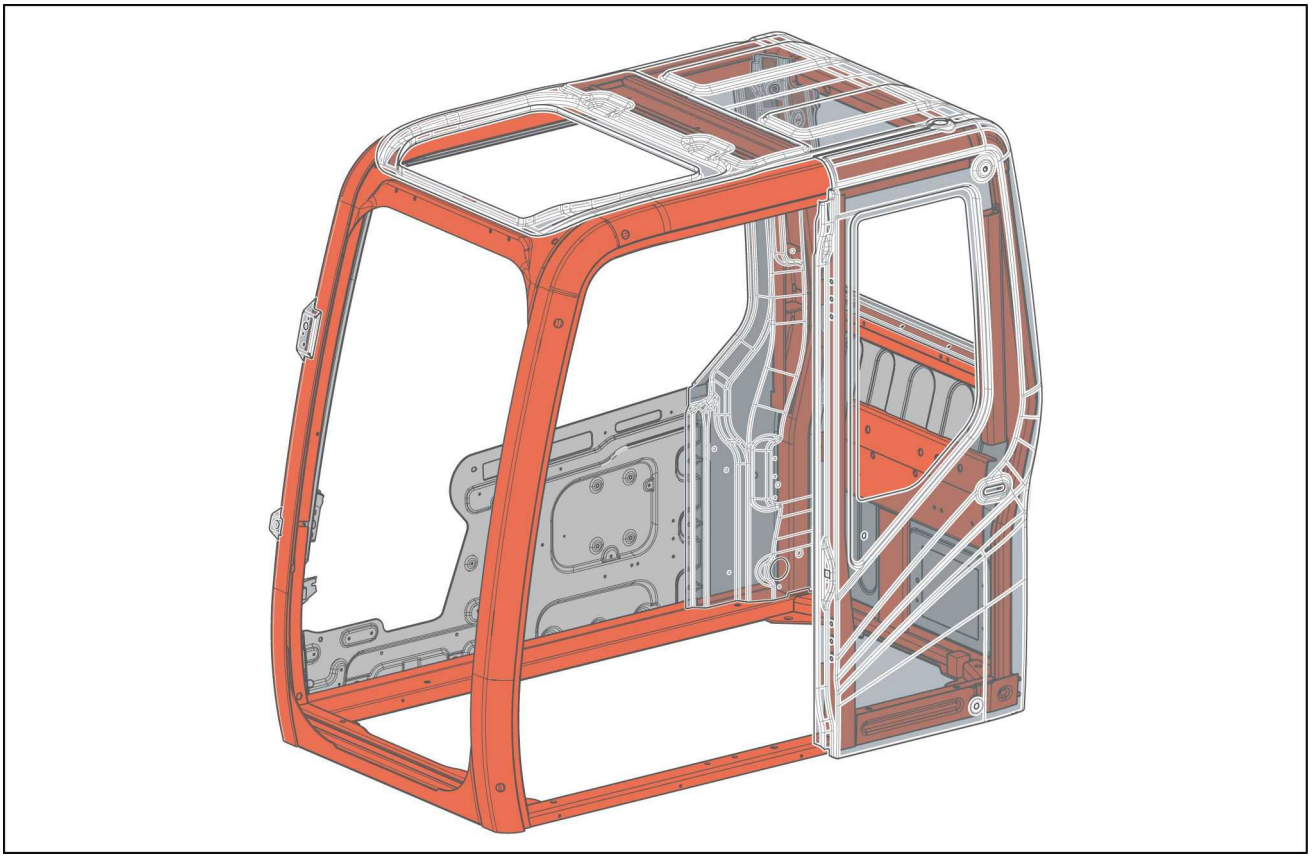
[X2 cab (CX130B/CX160B/CX210B/CX240B)]



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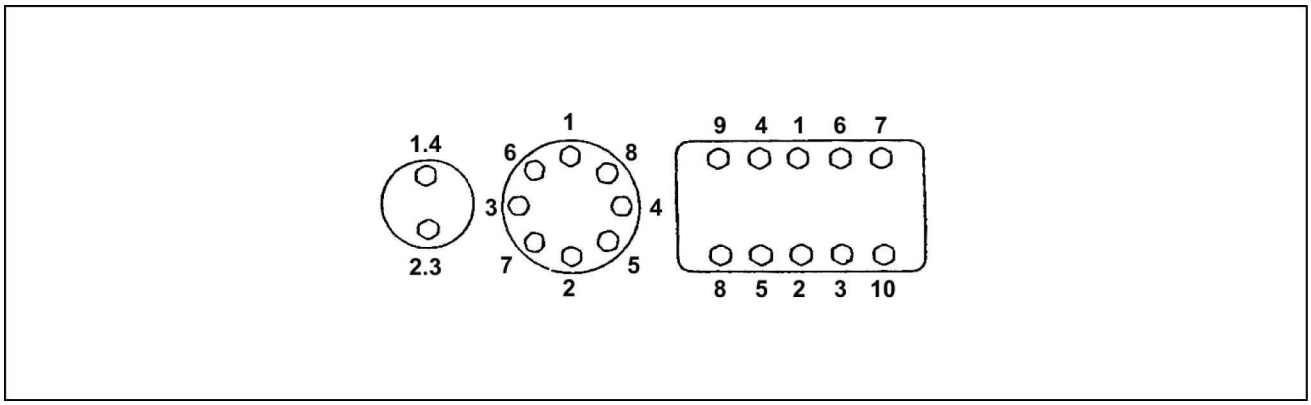
- In general, high cabs do not satisfy the ROPS criteria. (It is necessary to consult with us to check if the high cab model satisfies the ROPS criteria.)

Torque – Bolt and nut

- Tighten alternating between left and right and top and bottom so that uniform tightening force is applied.



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- If **LOCTITE®** was used on a removed bolt (there is something white sticking to the bolt when it is removed), clean the old **LOCTITE®** off with cleaning fluid, dry the bolt, then apply 2 - 3 drops of **LOCTITE®** to the thread section of the bolt.

Torque table

Bolt nominal diameter (size)		M6	M8	M10	M12	M14	M16	M18	M20
Hexagon bolt	Wrench	10 mm	13 mm	17 mm	19 mm	22 mm	24 mm	27 mm	30 mm
	Tightening torque	6.9 N·m (5.089 lb ft)	19.6 N·m (14.456 lb ft)	39.2 N·m (28.912 lb ft)	58.8 N·m (43.369 lb ft)	98.1 N·m (72.355 lb ft)	156.9 N·m (115.723 lb ft)	196.1 N·m (144.636 lb ft)	294.2 N·m (216.991 lb ft)
Hexagon socket head bolt	Wrench	5 mm	6 mm	8 mm	10 mm	12 mm	14 mm	14 mm	17 mm
	Tightening torque	8.8 N·m (6.491 lb ft)	21.6 N·m (15.931 lb ft)	42.1 N·m (31.051 lb ft)	78.5 N·m (57.899 lb ft)	117.7 N·m (86.811 lb ft)	176.5 N·m (130.180 lb ft)	245.2 N·m (180.850 lb ft)	343.2 N·m (253.131 lb ft)

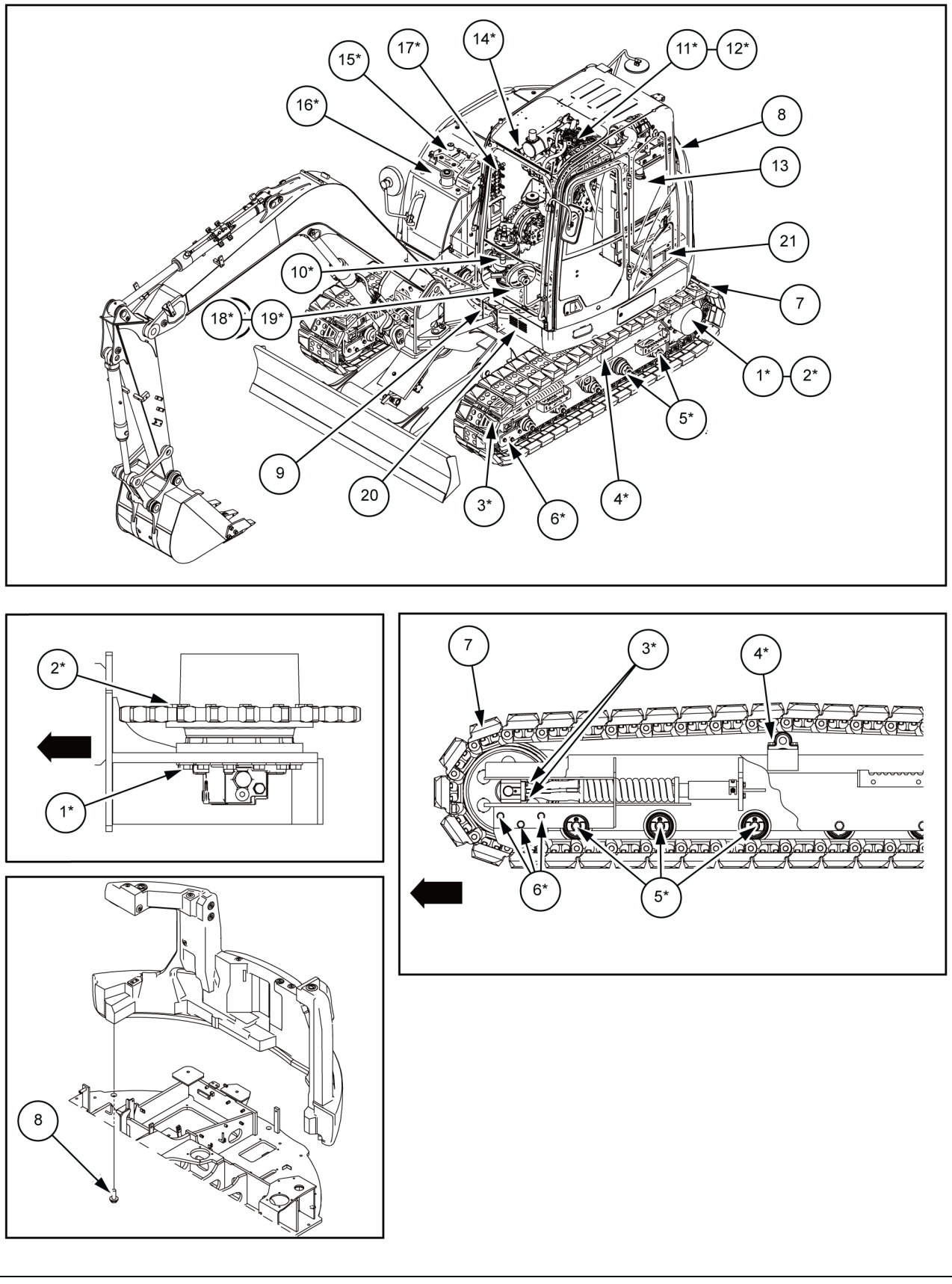
Torque

Special torque settings

Code	Retightening location		Bolt nominal diameter	Wrench	Tightening torque
1*	Travel motor		**M16**	**24 mm**	**267 - 312 N·m** (**196.93 - 230.12 lb ft**)
2*	Drive sprocket		**M14**	**22 mm**	**173 - 202 N·m** (**127.60 - 148.99 lb ft**)
3*	Take-up roller		**M10**	**17 mm**	**63 - 73 N·m** (**46.47 - 53.84 lb ft**)
4*	Upper roller		**M16**	**24 mm**	**267 - 312 N·m** (**196.93 - 230.12 lb ft**)
5*	Lower roller		**M20**	**30 mm**	**521 - 608 N·m** (**384.27 - 448.44 lb ft**)
6*	Front guard		**M16**	**24 mm**	**267 - 312 N·m** (**196.93 - 230.12 lb ft**)
7	Shoe		**M14**	**22 mm**	**220 - 270 N·m** (**162.26 - 199.14 lb ft**)
8	Counterweight		**M24**	**36 mm**	**850.2 - 992.4 N·m** (**627.08 - 731.96 lb ft**)
9	Turntable bearing		**M16**	**24 mm**	**252 - 283.4 N·m** (**185.87 - 209.03 lb ft**)
10*	Swing unit		**M16**	**24 mm**	**272.6 - 317.7 N·m** (**201.06 - 234.32 lb ft**)
11*	Engine	Mount	**M16**	**24 mm**	**264.9 - 313.9 N·m** (**195.38 - 231.52 lb ft**)
12*		Rear bracket	**M10**	**17 mm**	**63.8 - 73.6 N·m** (**47.06 - 54.28 lb ft**)
13	Radiator		**M12**	**19 mm**	**63.8 - 73.6 N·m** (**47.06 - 54.28 lb ft**)
14*	Hydraulic pump	Pump	**M18**	**14 mm** Hexagon socket head	**197 - 218 N·m** (**145.30 - 160.79 lb ft**)
15*	Hydraulic tank		**M12**	**19 mm**	**98.1 - 107.9 N·m** (**72.35 - 79.58 lb ft**)
16*	Fuel tank		**M12**	**19 mm**	**98.1 - 107.9 N·m** (**72.35 - 79.58 lb ft**)
17*	Control valve		**M12**	**19 mm**	**63.8 - 73.60 N·m** (**47.06 - 54.28 lb ft**)
18*	Center joint	Lock bar	**M12**	**19 mm**	**88.3 - 107 N·m** (**65.13 - 78.92 lb ft**)
19*		Joint	**M12**	**19 mm**	**109 - 127 N·m** (**80.39 - 93.67 lb ft**)
20	Cab		**M16**	**24 mm**	**149 - 173 N·m** (**109.90 - 127.60 lb ft**)
21	Battery		**M10**	**17 mm**	**19.6 - 29.4 N·m** (**14.46 - 21.68 lb ft**)

⚠ WARNING:

- For items marked with *, always apply **LOCTITE® 262** or the equivalent and tighten to the specified torque. The tightening torque in kgf·m is determined with **9.8 N·m** (**7.2 lb ft**).



