CASE CONSTRUCTION

SERVICE MANUAL

CRAWLER EXCAVATOR

CX290B

87673891 B
Replaces 87673891

Issued February 2010

CRAWLER EXCAVATOR
CX290B
SERVICE MANUAL

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** Consult the Engine Service Manual*

CNH AMERICA LLC.
700 State Street
Racine, WI 53404 U.S.A.

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Section

1001

SAFETY, GENERAL INFORMATION AND TORQUE SPECIFICATIONS

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

GENERAL INFORMATION

Cleanning

Clean all metal parts except bearings, in a suitable cleaning solvent or by steam cleaning. Do not use caustic soda for steam cleaning. After cleaning, dry and put oil on all parts. Clean oil passages with compressed air. Clean bearings in a suitable cleaning solvent, dry the bearings completely and put oil on the bearings.

Inspection

Check all parts when the parts are disassembled. Replace all parts that have wear or damage. Small scoring or grooves can be removed with a hone or crocus cloth. Complete a visual inspection for indications of wear, pitting and the replacement of parts necessary to prevent early failures.

Bearings

Check bearings for easy action. If bearings have a loose fit or rough action replace the bearing. Wash bearings with a suitable cleaning solvent and permit to air dry. DO NOT DRY BEARINGS WITH COMPRESSED AIR.

Needle bearings

Before you press needle bearings in a bore always remove any metal protrusions in the bore or edge of the bore. Before you press bearings into position put petroleum jelly on the inside and outside diameter of the bearings.

Gears

Check all gears for wear and damage. Replace gears that have wear or damage.

Oil seals, O-rings and gaskets

Always install new oil seals, O-rings and gaskets. Put petroleum jelly on seals and O-rings.

Shafts

Check all shafts that have wear or damage. Check the bearing and oil seal surfaces of the shafts for damage.

Service parts

Always install genuine Case service parts. When ordering refer to the Parts Catalog for the correct part number of the genuine Case replacement items. Failures due to the use of other than genuine Case replacement parts are not covered by warranty.

Lubrication

Only use the oils and lubricants specified in the Operator's or Service Manuals. Failures due to the use of non-specified oils and lubricants are not covered by warranty.

SAFETY

This symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED. The message that follows the symbol contains important information about safety. Carefully read the message. Make sure you fully understand the causes of possible injury or death.

To prevent injury always follow the Warning, Caution and Danger notes in this section and throughout the manual.

Put the warning tag shown below on the key for the keyswitch when servicing or repairing the machine. One warning tag is supplied with each machine. Additional tags Part Number 331-4614 are available from your service parts supplier

.

WARNING: *Read the operator's manual to familiarize yourself with the correct control functions.*

WARNING: *Operate the machine and equipment controls from the seat position only. Any other method could result in serious injury.*

WARNING: *This is a one man machine, no riders allowed.*

WARNING: *Before starting engine, study Operator's Manual safety messages. Read all safety signs on machine. Clear the area of other persons. Learn and practice safe use of controls before operating.*
It is your responsibility to understand and follow manufacturers instructions on machine operation, service and to observe pertinent laws and regulations. Operator's and Service Manuals may be obtained from your Case dealer.

WARNING: *If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.*

WARNING: *When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution.*

WARNING: *When doing checks and tests on the equipment hydraulics, follow the procedures as they are written. DO NOT change the procedure.*

WARNING: *When putting the hydraulic cylinders on this machine through the necessary cycles to check operation or to remove air from a circuit, make sure all people are out of the way.*

WARNING: *Use insulated gloves or mittens when working with hot parts.*

WARNING: *Lower all attachments to the ground or use stands to safely support the attachments before you do any maintenance or service.*

WARNING: *Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. If hydraulic oil under pressure does penetrate the skin, seek medical treatment immediately. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Make a replacement of any tube or hose that is damaged or thought to be damaged. DO NOT use your hand to check for leaks, use a piece of cardboard or wood.*

WARNING: *When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer.*

WARNING: *When using a hammer to remove and install pivot pins or separate parts using compressed air or using a grinder, wear eye protection that completely encloses the eyes (approved goggles or other approved eye protectors).*

WARNING: *Use suitable floor (service) jacks or chain hoist to raise wheels or tracks off the floor. Always block machine in place with suitable safety stands.*

WARNING: *When servicing or repairing the machine, keep the shop floor and operator's compartment and steps free of oil, water, grease, tools, etc. Use an oil absorbing material and/or shop cloths as required. Use safe practices at all times.*

WARNING: *Some components of this machine are very heavy. Use suitable lifting equipment or additional help as instructed in this Service Manual.*

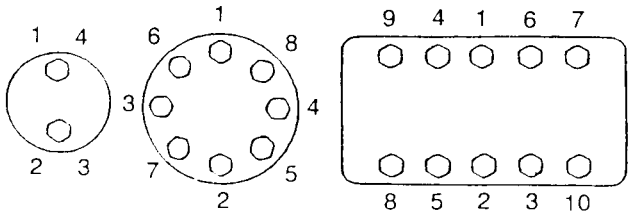
WARNING: *Engine exhaust fumes can cause death. If it is necessary to start the engine in a closed place, remove the exhaust fumes from the area with an exhaust pipe extension. Open the doors and get outside air into the area.*

WARNING: *When the battery electrolyte is frozen, the battery can explode if (1), you try to charge the battery, or (2), you try to jump start and run the engine. To prevent the battery electrolyte from freezing, try to keep the battery at full charge. If you do not follow these instructions, you or others in the area can be injured.*

STANDARD TORQUE DATA FOR CAP SCREWS AND NUTS

Tightening of cap screws, nuts

Tighten alternately so that tightening torque can be applied evenly. The numbers in the figure below indicate the order of tightening.



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Cap screws which have had Loctite used (white residue remains after removal) should be cleaned with loght oil or suitable cleaning solvent and dried. Apply 2-3 drops of Loctite to the thread portion of the cap screw and then tighten.

Torque table

Tighten cap screws and nuts according to the table below if there are no other special instructions.

Cap Screw Name Size (Size)			**M6**	**M8**	**M10**	**M12**	**M14**	**M16**	**M18**	**M20**
Cap Screw	Spanner	[mm]	10	13	17	19	22	24	27	30
		[in.]	0.39	0.51	0.67	0.75	0.87	0.95	1.06	1.18
	Tightening torque	[Nm]	6.9	19.6	39.2	58.8	98.1	156.9	196.1	294.2
		[lb-ft]	5.1	14.5	28.9	43.4	72.3	115.7	144.6	217
Socket Head Cap Screw	Spanner	[mm]	5	6	8	10	12	14	14	17
		[in.]	0.20	0.24	0.32	0.39	0.47	0.55	0.55	0.67
	Tightening torque	[Nm]	8.8	21.6	42.1	78.5	117.7	176.5	245.2	343.2
		[lb-ft]	6.5	15.9	31.1	57.9	86.9	130.2	181	253.2

Section

1002

SPECIFICATIONS

AND SPECIAL TORQUE SETTINGS

January 2010

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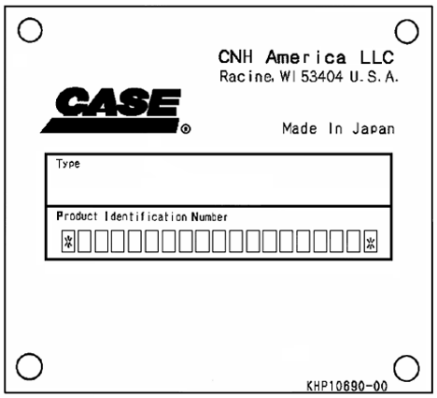
WARNING: *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message which follows. Your safety depends on it.*

TYPE, SERIAL NUMBER AND YEAR OF MANUFACTURE OF THE MACHINE

For all part orders, request for information or assistance, always specify the type and the serial number of the machine to your Case dealer.