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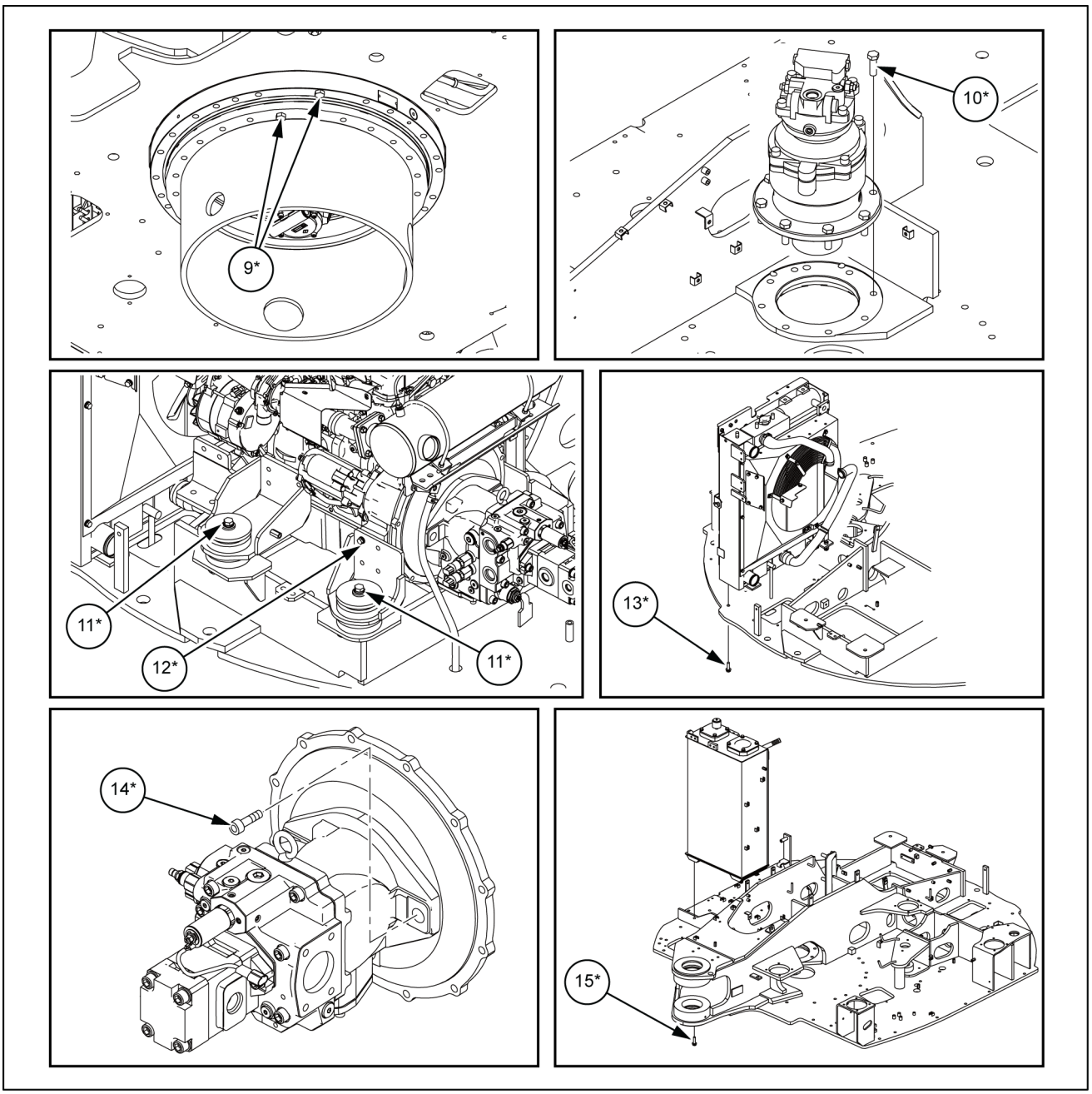

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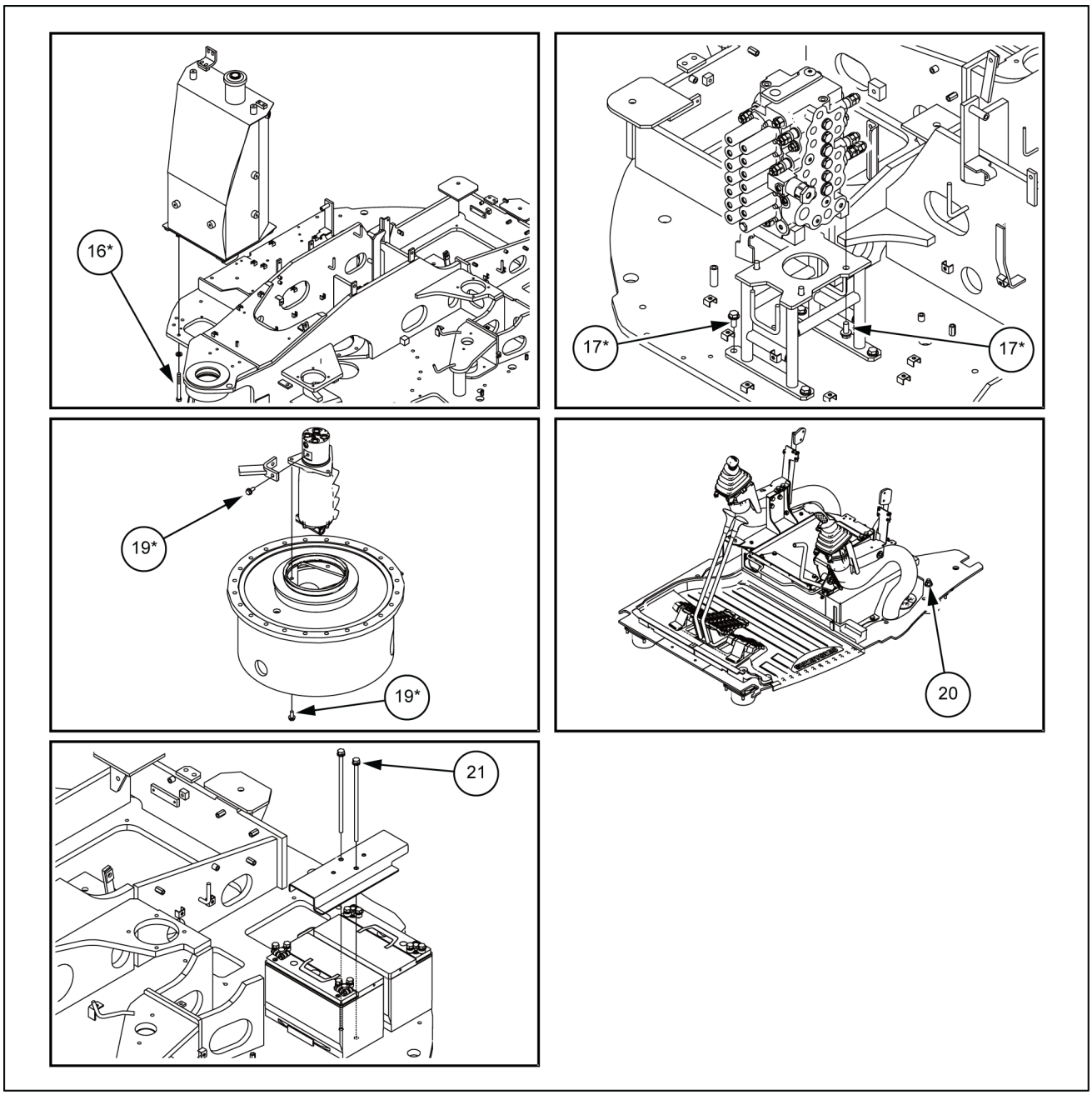

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General specification

CX80C NA

Main data

Operating weight	**8590 kg** (**18937.708 lb**)
Engine output	**40.0 kW** (**54.4 Hp**) / **2000 RPM**
Bucket capacity	Heaped **0.183 m³** (**6.463 ft³**)
	Leveled **0.451 m³** (**15.927 ft³**)

Performance

Standard weight	**6.6 kN** (**1483.739 lb**)
Swing speed	**10.4 RPM**
Travel speed	Low speed **3.2 km/h** (**1.988 mph**)
	High speed **5.1 km/h** (**3.169 mph**)
Maximum pulling force	**59.50 kN** (**13376.13 lb**)
Grade ability	70 % (35°)
Ground pressure	**38 kPa** (**6 psi**) [**450 mm** (**17.717 in**) grouser shoe]

Main unit dimensions

Main unit length	**3410 mm** (**134.252 in**)
Main unit width	**2320 mm** (**91.339 in**)
Upper swing body width	**2270 mm** (**89.37 in**)
Cab width	**1110 mm** (**43.70 in**)
Main unit height	**2760 mm** (**108.661 in**)
Swing radius (rear end)	**1680 mm** (**66.142 in**)
Swing body rear end distance	**1680 mm** (**66.142 in**)
Swing body rear section bottom height	**750 mm** (**29.528 in**)
Distance between tumblers	**2210 mm** (**87.008 in**)
Overall track length	**2845 mm** (**112.008 in**)
Overall track width	**2320 mm** (**91.339 in**)
Distance between tracks	**1870 mm** (**73.622 in**)
Track shoe width	**450 mm** (**17.717 in**)
Minimum ground clearance	**360 mm** (**14.173 in**) (to bottom of lower frame)

Engine

Name	Isuzu AP-4LE2X diesel engine
Type	4-cycle water-cooled overhead camshaft type, common rail system (electronic control), cooled EGR, with turbocharger (variable displacement type)
No. of cylinders-bore x stroke	4- **Ø85 mm** (**3.346 in**) x **96 mm** (**3.780 in**)
Total stroke volume	**2.179 l** (**0.5756 US gal**)
Maximum torque	**193 N·m** (**142.349 lb ft**) / **1800 RPM**
Starter	**24 V 3.2 kW** (**4.35 Hp**) reduction type
Charging generator	**24 V 50 A** AC type
Battery	**12 V 64 A·h** / **5 h** x 2

Cooling system

Fan type		**Ø475 mm** (**18.701 in**) 7 blades, suction
Radiator		
	Fin type	Wavy
	Fin pitch	**1.75 mm** (**0.06890 in**)

Oil cooler		
	Fin type	Wavy
	Fin pitch	**1.75 mm** (**0.06890 in**)
Intercooler		
	Fin type	Wavy
	Fin pitch	**2.0 mm** (**0.07874 in**)
Fuel cooler		
	Fin type	Wavy
	Fin pitch	**2.0 mm** (**0.07874 in**)

Upper side work system

Type		Backhoe attachment	
Components, dimensions, working dimensions			
	Standard bucket capacity	Heaped **0.370 m³** (**13.066 ft³**) (Leveled **0.100 m³** (**3.531 ft³**)	
	Bucket width	**730 mm** (**28.740 in**)	
	Bucket width with side cutter	**804 mm** (**31.654 in**)	
	Bucket weight with side cutter	**206 kg** (**454.152 lb**)	
	Boom length	**3500 mm** (**137.795 in**)	
	Arm type	Standard [**1.69 m** (**5.5446 ft**)]	Long [**2.19 m** (**7.1850 ft**)]
	Arm length	**1690 mm** (**66.535 in**)	**2190 mm** (**86.220 in**)
	Bucket radius	**1050 mm** (**41.339 in**)	
	Bucket wrist angle	177°	
	Maximum digging radius	**7090 mm** (**279.134 in**)	**7560 mm** (**297.638 in**)
	Maximum digging radius at ground line	**6940 mm** (**273.228 in**)	**7420 mm** (**292.126 in**)
	Maximum digging depth	**4180 mm** (**164.567 in**)	**4670 mm** (**183.858 in**)
	Maximum vertical straight wall digging depth	**3810 mm** (**150.000 in**)	**4360 mm** (**171.654 in**)
	Maximum digging height	**6570 mm** (**258.661 in**)	**6890 mm** (**271.260 in**)
	Maximum dump height	**4530 mm** (**178.346 in**)	**4850 mm** (**190.945 in**)
	Minimum swing radius at front	**2790 mm** (**109.843 in**)	**3030 mm** (**119.291 in**)
	Height for minimum swing radius at front	**5040 mm** (**198.425 in**)	**5060 mm** (**199.213 in**)

Operating device

Operator's seat		
	Position	Left side
	Structure	Adjustable forward and back and up and down, reclining mechanism, with seat suspension
Cab		Sealed steel type, all reinforced glass
Levers and pedals		
	For travel use	Lever and pedal type (hydraulic pilot type) x 2
	For operating machine use	Lever type (hydraulic pilot type) x 2
Instruments and switches		
Work mode switchover		3 modes (SP/H/A)
	Travel mode switchover	Low-speed/high-speed switch type
	One-touch idle	Knob switch type
	Engine emergency stop	Switch type
Monitor device		
	Machine status display (full color liquid crystal)	
	Work mode select status	SP/H/A
Instruments (full color liquid crystal)		
	Fuel gauge	Bar graph and indicator
	Engine coolant temperature gauge	Bar graph and indicator
	Hydraulic oil temperature gauge	Bar graph and indicator

	Hour meter		Digital type
	Machine status and warnings (full color liquid crystal and warning alarm) * has warning alarm		
	Overheat (*) Battery charge (*) Electrical system abnormality (*) Refill fuel (*) Engine oil pressure (*) Refill coolant (*) Engine pre-heat Auto warm up Air cleaner (*) Anti-theft device triggered Engine system abnormality (*) Engine emergency stop (*)		
Illumination equipment			
	Working light	Cab top	**24 V 70 W** x 1
		Boom up	**24 V 70 W** x 1
		House	**24 V 55 W** x 1
	Interior light		**24 V 5 W** x 1
Horn			Electric horn x 2
Other			Wiper with intermittent function, window washer, air-conditioner, clock, rear view mirrors (left and right, total of 3)

Swing units

Swing circle	Swing bearing type (with inner gear)
Swing hydraulic motor	Fixed displacement piston motor x 1
Reduction gear	Planetary gear 2-stage reduction gear
Swing parking brake	Mechanical lock (operational lever linkage type)

Travel lower body

Travel hydraulic motor		Variable displacement piston motor x 2
Reduction gear		Planetary gear 2-stage reduction gear
Travel brake		Hydraulic lock
Parking brake		Mechanical lock (travel lever linkage type)
Track shoe		
	Type	Assembly-type triple grouser shoe
	No. of shoes (per side)	With 450G seals: 39 seals
	Shoe width	**450 mm** (**17.717 in**)
	Grouser height	**20 mm** (**0.787 in**)
	Link pitch	**154 mm** (**6.063 in**)
Roller		
	No. of upper rollers (per side)	1
	No. of lower rollers (per side)	5
Track belt tension adjuster		Grease cylinder type (with cushion spring)

Hydraulic equipment

Hydraulic device

Hydraulic pump drive type		Direct engine link (no transmission)
Hydraulic pump		
	Type	Double variable displacement piston pump x 1
		Gear pump x 1
	Discharge volume	Piston pump 2 x **74 l/min** (**19.549 US gpm**)
		Gear pump **18 l/min** (**4.755 US gpm**)
	Pump control method	Simultaneous output full-horsepower control

Control valve and cylinder

Control valve			
	Type	Quintuple spool	One-piece type x 1
	Operating type	Hydraulic pilot type: Travel, swing, and operating machine	
Cylinder		No. of cylinders x tube bore-rod diameter-stroke	

	Boom cylinder	1x **Ø115 mm** (**4.528 in**) - **Ø75 mm** (**2.953 in**) - **850 mm** (**33.465 in**)
	Arm cylinder	1 x **Ø100 mm** (**3.937 in**) - **Ø65 mm** (**2.559 in**) - **755 mm** (**29.724 in**)
	Bucket cylinder	1 x **Ø85 mm** (**3.346 in**) - **Ø55 mm** (**2.165 in**) - **655 mm** (**25.787 in**)
	Blade cylinder	1 x **Ø110 mm** (**3.346 in**) - **Ø70 mm** (**2.756 in**) - **180 mm** (**7.087 in**)
	Boom swing	1 x **Ø95 mm** (**3.740 in**) - **Ø55 mm** (**2.165 in**) - **675 mm** (**26.575 in**)

Capacities, filters

Coolant and oil capacities

Coolant	**12.2 l** (**3.223 US gal**)
Fuel	**120 l** (**31.70 US gal**)
Engine lubricating oil	**11.5 l** (**3.038 US gal**)
Travel reduction gear lubricating oil (one side)	**1.1 l** (**0.291 US gal**)
Hydraulic oil	**96.3 l** (**25.440 US gal**)
Hydraulic oil tank regulation amount	**51 l** (**13.47 US gal**)

Hydraulic oil filters

Suction filter (inside tank)	105 µm
Return filter (inside tank)	6 µm
Pilot line filter (inside housing)	8 µm

Fuel filter

Main filter	2 µm
Pre-filter	5.5 µm

General specification - Main components

Travel unit

Manufacturer	Nabtesco Corporation
Motor type	Variable displacement piston motor
	Automatic 2-speed switchover with parking brake
Intake amount	**48.0 - 30.5 cm³/rev** (**2.9 - 1.9 in³/rev**)
Operating pressure	**29.4 MPa** (**4264 psi**)
Operating flow	**68.0 l/min** (**17.964 US gpm**)
Brake torque	**5.54 N·m** (**4.086 lb ft**) min. (including reduction gear)
Relief valve set pressure	**38.25 MPa** (**5548 psi**) at **15 l/min** (**3.963 US gpm**)
Automatic 2-speed switchover pressure	**23.8 MPa** (**3452 psi**) at **3.9 MPa** (**566 psi**)
Reduction gear	
Reduction gear type	Planetary gear 2-stage reduction gear
Reduction ratio	45.97
Dry weight	**83.0 kg** (**182.98 lb**)

Take-up roller

Weight	**41.8 kg** (**92.15 lb**)

Upper roller

Weight	**4.3 kg** (**9.48 lb**)

Lower roller

Weight	**13.5 kg** (**29.76 lb**)

Recoil spring

Item	Weight
Yoke	**7.7 kg** (**16.976 lb**) (Qty. 2)
Sems B **M16 x 35**	– (Qty. 8)
Threaded rod	**6.0 kg** (**13.228 lb**) (Qty. 2)
Groove height N **M39**	**0.3 kg** (**0.661 lb**) (Qty. 2)
SP pin 6 x 56	– (Qty. 2)
Recoil spring	**14.1 kg** (**31.085 lb**) (Qty. 2)
Grease cylinder assembly	**8.8 kg** (**19.401 lb**) (Qty. 2)
Assembly (total)	**37.4 kg** (**82.453 lb**)
Mounting length of spring	**402 mm** (**15.827 in**)

Shoe

	Weight or Q'ty
450 grouser	**425.4 kg** (**937.846 lb**)
Link	1 set
Shoe	39
Bolt	156
Nut	156
450 Geo grip	**424.4 kg** (**935.642 lb**)
Link	1 set
Shoe	39
Bolt	156
Nut	156
600G (with seal)	**479.8 kg** (**1057.778 lb**)

	Weight or Q'ty
Link	1 set
Shoe	39
Bolt	156
Nut	156

Upper component

Swing unit

Swing motor assembly		
Swing motor		
	Manufacturer	KYB Corporation
	Motor type	Fixed displacement piston motor
		With parking brake
	Intake amount	**44.1 cm³/rev** (**2.69 in³/rev**)
	Operating pressure	**22.6 MPa** (**3278 psi**)
	Operating flow	**74.0 l/min** (**19.549 US gpm**)
	Mechanical brake torque	**238.4 N·m** (**175.835 lb ft**) min.
	Brake off pressure	Min: **1.5 MPa** (**218 psi**) Max: **4.9 MPa** (**711 psi**)
	Relief valve set pressure	**22.6 MPa** (**3278 psi**) at **57.5 l/min** (**15.190 US gpm**)
Swing reduction gear		
	Reduction gear type	Planetary gear 2-stage reduction gear
	Reduction ratio	20.6
Dry weight		**80 kg** (**176 lb**)
Turntable bearing		
	No. of teeth	76
	Weight	**91.6 kg** (**201.943 lb**)
Counterweight		
	Weight	**970 kg** (**2138.484 lb**)

Engine-related

Engine

Engine model name	Isuzu 4LE2X diesel engine
Engine type	4-cycle, water-cooled, overhead valve, vertical in-line, direct-injection type (electronic control)
No. of cylinders - bore - stroke	4 - Ø **85.0 - 96.0 mm** (**3.346 - 3.780 in**)
Total displacement	**2.179 l** (**0.576 US gal**)
Compression ratio	17.6
Rated output	**40.0 kW** (**54.385 Hp**) / **2000 RPM**
Maximum torque	**193 N·m** (**142.349 lb ft**) /about **1800 RPM**
Fuel consumption ratio	*** g/kW·h
Engine dry weight	About **217 kg** (**478.403 lb**)
Engine dimension	L739.3 (29.106) - W601.1 (23.665) - H770.8 (30.346) mm (in.)
Cooling fan	Ø **475 mm** (**18.701 in**) - suction type - 7 vanes, plastic
Pulley ratio	1.03 (reduction)
Charging generator	**24 V 50 A** AC type
Starter motor	**24 V 3.2 kW** (**4.351 Hp**) reduction type
Coolant capacity	**4.1 l** (**1.083 US gal**)
Oil pan capacity	Max: **10.4 l** (**2.747 US gal**) Min: **7.3 l** (**1.928 US gal**) (not including oil filter)
Direction of rotation	Right (viewed from fan side)

Air cleaner (double element)

Manufacturer	Nippon Donaldson, Ltd.
Element (outer)	
Element (inner)	
Weight	**1.7 kg** (**3.748 lb**)

Radiator

Manufacturer		Tokyo Radiator MFG. Co.,Ltd.
Oil cooler	Weight	**12.0 kg** (**26.455 lb**)
	Oil volume	**4.4 l** (**1.162 US gal**)
Radiator	Weight	**6.0 kg** (**13.228 lb**)
	Coolant capacity	**4.7 l** (**1.242 US gal**)
Air cooler	Weight	**5.3 kg** (**11.684 lb**)
	Capacity	**3.9 l** (**1.030 US gal**)
Total weight		**50 kg** (**110.231 lb**)

Fuel cooler

Manufacturer	Tokyo Radiator MFG. Co.,Ltd.
Weight	**0.7 kg** (**1.543 lb**)
Capacity	**0.2 l** (**0.053 US gal**)

Hydraulic device

Hydraulic pump

Manufacturer		Kawasaki Heavy Industries, Ltd.			
Manufacturer type		K7SP36-122R-9212			
Item		Main pump	Blade pump	Pilot pump	Remarks
Displacement volume		**37.0 cm³/rev** (**2.258 in³/rev**) x 2	**17.7 cm³/rev** (**1.080 in³/rev**)	**9 cm³/rev** (**0.549 in³/rev**)	
Operating pressure	Rated	**29.4 MPa** (**4264 psi**)	**23.5 MPa** (**3409 psi**)	**3.9 MPa** (**566 psi**)	
Input revolution speed	Rated	**2000 RPM**			
	Maximum	**2230 RPM** max.			
Maximum discharge flow		**74.0 l/min** (**19.549 US gpm**) x 2 [at **2000 RPM**]	**35.4 l/min** (**9.352 US gpm**) [at **2000 RPM**]	**18.0 l/min** (**4.755 US gpm**) [at **2000 RPM**]	
Input horse-power	Before shift	**29.0 kW** (**39.429 Hp**)	**0.6 kW** (**0.816 Hp**)	**1.2 kW** (**1.632 Hp**)	at P3 = **1.0 MPa** (**145 psi**)
	After shift	**15.7 kW** (**21.346 Hp**)	**13.9 kW** (**18.899 Hp**)		at P3 = **23.5 MPa** (**3409 psi**)
Shaft input horsepower		**30.8 kW** (**41.876 Hp**) max.			
Shaft input torque		**146.8 N·m** (**108.274 lb ft**) max.			
Self-priming suction performance		More than **-0.01 MPa** (**-1 psi**)			At pump suction port position
Direction of rotation		Right rotation			View from shaft end
Temperature range		**-20 - 100 °C** (**-4.0 - 212.0 °F**)			Suction oil temperature
Hydraulic oil		ISO viscosity grade VG46-equivalent hydraulic fluid			

Control-related

Control valve

Manufacturer	KYB Corporation
Maximum flow	**81 l/min** (**21.398 US gpm**) (at **2200 RPM**
Overload set pressure	**31.9 MPa** (**4627 psi**)
Main relief set pressure	**29.4 MPa** (**4264 psi**)
Function	Straight travel circuit
	Boom-up/arm 2 pumps internal flow
	Boom load holding circuit
	Arm-in regenerative circuit
	Swing priority orifice
	2 pumps flow
Weight	**75.0 kg** (**165.347 lb**)

Solenoid Valve (3 stack)

Manufacturer		Yuken Kogyo Co., Ltd.	
Valve specifications			
	Maximum flow	P→B **20 l/min** (**5.283 US gpm**) Other **5 l/min** (**1.321 US gpm**)	
	Rated pressure	**4.5 MPa** (**653 psi**)	
	Port size	P.T.B. port	G3/8
		C1, **C2** ports	G1/4
Solenoid specifications			
	Operating voltage	DC **20 - 32 V**	
	Power consumption	**17 W** max.	
Weight		**4.7 kg** (**10.362 lb**)	

Valve for left/right operations

Manufacturer		Kawasaki Heavy Industries, Ltd.
Operating pressure		**3.92 MPa** (**569 psi**)
Secondary pressure		**0.64 - 2.45 MPa** (**93 - 355 psi**) primary short type
Operating angle	**1**, **3** port	19°
	2, **4** port	25°
Weight		**1.9 kg** (**4.189 lb**)