Fill in the following lines with the required information: Type, serial number, year of manufacture of the machine and the serial numbers of the hydraulic and mechanical components.

Machine



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(Type.....

(Serial number.....

Year of manufacture .....

Engine

Make and type.....

Serial number.....

Serial numbers of the components

Hydraulic pump .....

Swing reduction gear.....

Travel reduction gears .....

Control valve.....

FLUIDS AND LUBRICANTS

Lubricants must have the correct properties for each application.

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

Hydraulic fluid

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

Temperate climates: -20°C to +40°C (-4° to 104° F)

CASE/AKCELA: HYDRAULIC EXCAVATOR FLUID (MS 1230. ISO VG 46. DIN 51524 PART 2 HV)

Hot climates: 0°C to +50°C (32° to 122° F)

CASE/AKCELA: AW HYDRAULIC FLUID 68 HV (MS 1216. ISO VG 68. DIN 51524 PART 3 CATEGORY HVLP)

Cold climates: -25°C to +20°C (-13° to 68° F)

CASE/AKCELA: AW HYDRAULIC FLUID 32 (MS 1216. ISO VG 32. DIN 51524 PART 2)

Biodegradable fluid: -30°C to +40°C (-22° to 104° F)

This yellow-colored fluid is miscible with standard fluid. If used to change standard fluid, it is advised to drain the circuit completely before refilling with this fluid.

CASE/AKCELA: HYDRAULIC EXCAVATOR FLUID BIO (MS 1230. ISO VG 46. DIN 51524 PART 2 HV)

Transmission component oil

Extreme pressure oil used for enclosed transmission components.

CASE/AKCELA: GEAR 135H EP (SAE 80W-90. API GL 5. MIL-L-2105 D. MS 1316. ZF TE-ML 05A)

Grease

CASE/AKCELA: MOLY GREASE 251H EP-M (251H EP-M. NLGI 2)

"Extreme Pressure" multipurpose grease with lithium soap and molybdenum disulphide.

CASE/AKCELA: MULTIPURPOSE GREASE 251H EP (251H EP. NLGI 2)

"Extreme Pressure" multipurpose grease with lithium soap and calcium.

CASE/AKCELA: PREMIUM GREASE EP2 (NLGI 2)

"Extreme Pressure" multipurpose grease with lithium soap.

Hydraulic breakers

CASE/AKCELA: MULTIPURPOSE GREASE 251H EP (NLGI 2).

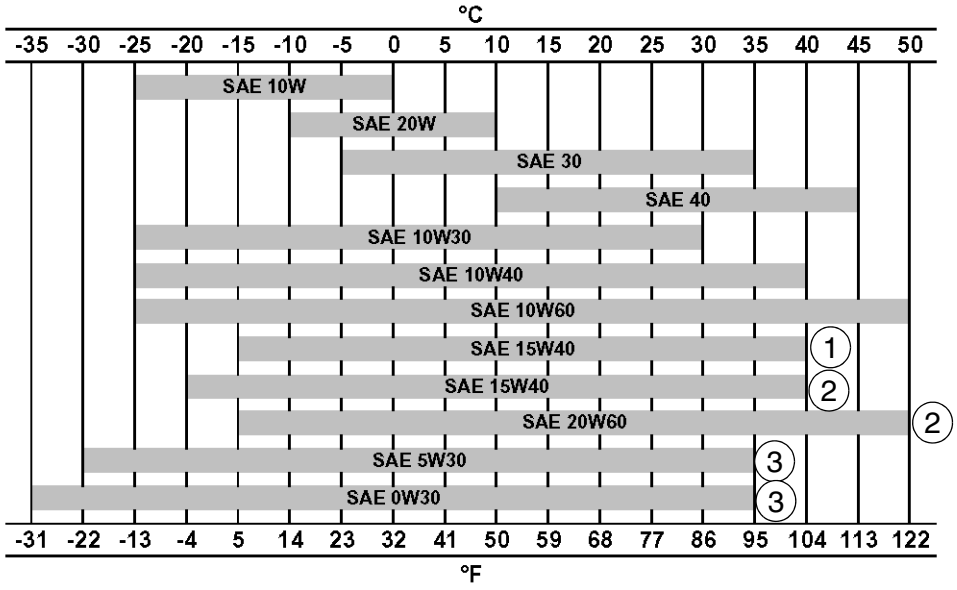
Engine Oil

THE CASE/AKCELA No. 1 engine oil is recommended for your engine. This oil ensures proper lubrication of your engine for all operating conditions.

If the CASE/AKCELA Multigrade "No. 1 ENGINE OIL" cannot be obtained, use the oil corresponding to one of the following categories: ACEA E7. API CI-4.

CP02N001

Oil viscosity / Oil range



CT02M001

1) With mineral base

(2) With semi-synthetic base

(3) With synthetic base

Fuel

Use fuel which is to ASTM (American Society for Testing and Materials) D975 standard.

Use grade No. 2-D fuel. The use of other types of fuel can result in a loss of power of the engine and may cause high fuel consumption.

In cold weather (below -7°C (19.4°F)), it is provisionally approved to use a mixture of fuels No. 1-D and No. 2-D. Consult your fuel supplier or your CASE Dealer.

If the temperature falls below the fuel cloud point (point at which wax begins to form) the wax crystals will cause power loss or will prevent the engine from starting.

Required conditions for 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.

Diesel fuel recommendation

- JIS (Japanese Industrial Standard) : No. 2
- DIN (Deutsche Industrie Normen) : DIN 51601
- SAE (Society of Automotive Engineers) Based on SAE-J-313C: No. 2-D
- BS (British Standard) Based on BS/2869-1970: Class A-1

IMPORTANT : *Using any other fuel will reduce the operating performance of the engine.*

Using fuels other than those recommended can damage the fuel injection pump, the injector and other parts of the fuel supply system and the engine. **CASE disowns any responsibility concerning this kind of damage, which is not covered by the guarantee.** To avoid any damage to the engine fuel supply system, you are recommended to take the following safety messages into account:
Some fuel suppliers mix used engine oil with diesel fuel. Certain manufacturers of large engines allow them to do this. However, for your engine, do not use diesel fuel contaminated by engine oil. In addition to damaging the engine, this fuel can actually adversely affect the correct purification of exhaust gases. Before using any diesel fuel, ask the supplier if this fuel has been mixed with engine oil.

IMPORTANT : *For a proper use of fuel additives consult your supplier or your CASE Dealer. Do not inject fuel oil or gasoline, both fuels can damage the engine.*

IMPORTANT : *In cold weather, fill the fuel tank at the end of the day's work, in order to prevent the formation of condensation.*

Fuel storage

Long storage can lead to the accumulation of impurities and condensation in the fuel. Engine trouble can often be traced to the presence of water in the fuel.

The storage tank must be placed outside and the temperature of the fuel should be kept as low as possible. Drain off water and impurities regularly.

Anti-freeze/Anti-corrosion

Use anti-freeze in all seasons to protect the cooling system from corrosion and all risk of freezing.