Valve for travel operation

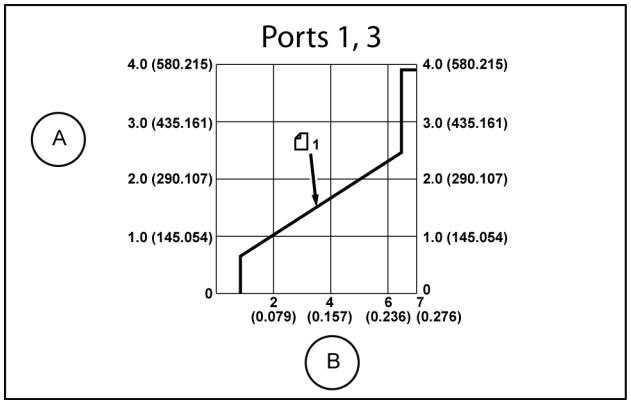
Manufacturer	Kawasaki Heavy Industries, Ltd.
Operating pressure	**3.92 MPa** (**569 psi**)
Secondary pressure	**0.64 - 2.45 MPa** (**93 - 355 psi**) primary short type
Operating angle	12.4°
Weight	**5.5 kg** (**12.125 lb**)

Remote control valve characteristic diagram

Operation remote control valve control diagram

A. Secondary pressure [MPa (psi)]
B. Push rod stroke [mm (in.)]
C. Operating angle [deg.]

1 Secondary pressure



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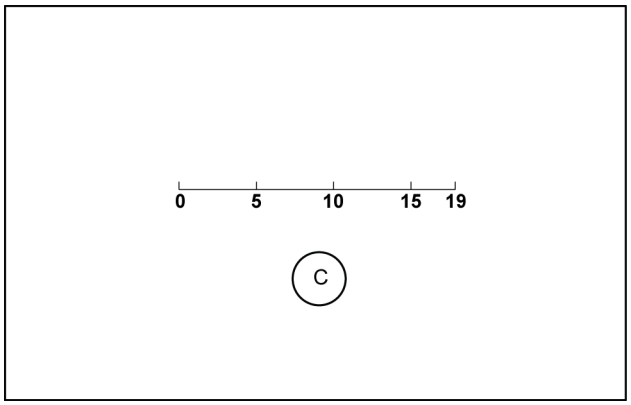

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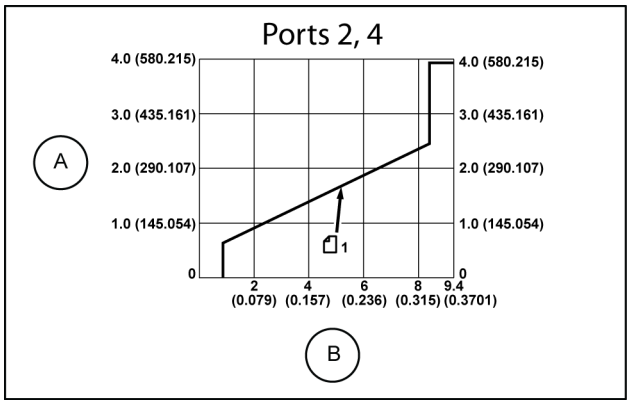
A. Secondary pressure [MPa (psi)]
B. Push rod stroke [mm (in.)]
C. Operating angle [deg.]

1 Secondary pressure



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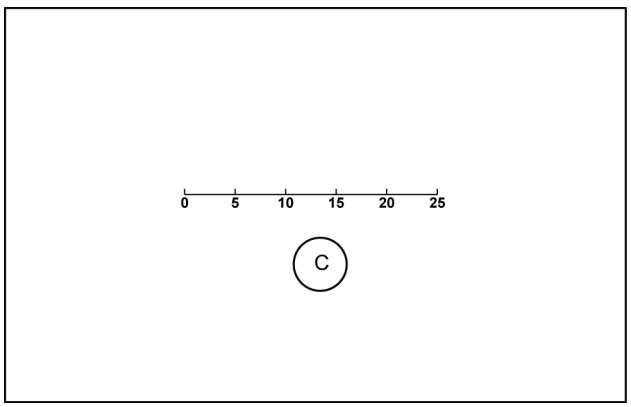

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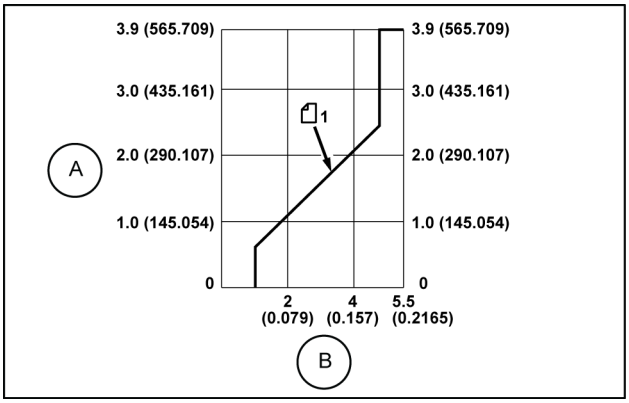
Travel remote control valve control diagram

A. Secondary pressure [MPa (psi)]
B. Push rod stroke [mm (in.)]
C. Pedal operating angle [deg.]

1 Secondary pressure



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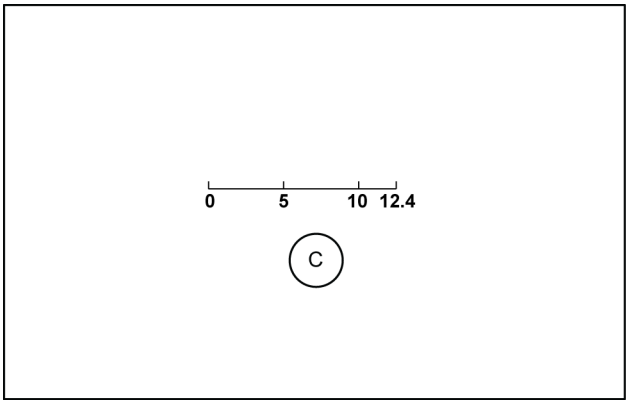

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Cushion valve (with shuttle valve)

Manufacturer	Yanagisawa Seiki MFG. Co., Ltd.
Port size	G1/4 (1, 2, 3, 4, S, T, E, F, G, H)
Weight	**4.5 kg** (**9.921 lb**)

Center joint

Operating pressure	High-pressure path (ABCD)	**29.4 MPa** (**4264 psi**)
	High-pressure path (EF)	**23.5 MPa** (**3409 psi**)
	High-pressure path (P)	**3.9 MPa** (**566 psi**)
	Low-pressure path (T)	**0.5 MPa** (**73 psi**)
Withstand pressure test pressure	ABCD	**44.1 MPa** (**6397 psi**)
	EF	**35.3 MPa** (**5120 psi**)
	P	**5.9 MPa** (**856 psi**)
	T	**1.0 MPa** (**145 psi**)
Flow amount	ABCD	**73.6 l/min** (**19.443 US gpm**)
	EF	**35.4 l/min** (**9.352 US gpm**)
	P	**23.0 l/min** (**6.076 US gpm**)
	T	**15.0 l/min** (**3.963 US gpm**)
Speed	**15 RPM** max.	
Rotation torque	No load **94 - 226 N·m** (**69.331 - 166.689 lb ft**)	
	Pressurize A/B or C/D port **29.4 MPa** (**4264 psi**) **133 - 247 N·m** (**98.096 - 182.178 lb ft**)	
Hydraulic oil used	**ISO VG-46**	
Hydraulic oil temperature range	**-20 - 95 °C** (**-4.000 - 203.000 °F**)	

Backhoe attachment

Cylinder

Boom cylinder	
Manufacturer	KYB Corporation
Cylinder bore	Ø **115 mm** (**4.528 in**)
Rod diameter	Ø **75 mm** (**2.953 in**)
Maximum retracted length	**1340 mm** (**52.756 in**)
Stroke	**850 mm** (**33.465 in**)
Weight	**110 kg** (**242.508 lb**)

Arm cylinder	
Manufacturer	KYB Corporation
Cylinder bore	Ø **100 mm** (**3.937 in**)
Rod diameter	Ø **65 mm** (**2.559 in**)
Maximum retracted length	**1215 mm** (**47.835 in**)
Stroke	**755 mm** (**29.724 in**)
Weight	**78 kg** (**171.961 lb**)

Bucket cylinder	
Manufacturer	KYB Corporation
Cylinder bore	Ø **85 mm** (**3.346 in**)
Rod diameter	Ø **55 mm** (**2.165 in**)
Maximum retracted length	**1035 mm** (**40.748 in**)
Stroke	**665 mm** (**26.181 in**)
Weight	**51 kg** (**112.436 lb**)

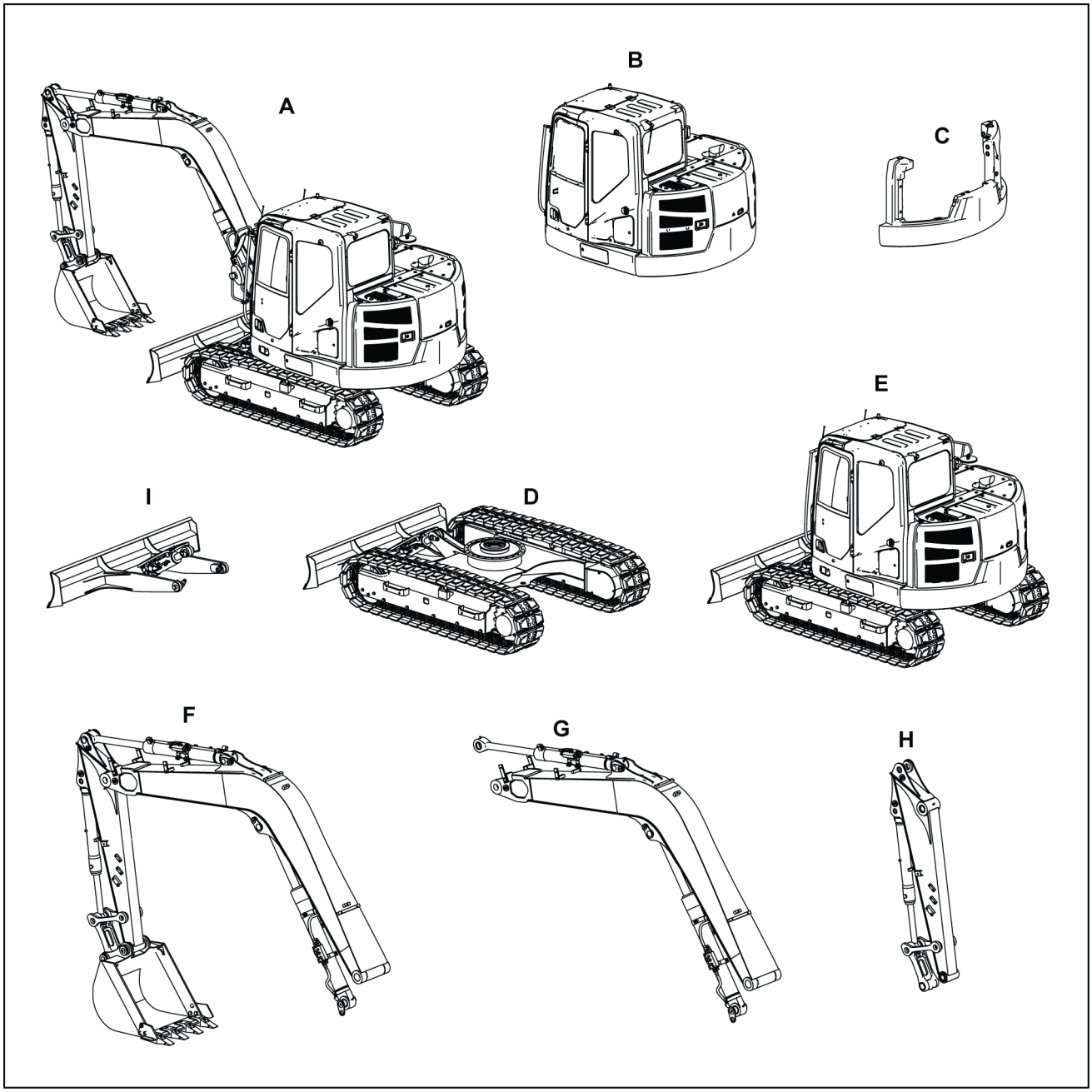
Blade cylinder	
Manufacturer	KYB Corporation
Cylinder bore	Ø **110 mm** (**4.331 in**)
Rod diameter	Ø **70 mm** (**2.756 in**)
Maximum retracted length	**550 mm** (**21.654 in**)
Stroke	**180 mm** (**7.087 in**)
Weight	**45 kg** (**99.208 lb**)

Boom swing cylinder	
Manufacturer	KYB Corporation
Cylinder bore	Ø **95 mm** (**3.740 in**)
Rod diameter	Ø **55 mm** (**2.165 in**)
Maximum retracted length	**1085 mm** (**42.717 in**)
Stroke	**675 mm** (**26.575 in**)
Weight	**56 kg** (**123.459 lb**)

Weight

CX80C NA

Divided weight



SMIL13CEX6066GA 1

Code	Component name	Weight
A	Operating weight	**8590 kg** (**18937.708 lb**)
B	Upper component (including counterweight and turntable bearing)	**4590 kg** (**10119.218 lb**)
C	Counterweight	**1100 kg** (**2425.098 lb**)
D	Lower component (with grouser shoe)	**2860 kg** (**6305.254 lb**)
E	Main unit weight	**7460 kg** (**16446.485 lb**)
F	Attachments	**1070 kg** (**2358.946 lb**)
G	Boom (including cylinders)	**590 kg** (**1300.727 lb**)
H	Arm (including cylinders and linkage)	**260 kg** (**573.202 lb**)
I	Blade (including cylinders)	**380 kg** (**837.757 lb**)

Stand alone part weight

	Component name	Weight
1	Travel unit	**108 kg** (**238.099 lb**)
2	Take-up roller	**42 kg** (**92.594 lb**)
3	Upper roller	**4 kg** (**8.818 lb**)
4	Lower roller	**14 kg** (**30.865 lb**)
5	Swing unit	**80 kg** (**176.370 lb**)
6	Turntable bearing	**92 kg** (**202.825 lb**)
7	Engine	**230 kg** (**507.063 lb**)
8	Radiator	**50 kg** (**110.231 lb**)
9	Hydraulic pump	**60 kg** (**132.277 lb**)
10	Fuel tank	**48 kg** (**105.822 lb**)
11	Hydraulic tank	**54 kg** (**119.050 lb**)
12	Control valve	**75 kg** (**165.347 lb**)
13	Center joint	**40 kg** (**88.185 lb**)
14	Boom	**410 kg** (**903.895 lb**)
15	Blade	**313 kg** (**690.047 lb**)

Shoe weight (per side)

	Component name	Weight
1	**450 mm** (**17.717 in**) grouser shoe	**425 kg** (**936.965 lb**)
2	**600 mm** (**23.622 in**) grouser shoe	**480 kg** (**1058.219 lb**)
3	**600 mm** (**23.622 in**) link chain	**424 kg** (**934.760 lb**)

Arm weight

	Component name	Weight
1	Standard arm	**144.7 kg** (**319.0106 lb**)
2	Long arm	**173.0 kg** (**381.4017 lb**)

NOTE: *The weights displayed are approximate weights.*

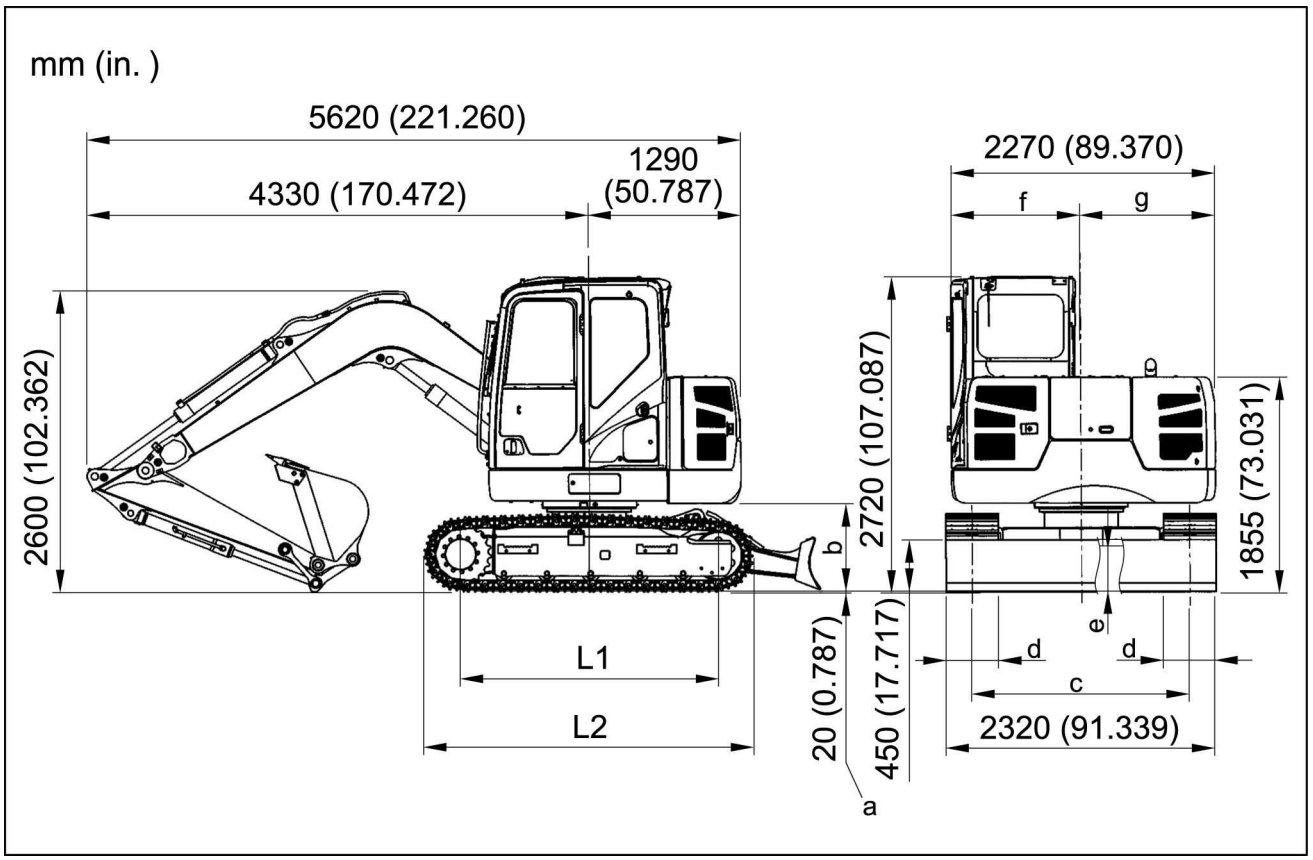
Dimension

CX80C NA

Standard arm [1.69 m (5.54 ft)]

NOTE: 1. *Numbers are subject to change without notice due to design change or other reason.*

NOTE: 2. *The diagrams give values that include the shoe lug height (a) [* ***20 mm*** *(****0.79 in****)].*



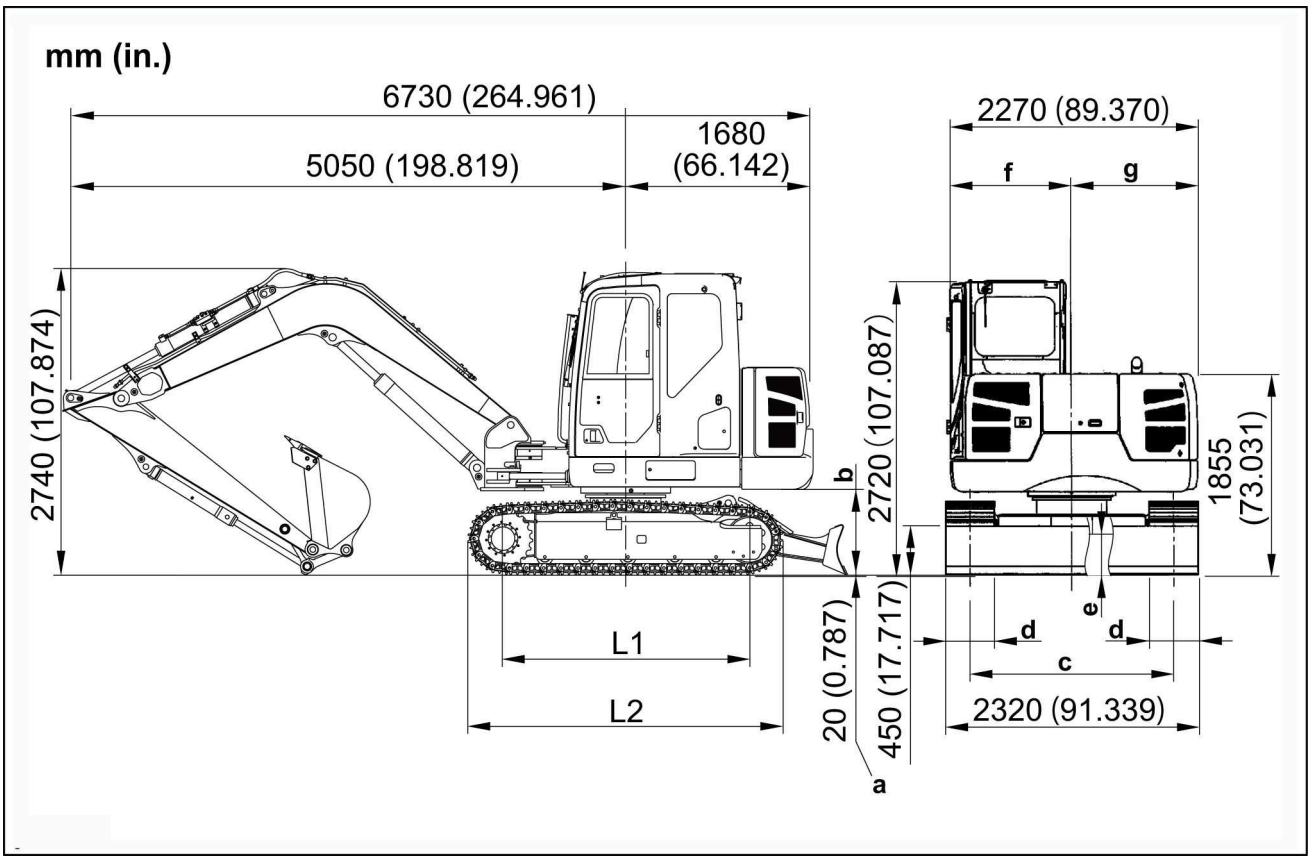
SMIL13CEX4740FA 1

b	**750 mm** (**29.53 in**)	f	**1110 mm** (**43.70 in**)
c	**1870 mm** (**73.62 in**)	g	**1160 mm** (**45.67 in**)
d	**450 mm** (**17.72 in**)	L1	**2210 mm** (**87.01 in**)
e	**360 mm** (**14.17 in**)	L2	**2845 mm** (**112.01 in**)

Long arm [2.19 m (7.19 ft)]

NOTE: 1. *Numbers are subject to change without notice due to design change or other reason.*

NOTE: 2. *The diagrams give values that include the shoe lug height (a) [* ***20 mm*** *(****0.79 in****)].*



SMIL13CEX5833FA 2

b	**750.00 mm** (**29.53 in**)	f	**1110 mm** (**43.70 in**)
c	**1870 mm** (**73.62 in**)	g	**1160 mm** (**45.67 in**)
d	**450 mm** (**17.72 in**)	L1	**2210 mm** (**87.01 in**)
e	**360 mm** (**14.17 in**)	L2	**2845 mm** (**112.01 in**)

Consumables

Fluids and lubricants

Lubricants must have the correct properties for each application.

NOTICE: *The conditions of use for individual fluids and lubricants must be respected.*

Hydraulic fluid

CASE AKCELA HYDRAULIC EXCAVATOR FLUID is specially designed for high pressure applications and for the CASE CONSTRUCTION hydraulic system. The type of fluid to be used depends on the ambient temperature.

Engine oil

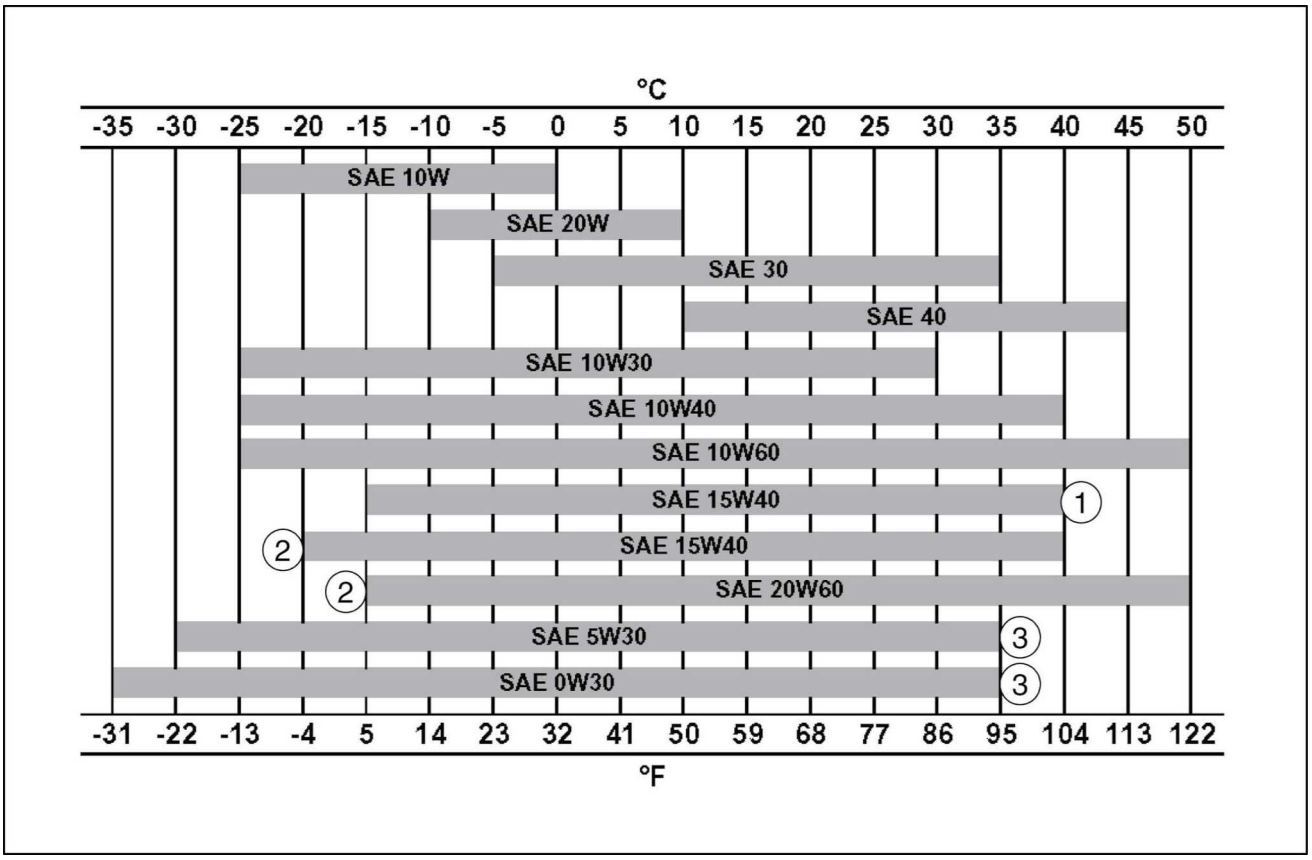
The **CASE AKCELA HYDRAULIC EXCAVATOR FLUID** "No. 1 ENGINE OIL" is recommended for your engine. This oil ensures correct lubrication of your engine in all working conditions.