CASE/AKCELA: PREMIUM ANTI-FREEZE (MS 1710)

For areas where the temperature goes down to -38°C (-36.4°F), mix 50/50 with water.

IMPORTANT : *Do not mix products of a different origin or brand. The same product must be used when topping up the system.*

Environment

Before carrying out any maintenance operation on this machine and before disposing of used fluids or lubricants, always think of the environment. Never throw oil or fluid on the ground and never place it in leaking receptacles.

Contact your local ecological recycling centre or your CASE Dealer to obtain information on the correct method of disposing of these lubricants.

Plastic and resin parts

When cleaning plastic parts, the console, the instrument panel, the indicators etc... avoid using petrol, kerosene, paint solvents etc... Use only water, soap and a soft cloth.

The use of petrol, kerosene, paint solvents etc... causes discoloration, cracks or deformation of these parts.

SPECIFICATIONS

Main data

Model name ..... CX290B Hydraulic Excavator
Operating weight ..... 29800 kg (65698 lbs)
Engine output ..... 154 kW / 1800 rpm

Performance

Swing speed ..... 10.2 Tr/min.
Travel speed ..... Low Speed 3.2 km/h (1.99 mph)
..... High Speed 5.6 km/h (3.48 mph)
Maximum drawbar pull ..... 233.2kN (52425.45 lbf)
Grade ability ..... 70% (35°)
Ground pressure ..... 56 kPa (600 mm (23.62 in) grouser shoe)
..... 49 kPa (700 mm (27.56 in) grouser shoe)
..... 43 kPa (800 mm (31.50 in) grouser shoe)

Complete machine dimensions

	Arm (dipper)		
	3180 mm (125.20 in)	2650 mm (104.33 in)	3600 mm (141.73 in)
Lenght (without attachment)	5590 mm (220.08 in)	5590 mm (220.08 in)	5590 mm (220.08 in)
Lenght (with attachment)	10450 mm (411.4 in)	10480 mm (412.6 in)	10470 mm (412.2 in)
Height (with attachment)	3260 mm (128.35 in)	3340 mm (131.5 in)	3460 mm (136.22 in)

Main body dimensions

Main body width ..... See machine overall dimensions
Upper side swing body width ..... 2870 mm (112.99 in)
Cab width ..... 1000 mm (39.37 in)
Main body height ..... 3110 mm (122.44 in)
Engine displacement ..... 3160 mm (124.41 in)
Swing body tail distance ..... 3150 mm (124.01 in)
Swing body rear section bottom height ..... 1190 mm (46.85 in)
Distance between tumblers ..... 3980 mm (156.69 in)
Overall track length ..... 4850 mm (190.94 in)
Width of track shoe ..... 800 mm (31.50 in) (Optional: 600 mm (23.62 in) 700 mm (27.56 in)
Minimum ground clearance ..... 470 mm (18.50 in) (To bottom of lower frame)

Engine

Name ..... ISUZU, 6HK1X
Type: ..... 4-cycle, water-cooled, overhead camshaft, vertical in-line, direct injection type (electronic control), with turbocharger.
No. of cylinders - bore x stroke ..... 6 - Ø115 mm x 125 mm (4.53 x 4.92 in)
Displacement ..... 7.79 L (2.06 gal)
Compression ratio 17.5
Rated output ..... 154 kW / 1800 min^{-1}
Maximum torque ..... 850 N.m (626.93 lb-ft) / 1500 min^{-1}
Engine dimensions (LxWxH) ..... 1357x995.4x1141 mm (53.42 x39.19x44.92 in)
Oil pan ..... All direction 35 rad, inclinable
Oil pan capacity ..... Maximum: 38 L (10.04 gal) Minimum: 28 L (7.40 gal) (excluding oil filter)
Direction of rotation ..... Right (as seen from fan)
Starter, reduction type ..... .24 V, 5 kW
Alternator, AC type ..... 24 V, 50 A
Battery ..... 2 x 12V,128 Ah/5 Hr

Cooling system

Fan type ..... Ø 850 mm (33.46 in), suction type - 6 blades, plastic with belt mouth-type fan guide
Pulley ratio ..... 0.80 (reduction)
Radiator
- Fin type ..... wavy
- Fin pitch ..... 2.0 mm (0.078 in)

Oil cooler
- Fin type ..... wavy
- Fin pitch ..... 1.75 mm (0.069 in)

Inter-cooler
- Fin type ..... triangular straight
- Fin pitch ..... 2.0 mm (0.078 in)

Fuel cooler
- Fin type ..... wavy
- Fin pitch ..... 2.0 mm (0.078 in)

Coolant capacity ..... 14.5 L (3.83 gal) (engine only)

Capacity of coolant and lubricants

Coolant ..... 29 L (7.66 gal)
Fuel ..... 450 L (118.88 gal)
Lubricant for engine ..... 38 L (10.04 gal)
Lubricant for travel reduction gear (per side) ..... 9.1 L (2.40 gal)
Lubricant for swing reduction gear (per side) ..... 6 L (1.58 gal)
Hydraulic oil ..... 300 L (79.25 gal)
Capacity of hydraulic oil tank ..... 147 L (38.43 gal)

Hydraulic oil filter

Suction filter (inside tank) ..... 150 mesh
Return filter (inside tank) ..... 6 µm
Pilot line filter (inside housing) ..... 8 µm

Fuel filter

Main filter ..... 4 µm
Pre-filter ..... 8 µm

Operating devices

Operator's seat
- Location: 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) (x2)
- For operating machine use: Lever type (hydraulic pilot type) (x2)

Instruments and switches
- Work mode select switch: 3 modes (SP / super power, H / heavy duty, A / automatic)
- Travel mode select switch: Low-speed / high-speed switch type
- One-touch idle: Knob switch type
- Engine emergency stop: Switch type

Monitor device
- Machine status display (full-dot liquid crystal)
- Work mode selection status: SP / H / A

Instruments (full-dot liquid crystal, except for hour meter)
- Fuel gauge: bar graph indicator
- Engine coolant temperature gauge: bar graph indicator
- Hydraulic oil temperature gauge: bar graph indicator
- Hour meter: digital type
- Machine Status and Warning Alarms (full-dot liquid crystal and warning tone) *Items have a warning alarm

Over heat*	Battery charge*	Faulty electrical system*
Refill fuel*	Engine oil pressure*	Refill coolant*
Engine preheat	Auto warm-up	Air cleaner clogged
Anti-theft device triggered	Faulty engine system	Engine emergency stop

Lighting

Working light	Tank:	24V, 70W (x1)
	Boom:	24V, 70W (x1)
	Cab:	24V, 70W (x2)
Interior light		24V, 10W (x1)

- Horn: electric horn (x2)
- Other

Wiper with intermittent function, Window washer, Air conditioner, Rear view mirrors (left and right), Clock

Hydraulic system

Hydraulic pump drive system, directly coupled to the engine (no transmission)

Main pump

- Manufacturer ..... Kawasaki
- Pump type ..... double variable displacement piston pump
- Displacement volume ..... 136.7 cm^3 (8.34 cu in) x 2 /rev
- Rated operating pressure ..... 34.3 MPa (4975 psi)
- Maximum operating pressure ..... 37.3 MPa (5410 psi)
- Input revolution speed 1800 min-1
- Maximum discharge flow ..... 246 L/min (64.99 gpm) x 2 / 243 L/min (64.19 gpm) x 2 at 1800 min^{-1}

Pilot pump

- Pump type ..... Gear pump
- Displacement volume ..... 15 cm^3 (0.91 cu in)/rev
- Operating pressure ..... 3.92 MPa (568 psi)
- Maximum flow ..... 27 L/min (7.13 gpm) (at 1800 min^{-1})
- Input horsepower ..... 2.8 kW

Control method

Hydraulic simultaneous constant output control.
Maximum flow adjustment control through external commands (negative control).
Setting horsepower adjustment control through external command current.

Control Valve

Model; 4-spool section: integrated (1) or 5-spool section: integrated (1)
Operation method: hydraulic pilot method: travel, swing and operating machine

- Maximum flow ..... 243 L / min (64.19 gpm)
- Main relief set pressure ..... standard; 34.3 MPa (4975 psi), power boost 37.3 MPa (5410 psi)
- Overload set pressure ..... when boom down; 29.4 ± 0.5 MPa (4264 ± 72.5 psi)
  ..... other: 39.2 MPa (5685 psi)
- Foot relief set pressure ..... 2.55 MPa (369.85 psi)

Functions

Straight travel circuit
Boom up / arm 2 pumps internal flow
Boom and arm load holding circuit
Boom-down regenerative circuit
Bucket-close regenerative circuit
Arm-in forced regenerative circuit
Swing priority variable orifice (for arm operation)
2 pumps flow
Variable foot relief

Hydraulic Cylinders

Boom cylinder (x2)

- Cylinder bore ..... Ø140 mm (Ø5.51 in)
- Rod diametre ..... Ø95 mm (Ø3.74 in)
- Maximum retracted lenghth ..... 1918 mm (75.51 in)
- Stroke ..... 1369 mm (53.90 in)

Arm (dipper) cylinder

- Cylinder bore ..... Ø150 mm (Ø5.90 in)
- Rod diametre ..... Ø105 mm (Ø4.13 in)
- Maximum retracted lenghth ..... 2205 mm (86.81 in)
- Stroke ..... 1569 mm (61.77 in)

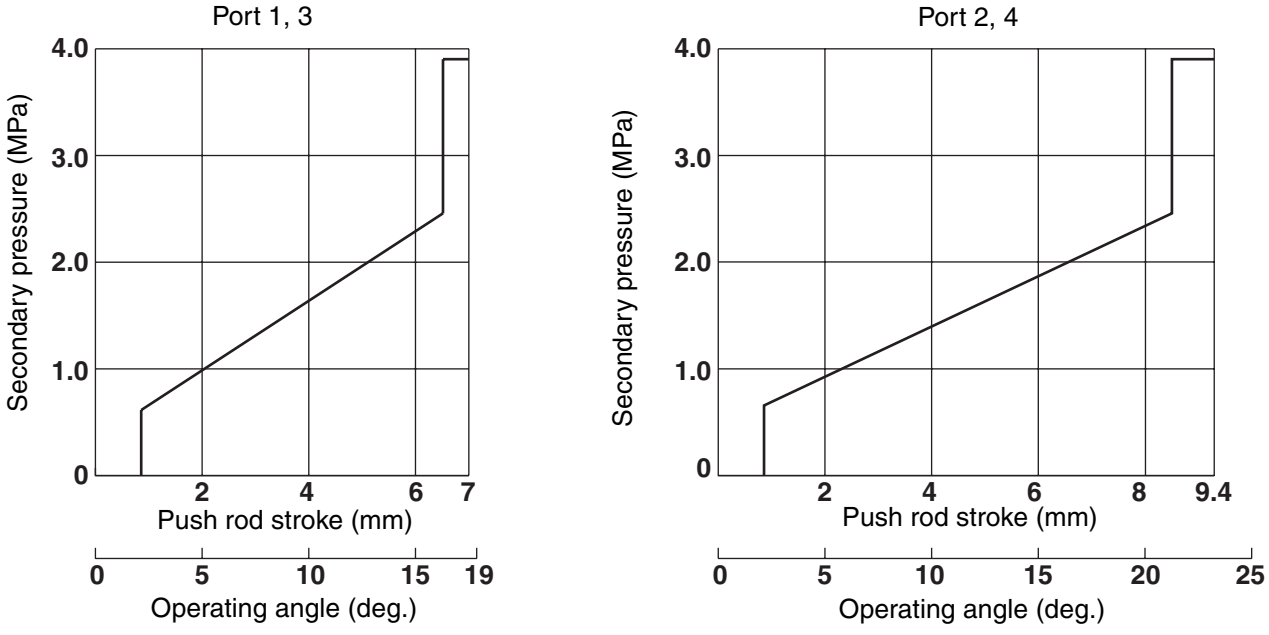
Bucket cylinder

- Cylinder bore ..... Ø135 mm (Ø5.31 in)
- Rod diametre ..... Ø90 mm (Ø3.54 in)
- Maximum retracted lenghth ..... 1692 mm (66.61 in)
- Stroke ..... 1078 mm (42.44 in)

Rotating Joint
- Operating pressure
  - High pressure passage (ABCD) ..... 34.3 MPa (4975 psi)
  - Drain port (E) ..... 1.0 MPa (145 psi)
  - Pilot port (F) ..... 3.9 MPa (566 psi)
- Flow
  - High pressure passage (ABCD) ..... 360 L/min (95.10 gpm)
  - Drain port (E) ..... 40 L/min (10.57 gpm)
  - Pilot port (F) ..... 31 L/min (8.19 gpm)
- Torque, when pressurizing 2 ports ..... 196 Nm (145 lb-ft)
- Port A; forward right G1
- Port B; forward left G1
- Port C; backward right G1
- Port D; backward left G1
- Port E; drain port G1/2
- Port F; pilot port G1/4

Solenoid Valve
- Maximum flow ..... P -> B: 25 L/min (6.60 gpm) Other: 5 L/min (1.32 gpm)
- Rated pressure ..... 4.5 MPa (652.67 psi)
- Port size
  - P, T, B port G3/8
  - C1, C2, C3, C4, C5 port G1/4
- Solenoid specifications
  - Operating voltage ..... DC 20 to 32 V
  - Power consumption ..... 17 W max.

Hand control valve
- Manufacturer ..... Kawasaki
- Operating pressure ..... 3.92 MPa (569 psi)
- Secondary pressure, primary short type ..... 0.64 to 2.45 MPa (92.82 to 355.34 psi)
- Operating angle
  - Ports 1, 3 ..... 19°
  - Ports 2, 4 ..... 25°



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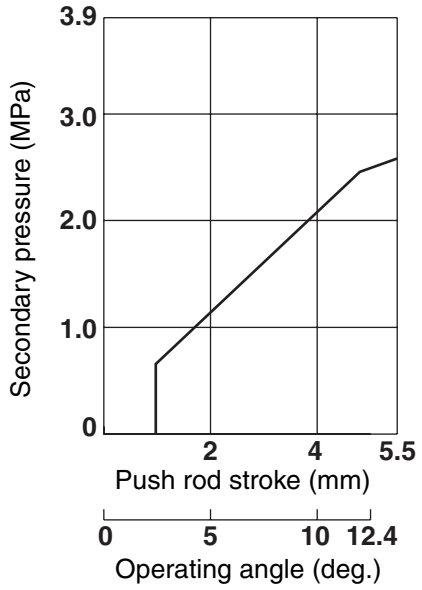
Foot control valve
- Manufacturer ..... Kawasaki
- Operating pressure ..... 3.92 MPa (569 psi)
- Secondary pressure, primary short type ..... 0.64 to 2.45 MPa (92.82 to 355.34 psi)
- Operating angle ..... 12.4°