If the **CASE AKCELA HYDRAULIC EXCAVATOR FLUID** Multigrade "No. 1 ENGINE OIL" cannot be obtained, use the oil corresponding to one of the following categories:

API CJ-4.

SMIL13CEX4912AA 1

Oil range



SMIL13CEX5633FA 2

1. With mineral base
2. With semi-synthetic base
3. With synthetic base

Fuel

The fuel must conform to Interim Tier 4/Stage 3B Exhaust Gas Control Regulations.

Use grade number 2-D (S15) fuel.

Using other types of fuel may lead to stalled engine output or deterioration in fuel economy.

During cold weather [lower than **-7 °C** (**19.4 °F**)], it is temporarily acceptable to use a mixture of No. 1-D (S15) and No. 2-D (S15).

Consult the fuel supplier or the CASE CONSTRUCTION Dealer.

If the temperature drops below the fuel cloud point, output deficiency or engine start problems may occur due to wax crystals.

Conditions applicable to diesel fuel

The diesel fuel used must:

- Be free from dust particles, even minute ones.
- Have the proper viscosity.
- Have a high cetane number.
- Present great fluidity at low temperatures.
- Have low sulphur content.
- Have very little residual carbon.

Recommended conditions that can be applied to diesel fuel

- JIS (Japanese Industrial Standards): No. 2
- DIN (German Institute for Standardization): **DIN 51601**
- **SAE** (Society of Automotive Engineers), corresponds to **SAE-J-313C**: No. 2-D (S15)
- BS (British Standards): Class A-1, corresponds to **BS 2869**-1970.
- EN 590 (max. sulfur 10 ppm)
- or fuels specified by the country in which these standards and this vehicle are used.

NOTICE: *EPA regulation ultra low sulfur fuel only.*

NOTICE: *Using other fuels may cause serious problems, which will void the warranty.*

Using non-recommended fuels may cause damage to the fuel injector pump and injector, as well as other fuel supply systems and the engine itself.

CASE CONSTRUCTION is not liable for any such damages.

Also, take note that the warranty does not cover such damages.

We recommend that you observe the following safety information in order to avoid damaging the engine fuel supply system.

Some fuel suppliers mix old engine oil and diesel fuel.

Larger engine manufacturers allow for this kind of fuel to be used.

However, do not use diesel fuel that has been tainted with engine oil in your engine.

This kind of fuel will not only damage your engine, it may have a negative effect on the exhaust gas purification functions of the vehicle.

Confirm that the fuel conforms to the above specs with your fuel supplier before using diesel fuel in your vehicle.

NOTICE: *Ask your fuel supplier or CASE CONSTRUCTION dealer regarding the proper use of fuel additives. Do not use fuel oil or gasoline, as it may damage your engine.*

NOTICE: *To avoid condensation in cold weather, make sure to fill up the fuel tank after the end of the workday.*

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^2	0.0981	MPa
atm	0.1013	MPa
lbf/in^2	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
$kgf•s/cm^2$	98067	Pa•s
cP	0.001	Pa•s
P	0.1	Pa•s
cSt	1×10^{-6}	m^2/s
St	0.0001	m^2/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

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	101.7060	104.9869	108.2677	111.5486	114.8294	118.1102	121.3911	124.6719	127.9528	30
40	131.2336	134.5144	137.7953	141.0761	144.3570	147.6378	150.9186	154.1995	157.4803	160.7612	40
50	164.0420	167.3228	170.6037	173.8845	177.1654	180.4462	183.7270	187.0079	190.2887	193.5696	50
60	196.8504	200.1312	203.4121	206.6929	209.9738	213.2546	216.5354	219.8163	223.0971	226.3780	60
70	229.6588	232.9396	236.2205	239.5013	242.7822	246.0630	249.3438	252.6247	255.9055	259.1864	70
80	262.4672	265.7480	269.0289	272.3097	275.5906	278.8714	282.1522	285.4331	288.7139	291.9948	80
90	295.2756	298.5564	301.8373	305.1181	308.3990	311.6798	314.9606	318.2415	321.5223	324.8031	90
100	328.0840	331.3648	334.6457	337.9265	341.2073	344.4882	347.7690	351.0499	354.3307	357.6115	100

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^2	0	1	2	3	4	5	6	7	8	9	in^2
	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	
----		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

Square centimeters to square inches

cm^2	0	1	2	3	4	5	6	7	8	9	cm^2
	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	
----		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^3	0	1	2	3	4	5	6	7	8	9	in^3
	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (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	1016.00 0	1032.38 7	1048.77 5	1065.16 2	1081.54 9	1097.93 6	1114.323	1130.71 0	60
70	1147.09 7	1163.48 4	1179.87 1	1196.25 8	1212.64 6	1229.03 3	1245.42 0	1261.80 7	1278.19 4	1294.58 1	70
80	1310.96 8	1327.35 5	1343.74 2	1360.13 0	1376.51 7	1392.90 4	1409.29 1	1425.67 8	1442.06 5	1458.45 2	80
90	1474.83 9	1491.22 6	1507.61 3	1524.00 1	1540.38 8	1556.77 5	1573.16 2	1589.54 9	1605.93 6	1622.32 3	90
100	1638.71 0	1655.09 7	1671.48 4	1687.87 2	1704.25 9	1720.64 6	1737.03 3	1753.42 0	1769.80 7	1786.19 4	100

Cubic centimeters to cubic inches

cm^3 (cc)	0	1	2	3	4	5	6	7	8	9	cm^3 (cc)
	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	
----		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

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	102.2039	105.9892	109.7745	20
30	113.5599	117.3452	121.1305	124.9159	128.7012	132.4865	136.2718	140.0572	143.8425	147.6278	30
40	151.4132	155.1985	158.9838	162.7691	166.5545	170.3398	174.1251	177.9105	181.6958	185.4811	40
50	189.2665	193.0518	196.8371	200.6224	204.4078	208.1931	211.9784	215.7638	219.5491	223.3344	50
60	227.1197	230.9051	234.6904	238.4757	242.2611	246.0464	249.8317	253.6170	257.4024	261.1877	60
70	264.9730	268.7584	272.5437	276.3290	280.1143	283.8997	287.6850	291.4703	295.2557	299.0410	70
80	302.8263	306.6116	310.3970	314.1823	317.9676	321.7530	325.5383	329.3236	333.1090	336.8943	80
90	340.6796	344.4649	348.2503	352.0356	355.8209	359.6063	363.3916	367.1769	370.9622	374.7476	90
100	378.5329	382.3182	386.1036	389.8889	393.6742	397.4595	401.2449	405.0302	408.8155	412.6009	100

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

Gallons (Imp.) to liters

Imp.gal.	0	1	2	3	4	5	6	7	8	9	Imp.gal.
	liters	liters	liters	liters	liters	liters	liters	liters	liters	liters	
----		4.5455	9.0909	13.6364	18.1818	22.7273	27.2727	31.8182	36.3636	40.9091	----
10	45.4545	50.0000	54.5455	59.0909	63.6364	68.1818	72.7273	77.2727	81.8182	86.3636	10
20	90.9091	95.4545	100.0000	104.5455	109.0909	113.6364	118.1818	122.7273	127.2727	131.8182	20
30	136.3636	140.9091	145.4545	150.0000	154.5455	159.0909	163.6364	168.1818	172.7273	177.2727	30
40	181.8182	186.3636	190.9091	195.4545	200.0000	204.5455	209.0909	213.6364	218.1818	222.7273	40
50	227.2727	231.8182	236.3636	240.9091	245.4545	250.0000	254.5455	259.0909	263.6364	268.1818	50
60	272.7273	277.2727	281.8182	286.3636	290.9091	295.4545	300.0000	304.5455	309.0909	313.6364	60
70	318.1818	322.7273	327.2727	331.8182	336.3636	340.9091	345.4545	350.0000	354.5455	359.0909	70
80	363.6364	368.1818	372.7273	377.2727	381.8182	386.3636	390.9091	395.4545	400.0000	404.5455	80
90	409.0909	413.6364	418.1818	422.7273	427.2727	431.8182	436.3636	440.9091	445.4545	450.0000	90
100	454.5455	459.0909	463.6364	468.1818	472.7273	477.2727	481.8182	486.3636	490.9091	495.4545	100

Liters to gallons (Imp.)

liters	0	1	2	3	4	5	6	7	8	9	liters
	Imp.gal.	Imp.gal.	Imp.gal.	Imp.gal.	Imp.gal.	Imp.gal.	Imp.gal.	Imp.gal.	Imp.	Imp.gal.	
----		0.2200	0.4400	0.6600	0.8800	1.1000	1.3200	1.5400	1.7600	1.9800	----
10	2.2000	2.4200	2.6400	2.8600	3.0800	3.3000	3.5200	3.7400	3.9600	4.1800	10
20	4.4000	4.6200	4.8400	5.0600	5.2800	5.5000	5.7200	5.9400	6.1600	6.3800	20
30	6.6000	6.8200	7.0400	7.2600	7.4800	7.7000	7.9200	8.1400	8.3600	8.5800	30
40	8.8000	9.0200	9.2400	9.4600	9.6800	9.9000	10.1200	10.3400	10.5600	10.7800	40
50	11.0000	11.2200	11.4400	11.6600	11.8800	12.1000	12.3200	12.5400	12.7600	12.9800	50
60	13.2000	13.4200	13.6400	13.8600	14.0800	14.3000	14.5200	14.7400	14.9600	15.1800	60
70	15.4000	15.6200	15.8400	16.0600	16.2800	16.5000	16.7200	16.9400	17.1600	17.3800	70
80	17.6000	17.8200	18.0400	18.2600	18.4800	18.7000	18.9200	19.1400	19.3600	19.5800	80
90	19.8000	20.0200	20.2400	20.4600	20.6800	20.9000	21.1200	21.3400	21.5600	21.7800	90
100	22.0000	22.2200	22.4400	22.6600	22.8800	23.1000	23.3200	23.5400	23.7600	23.9800	100

Weight

Pounds to kilograms

lbs.	0	1	2	3	4	5	6	7	8	9	lbs.
	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	
----		0.454	0.907	1.361	1.814	2.268	2.722	3.175	3.629	4.082	----
10	4.536	4.989	5.443	5.897	6.350	6.804	7.257	7.711	8.165	8.618	10
20	9.072	9.525	9.979	10.433	10.886	11.340	11.793	12.247	12.701	13.154	20
30	13.608	14.061	14.515	14.968	15.422	15.876	16.329	16.783	17.236	17.690	30
40	18.144	18.597	19.051	19.504	19.958	20.412	20.865	21.319	21.772	22.226	40
50	22.680	23.133	23.587	24.040	24.494	24.947	25.401	25.855	26.308	26.762	50
60	27.215	27.669	28.123	28.576	29.030	29.483	29.937	30.391	30.844	31.298	60
70	31.751	32.205	32.658	33.112	33.566	34.019	34.473	34.926	35.380	35.834	70
80	36.287	36.741	37.194	37.648	38.102	38.555	39.009	39.462	39.916	40.370	80
90	40.823	41.277	41.730	42.184	42.637	43.091	43.545	43.998	44.452	44.905	90
100	45.359	45.813	46.266	46.720	47.173	47.627	48.081	48.534	48.988	49.441	100

Kilograms to pounds

kg	0	1	2	3	4	5	6	7	8	9	kg
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
----		2.205	4.409	6.614	8.819	11.023	13.228	15.432	17.637	19.842	----
10	22.046	24.251	26.456	28.660	30.865	33.069	35.274	37.479	39.683	41.888	10
20	44.093	46.297	48.502	50.707	52.911	55.116	57.320	59.525	61.730	63.934	20
30	66.139	68.344	70.548	72.753	74.958	77.162	79.367	81.571	83.776	85.981	30
40	88.185	90.39	92.595	94.799	97.004	99.209	101.413	103.618	105.822	108.027	40
50	110.232	112.436	114.641	116.846	119.050	121.255	123.460	125.664	127.869	130.073	50
60	132.278	134.483	136.687	138.892	141.097	143.301	145.506	147.710	149.915	152.120	60
70	154.324	156.529	158.734	160.938	163.143	165.348	167.552	169.757	171.961	174.166	70
80	176.371	178.575	180.780	182.985	185.189	187.394	189.599	191.803	194.008	196.212	80
90	198.417	200.622	202.826	205.031	207.236	209.440	211.645	213.850	216.054	218.259	90
100	220.463	222.668	224.873	227.077	229.282	231.487	233.691	235.896	238.100	240.305	100