RST-03-01-001D

Swing unit

Swing circle ..... Swing bearing type (with internal gear)
Swing parking brake ..... Mechanical lock (operational lever linkage type)
Swing hydraulic motor ..... Fixed displacement piston motor
- Displacement ..... 164.7 cm^3 (10.05 cu in)/rev
- Operating pressure ..... 29.4 MPa (4264 psi)
- Operating flow ..... 217 L/min(57.32 gpm)
- Mechanical brake torque ..... 1013 Nm (747.15 lb-ft) min.
- Brake off pressure ..... 3.1 MPa (449.62 psi) max.
- Relief valve set pressure ..... 29.3 MPa (4249.61 psi)

Reduction gear ..... Planetary gear 2-stage reduction gear
- Reduction ratio 27.143

Travel lower body

Travel hydraulic motor (x2) ..... Variable displacement piston motor, automatic 2-speed switch-over with parking brake
- Displacement ..... 244.3/141.1 cm^3 (14.91/8.61 cu in)/rev
- Operating pressure ..... 34.3 MPa (4975 psi)
- Operating flow ..... 241 L/min (63.66 gpm)
- Brake torque ..... 36 KNm (26552.2 lb-ft) min. (including reduction gear)
- Relief valve set pressure ..... 36.2 to 39.7 MPa (5250.37 to 5758 psi)
- automatic 2-speed switch-over pressure ..... 26.5 MPa (3843.5 psi)

Reduction gear ..... Planetary gear 2-stage reduction gear
- Reduction ratio 39.875

Travel brake ..... Hydraulic lock
Parking brake ..... Mechanical lock (travel lever linkage type)
Track shoe
- Model ..... Assembly type triple grouser shoe
- Number of shoes (per side) 50
- Shoe width
  - standard ..... 800 mm (31.50 in)
  - optional ..... 600 mm (23.62 in) 700 mm (27.56 in)
- Grouser height ..... 26 mm (1.02 in)
- Link pitch ..... 203 mm (7.99 in)

Roller
Number of upper rollers (per side) 2
Number of lower rollers (per side) 9
Track belt tension adjuster .....Grease cylinder type (with cushion spring)
Mounting length of spring ..... 774 mm (30.47 in)

Work Unit

Model .....Backhoe attachment
Components / dimensions / working dimensions

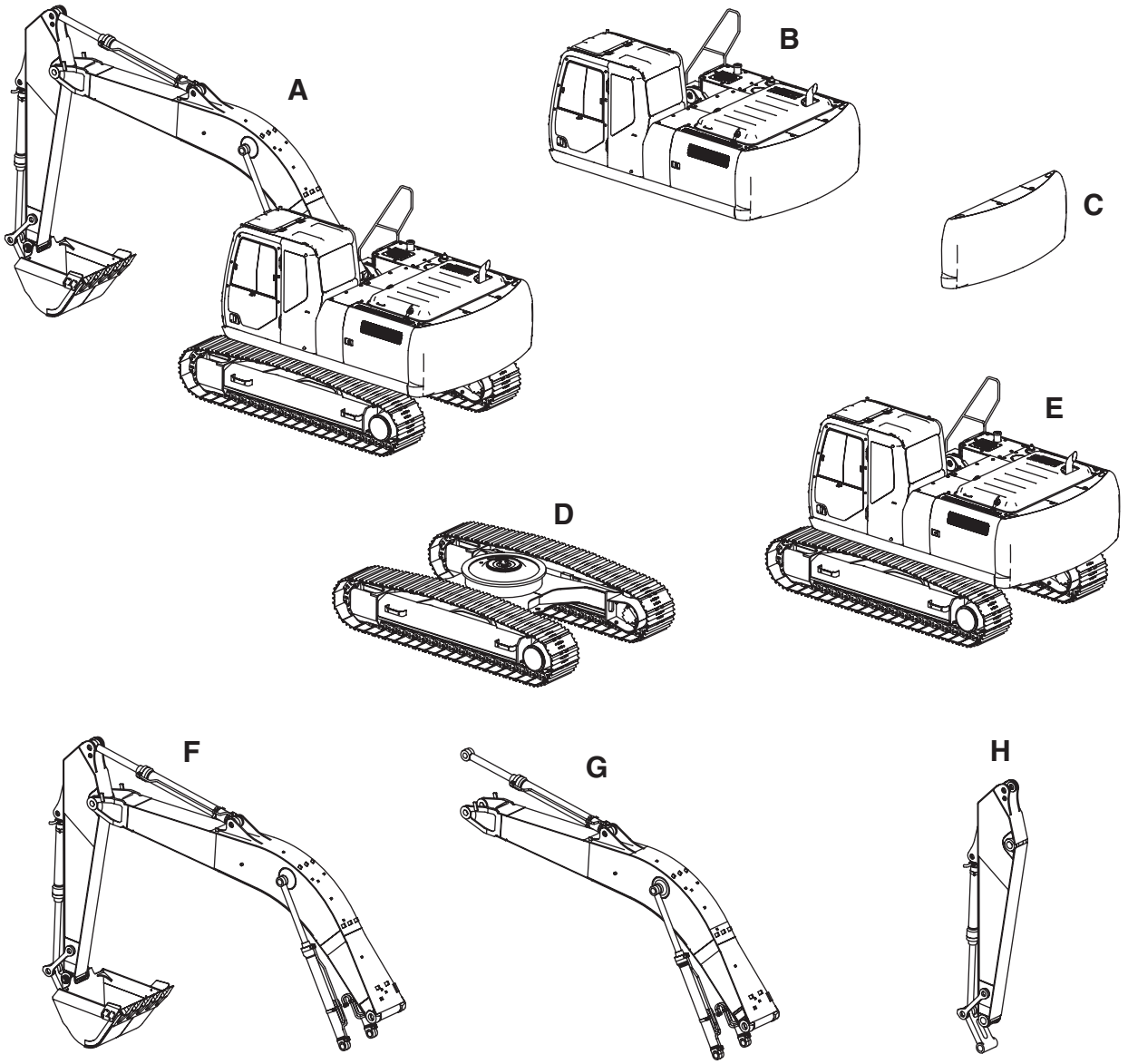
	Standard boom		
	Standard arm	Short arm	Long arm
Arm (dipper) length	3180 mm 125.20 in	2650 mm 104.33 in	3600 mm 141.73 in
Boom length (Standard boom spec.)	6150 mm 242.12 in		
Bucket radius	1571.2 mm 61.86 in		
Bucket wrist angle	176°		
Maximum digging radius	10670 mm 420.08 in	10220 mm 402.36 in	11160 mm 439.67 in
Maximum digging radius at ground line	10500 mm 413.38 in	10040 mm 395.27 in	10990 mm 432.68 in
Maximum digging depth	7100 mm 279.53 in	6570 mm 258.66 in	7580 mm 298.42 in
Maximum vertical straight wall digging depth	6120 mm 240.94 in	5760 mm 226.77 in	6720 mm 264.57 in
Maximum digging height	10060 mm 396.06 in	9930 mm 390.94 in	10390 mm 409.05 in
Maximum dump height	7090 mm 279.13 in	6940 mm 273.23 in	7390 mm 290.94 in
Minimum swing radius at front	3920 mm 154.33 in	4000 mm 157.48 in	4000 mm 157.48 in
Height for minimum swing radius at front	8190 mm 322.44 in	8220 mm 323.62 in	8170 mm 321.65 in