Weight kilograms to newtons

kgf	0	1	2	3	4	5	6	7	8	9	kg
	N	N	N	N	N	N	N	N	N	N	
----		9.81	19.61	29.42	39.23	49.03	58.84	68.65	78.45	88.26	----
10	98.07	107.87	117.68	127.49	137.29	147.10	156.91	166.71	176.52	186.33	10
20	196.13	205.94	215.75	225.55	235.36	245.17	254.97	264.78	274.59	284.39	20
30	294.20	304.01	313.81	323.62	333.43	343.23	353.04	362.85	372.65	382.46	30
40	392.27	402.07	411.88	421.69	431.49	441.30	451.11	460.91	470.72	480.53	40
50	490.33	500.14	509.95	519.75	529.56	539.37	549.17	558.98	568.79	578.59	50
60	588.40	598.21	608.01	617.82	627.63	637.43	647.24	657.05	666.85	676.66	60
70	686.47	696.27	706.08	715.89	725.69	735.50	745.31	755.11	764.92	774.73	70
80	784.53	794.34	804.15	813.95	823.76	833.57	843.37	853.18	862.99	872.79	80
90	882.60	892.41	902.21	912.02	921.83	931.63	941.44	951.25	961.05	970.86	90
100	980.67	990.47	1000.28	1010.08	1019.89	1029.70	1039.5	1049.31	1059.12	1068.92	100

Newtons to weight kilograms

N	0	1	2	3	4	5	6	7	8	9	N
	kgf	kgf	kgf	kgf	kgf	kgf	kgf	kgf	kgf	kgf	
----		0.1020	0.2039	0.3059	0.4079	0.5099	0.6118	0.7138	0.8158	0.9177	----
10	1.0197	1.1217	1.2237	1.3256	1.4276	1.5296	1.6315	1.7335	1.8355	1.9375	10
20	2.0394	2.1414	2.2434	2.3453	2.4473	2.5493	2.6513	2.7532	2.8552	2.9572	20
30	3.0591	3.1611	3.2631	3.3651	3.4670	3.5690	3.6710	3.7729	3.8749	3.9769	30
40	4.0789	4.1808	4.2828	4.3848	4.4868	4.5887	4.6907	4.7927	4.8946	4.9966	40
50	5.0986	5.2006	5.3025	5.4045	5.5065	5.6084	5.7104	5.8124	5.9144	6.0163	50
60	6.1183	6.2203	6.3222	6.4242	6.5262	6.6282	6.7301	6.8321	6.9341	7.0360	60
70	7.1380	7.2400	7.3420	7.4439	7.5459	7.6479	7.7498	7.8518	7.9538	8.0558	70
80	8.1577	8.2597	8.3617	8.4636	8.5656	8.6676	8.7696	8.8715	8.9735	9.0755	80
90	9.1774	9.2794	9.3814	9.4834	9.5853	9.6873	9.7893	9.8912	9.9932	10.0952	90
100	10.1972	10.2991	10.4011	10.5031	10.6050	10.7070	10.8090	10.9110	11.0129	11.1149	100

Pressure

Weight pounds/square inch to weight kilograms/square centimeter

lbf/in^2	0	1	2	3	4	5	6	7	8	9	lbf/in^2
(psi)	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	(psi)
----		0.0703	0.1406	0.2109	0.2812	0.3515	0.4218	0.4921	0.5624	0.6327	----
10	0.7030	0.7733	0.8436	0.9139	0.9842	1.0545	1.1248	1.1951	1.2654	1.3357	10
20	1.4060	1.4763	1.5466	1.6169	1.6872	1.7575	1.8278	1.8981	1.9684	2.0387	20
30	2.1090	2.1793	2.2496	2.3199	2.3902	2.4605	2.5308	2.6011	2.6714	2.7417	30
40	2.8120	2.8823	2.9526	3.0229	3.0932	3.1635	3.2338	3.3041	3.3744	3.4447	40
50	3.5150	3.5853	3.6556	3.7259	3.7962	3.8665	3.9368	4.0071	4.0774	4.1477	50
60	4.2180	4.2883	4.3586	4.4289	4.4992	4.5695	4.6397	4.7100	4.7803	4.8506	60
70	4.9209	4.9912	5.0615	5.1318	5.2021	5.2724	5.3427	5.4130	5.4833	5.5536	70
80	5.6239	5.6942	5.7645	5.8348	5.9051	5.9754	6.0457	6.1160	6.1863	6.2566	80
90	6.3269	6.3972	6.4675	6.5378	6.6081	6.6784	6.7487	6.8190	6.8893	6.9596	90
100	7.0299	7.1002	7.1705	7.2408	7.3111	7.3814	7.4517	7.5220	7.5923	7.6626	100

Weight kilograms/square centimeter to weight pounds/square inch

kgf/cm^2	0	1	2	3	4	5	6	7	8	9	kgf/cm^2
	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	lbf/ in^2(psi)	
----		14.22	28.45	42.67	56.90	71.12	85.35	99.57	113.80	128.02	----
10	142.25	156.47	170.70	184.92	199.15	213.37	227.60	241.82	256.05	270.27	10
20	284.50	298.72	312.95	327.17	341.40	355.62	369.85	384.07	398.30	412.52	20
30	426.75	440.97	455.20	469.42	483.65	497.87	512.10	526.32	540.55	554.77	30
40	569.00	583.22	597.45	611.67	625.90	640.12	654.35	668.57	682.80	697.02	40
50	711.25	725.47	739.70	753.92	768.14	782.37	796.59	810.82	825.04	839.27	50
60	853.49	867.72	881.94	896.17	910.39	924.62	938.84	953.07	967.29	981.52	60
70	995.74	1009.97	1024.19	1038.42	1052.64	1066.87	1081.09	1095.32	1109.54	1123.77	70
80	1137.99	1152.22	1166.44	1180.67	1194.89	1209.12	1223.34	1237.57	1251.79	1266.02	80
90	1280.24	1294.47	1308.69	1322.92	1337.14	1351.37	1365.59	1379.82	1394.04	1408.27	90
100	1422.49	1436.72	1450.94	1465.17	1479.39	1493.62	1507.84	1522.06	1536.29	1550.51	100

Weight kilograms/square centimeter to kilopascals

kgf/cm^2	0	1	2	3	4	5	6	7	8	9	kgf/cm^2
	kpa	kpa	kpa	kpa	kpa	kpa	kpa	kpa	kpa	kpa	
----		98.1	196.1	294.2	392.3	490.3	588.4	686.5	784.5	882.6	----
10	980.7	1078.7	1176.8	1274.9	1372.9	1471.0	1569.1	1667.1	1765.2	1863.3	10
20	1961.3	2059.4	2157.5	2255.5	2353.6	2451.7	2549.7	2647.8	2745.9	2843.9	20
30	2942.0	3040.1	3138.1	3236.2	3334.3	3432.3	3530.4	3628.5	3726.5	3824.6	30
40	3922.7	4020.7	4118.8	4216.9	4314.9	4413.0	4511.1	4609.1	4707.2	4805.3	40
50	4903.3	5001.4	5099.5	5197.5	5295.6	5393.7	5491.7	5589.8	5687.9	5785.9	50
60	5884.0	5982.1	6080.1	6178.2	6276.3	6374.3	6472.4	6570.5	6668.5	6766.6	60
70	6864.7	6962.7	7060.8	7158.9	7256.9	7355.0	7453.1	7551.1	7649.2	7747.3	70
80	7845.3	7943.4	8041.5	8139.5	8237.6	8335.7	8433.7	8531.8	8629.9	8727.9	80
90	8826.0	8924.1	9022.1	9120.2	9218.3	9316.3	9414.4	9512.5	9610.5	9708.6	90
100	9806.7	9904.7	10002.8	10100.8	10198.9	10297	10395.0	10493.1	10591.2	10689.2	100

Kilopascals to weight kilograms/square centimeter

kpa	0	100	200	300	400	500	600	700	800	900	kpa
	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	kgf/cm^2	
----		1.020	2.039	3.059	4.079	5.099	6.118	7.138	8.158	9.177	----
1000	10.197	11.217	12.237	13.256	14.276	15.296	16.315	17.335	18.355	19.375	1000
2000	20.394	21.414	22.434	23.453	24.473	25.493	26.513	27.532	28.552	29.572	2000
3000	30.591	31.611	32.631	33.651	34.670	35.690	36.710	37.729	38.749	39.769	3000
4000	40.789	41.808	42.828	43.848	44.868	45.887	46.907	47.927	48.946	49.966	4000
5000	50.986	52.006	53.025	54.045	55.065	56.084	57.104	58.124	59.144	60.163	5000
6000	61.183	62.203	63.222	64.242	65.262	66.282	67.301	68.321	69.341	70.360	6000
7000	71.380	72.400	73.420	74.439	75.459	76.479	77.498	78.518	79.538	80.558	7000
8000	81.577	82.597	83.617	84.636	85.656	86.676	87.696	88.715	89.735	90.755	8000
9000	91.774	92.794	93.814	94.834	95.853	96.873	97.893	98.912	99.932	100.952	9000
10000	101.972	102.991	104.011	105.031	106.050	107.070	108.090	109.110	110.129	111.149	10000

Torque

Feet weight pounds to weight kilogram meters

lbf.ft	0	1	2	3	4	5	6	7	8	9	lbf.ft
	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	
----		0.138	0.277	0.415	0.553	0.692	0.830	0.969	1.107	1.245	----
10	1.384	1.522	1.660	1.799	1.937	2.075	2.214	2.352	2.490	2.629	10
20	2.767	2.906	3.044	3.182	3.321	3.459	3.597	3.736	3.874	4.012	20
30	4.151	4.289	4.428	4.566	4.704	4.843	4.981	5.119	5.258	5.396	30
40	5.534	5.673	5.811	5.949	6.088	6.226	6.365	6.503	6.641	6.780	40
50	6.918	7.056	7.195	7.333	7.471	7.610	7.748	7.887	8.025	8.163	50
60	8.302	8.440	8.578	8.717	8.855	8.993	9.132	9.270	9.409	9.547	60
70	9.685	9.824	9.962	10.100	10.239	10.377	10.515	10.654	10.792	10.930	70
80	11.069	11.207	11.346	11.484	11.622	11.761	11.899	12.037	12.176	12.314	80
90	12.452	12.591	12.729	12.868	13.006	13.144	13.283	13.421	13.559	13.698	90
100	13.836	13.974	14.113	14.251	14.389	14.528	14.666	14.805	14.943	15.081	100

Weight kilogram meters to feet weight pounds

kgf·m	0	1	2	3	4	5	6	7	8	9	kgf·m
	lbf.ft	lbf.ft	lbf.ft	lbf.ft	lbf.ft	lbf.ft	lbf.ft	lbf.ft	lbf.ft	lbf.ft	
----		7.228	14.455	21.683	28.910	36.138	43.365	50.593	57.820	65.048	----
10	72.275	79.503	86.730	93.958	101.185	108.413	115.640	122.868	130.095	137.323	10
20	144.550	151.778	159.005	166.233	173.460	180.688	187.915	195.143	202.370	209.598	20
30	216.825	224.053	231.280	238.508	245.735	252.963	260.190	267.418	274.645	281.873	30
40	289.100	296.328	303.555	310.783	318.010	325.238	332.465	339.693	346.920	354.148	40
50	361.375	368.603	375.830	383.058	390.285	397.513	404.740	411.968	419.195	426.423	50
60	433.650	440.878	448.105	455.333	462.560	469.788	477.015	484.243	491.470	498.698	60
70	505.925	513.153	520.380	527.608	534.835	542.063	549.290	556.518	563.745	570.973	70
80	578.200	585.428	592.655	599.883	607.110	614.338	621.565	628.793	636.020	643.248	80
90	650.475	657.703	664.930	672.158	679.385	686.613	693.840	701.068	708.295	715.523	90
100	722.750	729.978	737.205	744.433	751.660	758.888	766.115	773.343	780.570	787.798	100

Weight kilogram meters to Newton meters

kgf·m	0	1	2	3	4	5	6	7	8	9	kgf·m
	N·m	N·m	N·m	N·m	N·m	N·m	N·m	N·m	N·m	N·m	
----		9.81	19.61	29.42	39.23	49.03	58.84	68.65	78.45	88.26	----
10	98.07	107.87	117.68	127.49	137.29	147.10	156.91	166.71	176.52	186.33	10
20	196.13	205.94	215.75	225.55	235.36	245.17	254.97	264.78	274.59	284.39	20
30	294.20	304.01	313.81	323.62	333.43	343.23	353.04	362.85	372.65	382.46	30
40	392.27	402.07	411.88	421.69	431.49	441.30	451.11	460.91	470.72	480.53	40
50	490.33	500.14	509.95	519.75	529.56	539.37	549.17	558.98	568.79	578.59	50
60	588.40	598.21	608.01	617.82	627.63	637.43	647.24	657.05	666.85	676.66	60
70	686.47	696.27	706.08	715.89	725.69	735.50	745.31	755.11	764.92	774.73	70
80	784.53	794.34	804.15	813.95	823.76	833.57	843.37	853.18	862.99	872.79	80
90	882.60	892.41	902.21	912.02	921.83	931.63	941.44	951.25	961.05	970.86	90
100	980.67	990.47	1000.28	1010.08	1019.89	1029.70	1039.5	1049.31	1059.12	1068.92	100

Newton meters to weight kilogram meters

N·m	0	10	20	30	40	50	60	70	80	90	N·m
	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	
----		1.020	2.039	3.059	4.079	5.099	6.118	7.138	8.158	9.177	----
100	10.197	11.217	12.237	13.256	14.276	15.296	16.315	17.335	18.355	19.375	10
200	20.394	21.414	22.434	23.453	24.473	25.493	26.513	27.532	28.552	29.572	20
300	30.591	31.611	32.631	33.651	34.670	35.690	36.710	37.729	38.749	39.769	30
400	40.789	41.808	42.828	43.848	44.868	45.887	46.907	47.927	48.946	49.966	40
500	50.986	52.006	53.025	54.045	55.065	56.084	57.104	58.124	59.144	60.163	50
600	61.183	62.203	63.222	64.242	65.262	66.282	67.301	68.321	69.341	70.360	60
700	71.380	72.400	73.420	74.439	75.459	76.479	77.498	78.518	79.538	80.558	70
800	81.577	82.597	83.617	84.636	85.656	86.676	87.696	88.715	89.735	90.755	80
900	91.774	92.794	93.814	94.834	95.853	96.873	97.893	98.912	99.932	100.952	90
1000	101.972	102.991	104.011	105.031	106.050	107.070	108.090	109.110	110.129	111.149	100

Temperature

Fahrenheit to centigrade

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
60	51.1	2	-18.9	56	13.3	114	45.6	172	77.8	230	110	288	142.2	346	174.4
58	50	0	-17.8	58	14.4	116	46.7	174	78.9	232	111.1	290	143.3	348	175.6
56	48.9	2	-16.7	60	15.6	118	47.8	176	80.0	234	112.2	292	144.4	350	176.7
54	47.8	4	-15.6	62	16.7	120	48.9	178	81.1	236	113.3	294	145.6	352	177.8
-52	-46.7	6	-14.4	64	17.8	122	50.0	180	82.2	238	114.4	296	146.7	354	178.9
-50	-45.6	8	-13.3	66	18.9	124	51.1	182	83.3	240	115.6	298	147.8	356	180
-48	-44.4	10	-12.2	68	20	126	52.2	184	84.4	242	116.7	300	148.9	358	181.1
-46	-43.3	12	-11.1	70	21.1	128	53.3	186	85.6	244	117.8	302	150	360	182.2
-44	-42.2	14	-10	72	22.2	130	54.4	188	86.7	246	118.9	304	151.1	362	183.3
-42	-41.1	16	-8.9	74	23.3	132	55.6	190	87.8	248	120	306	152.2	364	184.4
-40	-40.0	18	-7.8	76	24.4	134	56.7	192	88.9	250	121.1	308	153.3	366	185.6
-38	-38.9	20	-6.7	78	25.6	136	57.8	194	90.0	252	122.2	310	154.4	368	186.7
-36	-37.8	22	-5.6	80	26.7	138	58.9	196	91.1	254	123.3	312	155.6	370	187.8
-34	-36.7	24	-4.4	82	27.8	140	60	198	92.2	256	124.4	314	156.7	372	188.9
-32	-35.6	26	-3.3	84	28.9	142	61.1	200	93.3	258	125.6	316	157.8	374	190.0
-30	-34.4	28	-2.2	86	30.0	144	62.2	202	94.4	260	126.7	318	158.9	376	191.1
-28	-33.3	30	-1.1	88	31.1	146	63.3	204	95.6	262	127.8	320	160	378	192.2
-26	-32.2	32	0.0	90	32.2	148	64.4	206	96.7	264	128.9	322	161.1	380	193.3
-24	-31.1	34	1.1	92	33.3	150	65.6	208	97.8	266	130.0	324	162.2	382	194.4
-22	-30.0	36	2.2	94	34.4	152	66.7	210	98.9	268	131.1	326	163.3	384	195.6
-20	-28.9	38	3.3	96	35.6	154	67.8	212	100.0	270	132.2	328	164.4	386	196.7
-18	-27.8	40	4.4	98	36.7	156	68.9	214	101.1	272	133.3	330	165.6	388	197.8
-16	-26.7	42	5.6	100	37.8	158	70.0	216	102.2	274	134.4	332	166.7	390	198.9
-14	-25.6	44	6.7	102	38.9	160	71.1	218	103.3	276	135.6	334	167.8	392	200
-12	-24.4	46	7.8	104	40.0	162	72.2	220	104.4	278	136.7	336	168.9	400	204.4
-10	-23.3	48	8.9	106	41.1	164	73.3	222	105.6	280	137.8	338	170.0	410	210.0
-8	-22.2	50	10.0	108	42.2	166	74.4	224	106.7	282	138.9	340	171.1	420	215.6
-6	-21.1	52	11.1	110	43.3	168	75.6	226	107.8	284	140.0	342	172.2	430	221.1
-4	-20.0	54	12.2	112	44.4	170	76.7	228	108.9	286	141.1	344	173.3	440	226.7

Centigrade to fahrenheit

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
50	58.0	-18	-0.4	14	57.2	46	114.8	78	172.4	110	230.0	142	287.6	174	345.2
49	56.2	-17	1.4	15	59.0	47	116.6	79	174.2	111	231.8	143	289.4	175	347.0
48	54.4	-16	3.2	16	60.8	48	118.4	80	176.0	112	233.6	144	291.2	176	348.8
47	52.6	-15	5.0	17	62.6	49	120.2	81	177.8	113	235.4	145	293.0	177	350.6
46	50.8	-14	6.8	18	64.4	50	122.0	82	179.6	114	237.2	146	294.8	178	352.4
45	49.0	-13	8.6	19	66.2	51	123.8	83	181.4	115	239.0	147	296.6	179	354.2
44	47.2	-12	10.4	20	68.0	52	125.6	84	183.2	116	240.8	148	298.4	180	356.0
43	45.4	-11	12.2	21	69.8	53	127.4	85	185.0	117	242.6	149	300.2	181	357.8
42	43.6	-10	14.0	22	71.6	54	129.2	86	186.8	118	244.4	150	302.0	182	359.6
41	41.8	-9	15.8	23	73.4	55	131.0	87	188.6	119	246.2	151	303.8	183	361.4
40	40.0	-8	17.6	24	75.2	56	132.8	88	190.4	120	248.0	152	305.6	184	363.2
39	38.2	-7	19.4	25	77.0	57	134.6	89	192.2	121	249.8	153	307.4	185	365.0
38	36.4	-6	21.2	26	78.8	58	136.4	90	194.0	122	251.6	154	309.2	186	366.8
37	34.6	-5	23.0	27	80.6	59	138.2	91	195.8	123	253.4	155	311.0	187	368.6
36	32.8	-4	24.8	28	82.4	60	140.0	92	197.6	124	255.2	156	312.8	188	370.4
35	31.0	-3	26.6	29	84.2	61	141.8	93	199.4	125	257.0	157	314.6	189	372.2
-34	-29.2	-2	28.4	30	86.0	62	143.6	94	201.2	126	258.8	158	316.4	190	374.0
-33	-27.4	-1	30.2	31	87.8	63	145.4	95	203.0	127	260.6	159	318.2	191	375.8
-32	-25.6	0	32.0	32	89.6	64	147.2	96	204.8	128	262.4	160	320.0	192	377.6
-31	-23.8	1	33.8	33	91.4	65	149.0	97	206.6	129	264.2	161	321.8	193	379.4
-30	-22.0	2	35.6	34	93.2	66	150.8	98	208.4	130	266.0	162	323.6	194	381.2
-29	-20.2	3	37.4	35	95.0	67	152.6	99	210.2	131	267.8	163	325.4	195	383.0
-28	-18.4	4	39.2	36	96.8	68	154.4	100	212.0	132	269.6	164	327.2	196	384.8
-27	-16.6	5	41.0	37	98.6	69	156.2	101	213.8	133	271.4	165	329.0	197	386.6
-26	-14.8	6	42.8	38	100.4	70	158.0	102	215.6	134	273.2	166	330.8	198	388.4
-25	-13.0	7	44.6	39	102.2	71	159.8	103	217.4	135	275.0	167	332.6	199	390.2
-24	-11.2	8	46.4	40	104.0	72	161.6	104	219.2	136	276.8	168	334.4	200	392.0
-23	-9.4	9	48.2	41	105.8	73	163.4	105	221.0	137	278.6	169	336.2	210	410.0
-22	-8	10	50.0	42	107.6	74	165.2	106	222.8	138	280.4	170	338.0	220	428.0
-21	-6	11	51.8	43	109.4	75	167.0	107	224.6	139	282.2	171	339.8	230	446.0
-20	-4	12	53.6	44	111.2	76	168.8	108	226.4	140	284.0	172	341.6	240	464.0
-19	-2	13	55.4	45	113.0	77	170.6	109	228.2	141	285.8	173	343.4	250	482.0

Abbreviation

Abbreviation	Explanation
A/C	Air-conditioner
A/D	Analog/digital
ABDC	After bottom dead center
AC	AC
ACC	Accessories
ACG	AC generator
ACT	Actuator
API	American Petroleum Institute
ASM	Assembly
ATDC	After top dead center
ATF	Automatic transmission fluid
Drilled hole B	Notch hole bolt
Eye B	Eyebolt
Full threaded B	Full threaded bolt
Hexagon socket head B	Hexagon socket head bolt
High-strength B	High-strength bolt
Reamer B	Reamer bolt
B+	Battery + terminal
BAT	Battery
BBDC	Before bottom dead center
BKT	Bracket
BRG	Bearing
BTDC	Before top dead center
C/B	Circuit breaker
C/U	Control unit
CAL	Calibration
CAN	A type of control unit communication technique (controller area network)
CFG	Config
CHK	Check
CKP	Crankshaft position
CMP	Camshaft position
CO	Carbon monoxide
CPU	Central processing device
DC	DC
DI	Direct injection
DIAG	Diagnostic
DLC	Data link connector
DMM	Digital multi-meter
DOC	Diesel oxidation catalyst
DPD	Diesel particulate diffuser
DTC	Diagnostic trouble code
ECM	Engine controller module
ECT	Engine coolant temperature
ECU	Electronic control unit
EEPROM	Electrically erasable programmable read-only memory
EGR	Exhaust gas recirculation
EMI	Electromagnetic interference
EMPS	Engine module programming system
ENG	Engine
EPF	Engine protection feature
EVRV	Electric vacuum regulating valve
EXH	Exhaust gas
F/B	Feedback
F/C	Fuel cut

Abbreviation	Explanation
F/L	Fusible link
FLW	Fusible link wire
FRT	Front
FT	Fuel temperature
FWD	Forward
GEN	Generator
GND	Ground
HBCV	HBCV
HC	Hydrocarbons
HO2S	Heated O2 sensor
HR	Time
HRD	High reach demolition machine
IAC	Idle air control
IAT	Suction air temperature
IC	Integrated circuit
ID Plate	Nameplate, ID plate
IMT	Intake manifold temperature
INL	Suction air
INJ	Injection
ISO	International Organization for Standardization
ISP	Intake shutter position
ITP	Intake throttle position
J/C	Joint connector
JIS	Japanese Industrial Standards
KW	A type of communication technique (keyword)
LED	Light-emitting diode
LH	Left
LLC	Long-life coolant
LM	Lifting magnet
M/V	Magnet valve
MAF	Mass air flow
MAP	Manifold air pressure
Max	Maximum
MIL	Malfunction indicator lamp (diagnostic)
milli-amp	Current
Min	Minimum
MPU	Micro-processing unit
High-strength N	High-strength nut
NC	Normal closed
NO	Normal open
NOx	Nitrogen oxides
N-TDC	Number of top dead center
O2S	O2 sensor
OBD	On-board diagnostics
OEM	Original equipment manufacturer
OPT	Options
OT	Oil temperature
P/L	Indicator lamp
PCV	Pump control valve/positive crankcase ventilation
P-I	Proportional - integral
PM	Particulate matter
PTO	Power take-off
PWM	Pulse width modulation wave
QOS	Quick on start system
QWS	Quick warm up system

Abbreviation	Explanation
R/L	Relay
RAM	Random access memory
REF	Reference
RH	Right hand
ROM	Read-only memory
RP	Rail pressure
Rr	Rear
RWD	Rearward
+ Flush head S	+ Flush head Screw
+ Phillips pan head S	+ Phillips pan head Screw
+ Screw tapping S	+ Screw tapping Screw
S/A	Subassembly
SAE	Society of Automotive Engineers
SBF	Slow blow fuse
SCV	Suction control valve
SIG	Signal
SLD	Shield
SP pin	Special pin
ST	Starter/start
STD	Standard
SW	Switch
TDC	Top dead center
TEMP	Temperature
TP	Throttle position
UART	Universal asynchronous receiver-transmitter
VB	Battery voltage
VGS Turbo	Variable geometry system turbo
High-strength W	High-strength washer
Outer-tooth W	Outer-tooth washer
W/H	Wire, harness
W/L	Warning lamp
W/S	Welded splice
WOT	Wide open throttle

SERVICE MANUAL

Engine

CX80C

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