Digging force (ISO 6015)

	Arm (dipper)		
	3.18 m (125.20 in)	2.65 m (104.33 in)	3.60 m (141.73 in)
Arm (dipper) digging force (standard)	121.6 kN (27336.8 lbf)	140.2 kN (35518.2 lbf)	109.8 kN (24684 lbf)
Arm (dipper) digging force (power up)	132.4 kN (29764.7 lbf)	153.0 KN (34395.8 lbf)	118.7 kN (26684.8 lbf)
Bucket digging force (standard)	174.6 kN (39251.6 lbf)	174.6 kN (39251.6 lbf)	174.6 kN (39251.6 lbf)
Bucket digging force (power up)	190.2 kN (42758.7 lbf)	190.2 kN (42758.7 lbf)	190.2 kN (42758.7 lbf)

COMPONENT WEIGHT

Major component weight



RST-11-001A

Weight information is approximate

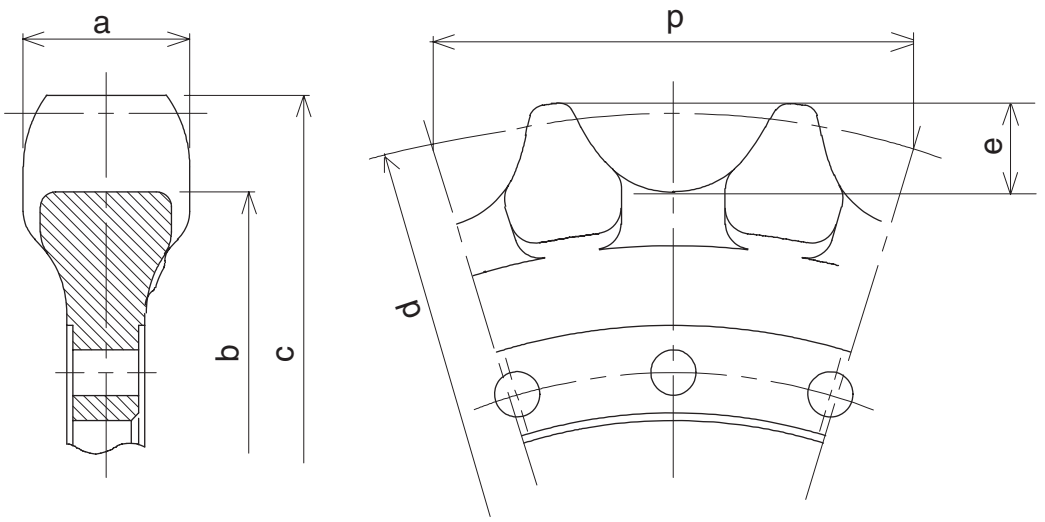
A) Operating weight .....29800 kg (65698 lbs)
B) Upper mechanism (including counterweight and turntable bearing) .....12600 kg (27778 lbs)
C) Counterweight .....5410 kg (11927 lbs)
D) Lower mechanism (with standard grouser shoe) .....11790 kg (25993 lbs)
E) Main Unit Weighty .....24400 kg (53793 lbs)
F) Attachments.....5400 kg (11904 lbs)
G) Boom (including cylinders).....3100 kg (6834 lbs)
H) Arm (dipper) (including cylinders and linkage).....1360 kg (2998 lbs)

Other component weight

Engine	696 kg (1534 lbs)
Air cleaner	13.6 kg (30 lbs)
Hydraulic pump	156 kg (344 lbs)
Attachment control valve	220 kg (485 lbs)
Swing motor and reduction gear assembly	464 kg (1023 lbs)
Travel motor and reduction gear assembly	456 kg (1005 lbs)
Rotary joint	58 kg (128 lbs)
Solenoid valve bank	6.7 kg (14.8 lbs)
Cushion valve	12.5 kg (26.6 lbs)
Hand control valve	1.9 kg (4.2 lbs)
Foot control valve	7.8 kg (17.2 lbs)
Boom	2110 kg (4652 lbs)
Standard arm (dipper)	860 kg (1896 lbs)
Short arm (dipper)	760 kg (1676 lbs)
Long arm (dipper)	990 kg (2183 lbs)
Boom cylinder (one)	237 kg (522 lbs)
Arm (dipper) cylinder	335 kg (739 lbs)
Bucket cylinder	207 kg (456 lbs)
Fuel tank	169 kg (373 lbs)
Hydraulic oil tank	152 kg (335 lbs)
Turntable bearing	543 kg (1197 lbs)
Muffler	20 kg (44.1 lbs)
Radiator total weight	170 kg (375 lbs)
Oil cooler	26 kg (57.3 lbs)
Radiator	19.4 kg (42.8 lbs)
Air cooler	18.7 kg (41.2 lbs)
Fuel cooler	1.2 kg (2.65 lbs)
Idler wheel	165 kg (364 lbs)
Upper roller	44 kg (97 lbs)
Lower roller	56 kg (123.5 lbs)
Recoil spring assembly	263 kg (580 lbs)
Recoil spring	119.4 kg (263.2 lbs)
Grease cylinder assembly	41.4 kg (91.3 lbs)
Threaded rod	50.3 kg (110.9 lbs)
Yoke	39.8 kg (87.7 lbs)
Track chains (per side)	
600 mm (23.62 in)	1860 kg (4101 lbs)
700 mm (27.56 in)	2040 kg (4497 lbs)
800 mm (31.5 in)	2210 kg (4872 lbs)

DIMENSIONS AND WEAR LIMIT OF THE TRACK ASSEMBLY

Sprocket

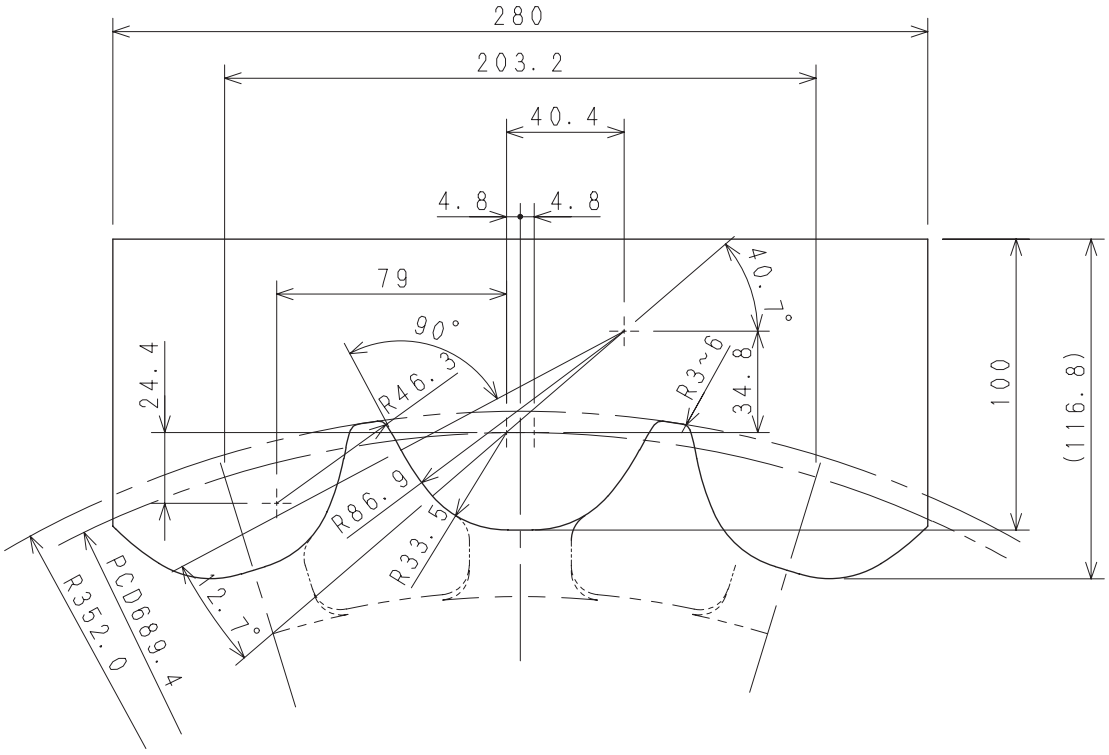


SI14004-007

Part name	Code	Measured dimensions (mm)	Standard value (mm)	Usage limit (mm)	Judgment	Solution
Sprocket	a		86	76	Acceptable/Unacceptable	Cladding by welding or replacement
	b	Ø	Ø622.34	Ø612.34	Acceptable/Unacceptable	
	c	Ø	Ø704	Ø695	Acceptable/Unacceptable	
	d	Ø	Ø689.39	-	Acceptable/Unacceptable	
	e		37.4	32.4	Acceptable/Unacceptable	
	p		203.2	-	Acceptable/Unacceptable	

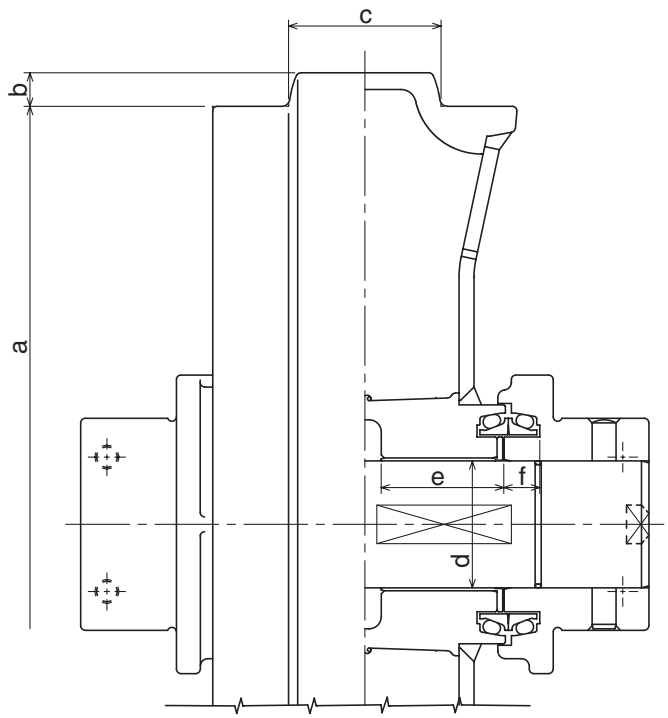
Gauge

unit in mm



BI14012-001

Idler wheel

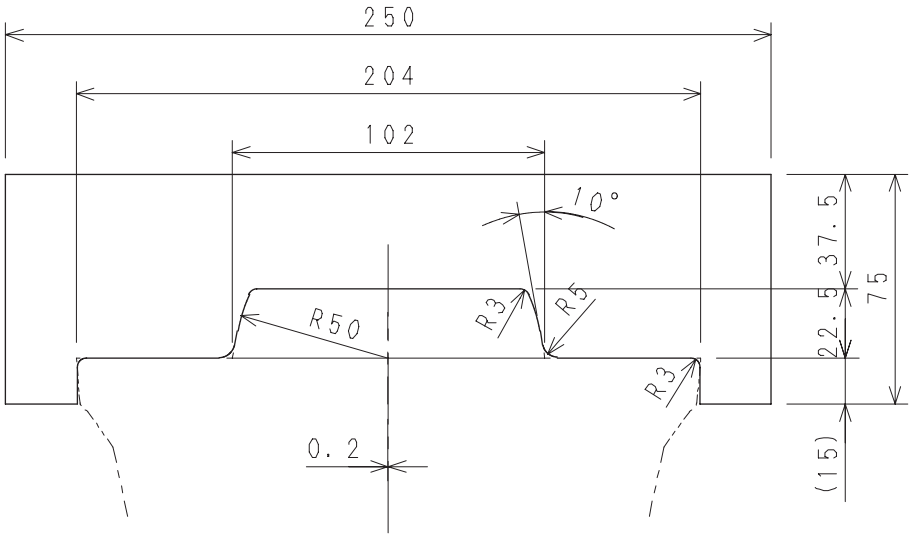


SI14004-008

Part name	Code	Measured dimensions (mm)	Standard value (mm)	Usage limit (mm)	Judgment	Solution
Ilder wheel	a	Ø	Ø560	Ø550	Acceptable/Unacceptable	Cladding by welding or replacement
	b		22.5	-	Acceptable/Unacceptable	
	c		102	92	Acceptable/Unacceptable	
Shaft	d	Ø	Ø85	Ø84	Acceptable/Unacceptable	Replacement
Bushing	d	Ø	Ø85	Ø86	Acceptable/Unacceptable	Replacement
	e		82	81	Acceptable/Unacceptable	
Hub	f		24	23.6	Acceptable/Unacceptable	Replacement

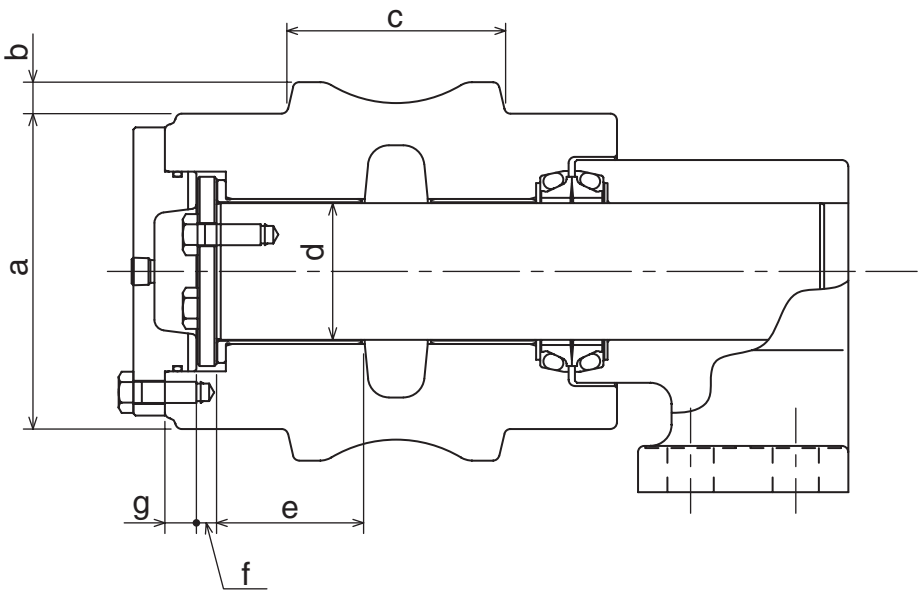
Gauge

unit in mm



300-6-10-03-03b

Upper roller

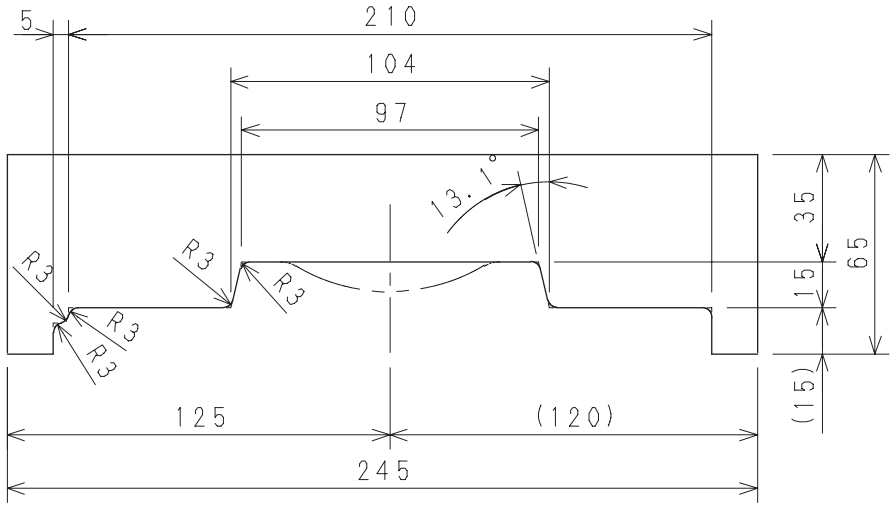


SI14004-009

Part name	Code	Measured dimensions (mm)	Standard value (mm)	Usage limit (mm)	Judgment	Solution
Carrier roller	a	Ø	Ø150	Ø140	Acceptable/Unacceptable	Cladding by welding or replacement
	b		15	-	Acceptable/Unacceptable	
	c		104	-	Acceptable/Unacceptable	
Shaft	d	Ø	Ø65	Ø64	Acceptable/Unacceptable	Replacement
Bushing	d	Ø	Ø65	Ø66	Acceptable/Unacceptable	Replacement
	e		69	68	Acceptable/Unacceptable	
Thrust plate	f		9	8.5	Acceptable/Unacceptable	Replacement
Cover	g		15	-	Acceptable/Unacceptable	Replacement

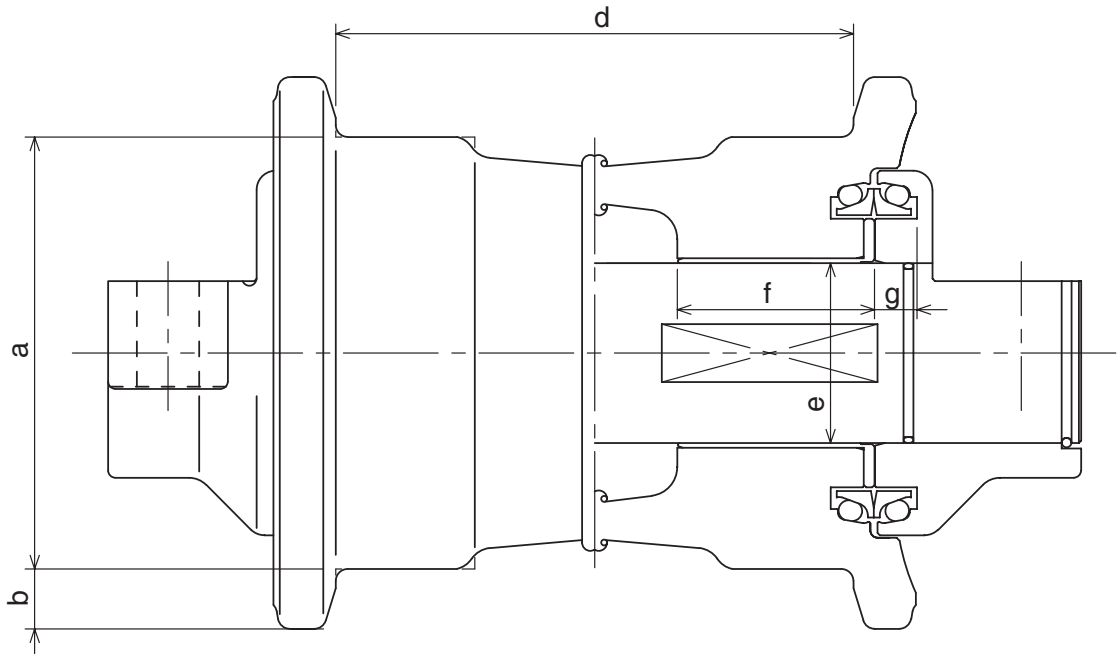
Gauge

unit in mm



300-6-10-03-03c

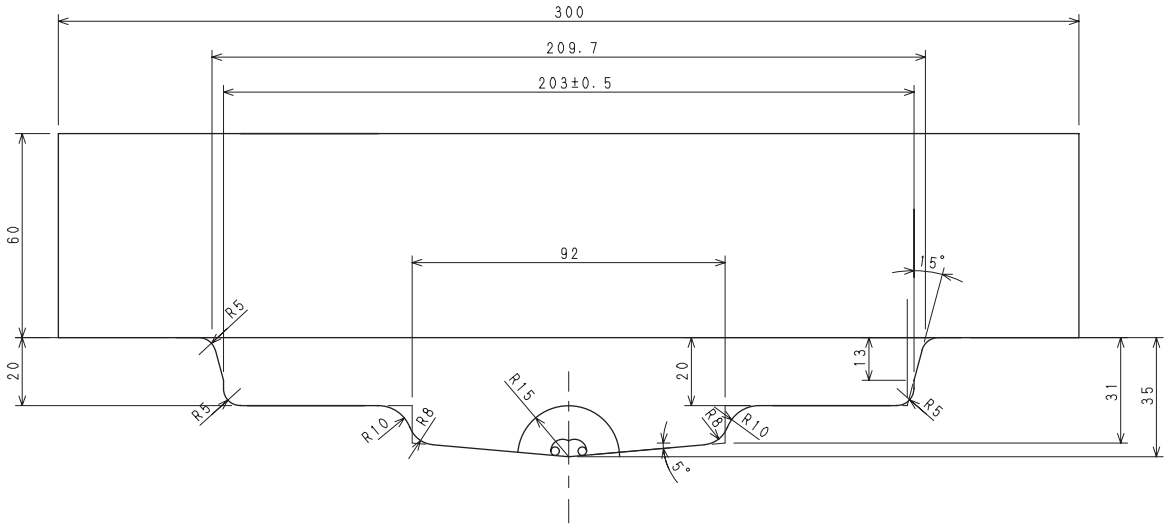
Lower roller



Part name	Code	Measured dimensions (mm)	Standard value (mm)	Usage limit (mm)	Judgment	Solution
Track roller	a	Ø	Ø180	Ø170	Acceptable/Unacceptable	Cladding by welding or replacement
	b		20	16	Acceptable/Unacceptable	
	d		203	211	Acceptable/Unacceptable	
Shaft	e	Ø	Ø75	Ø74	Acceptable/Unacceptable	Replacement
Bushing	e	Ø	Ø75	Ø76	Acceptable/Unacceptable	Replacement
	f		82	81	Acceptable/Unacceptable	
Collar	g		17.7	17.2	Acceptable/Unacceptable	Replacement

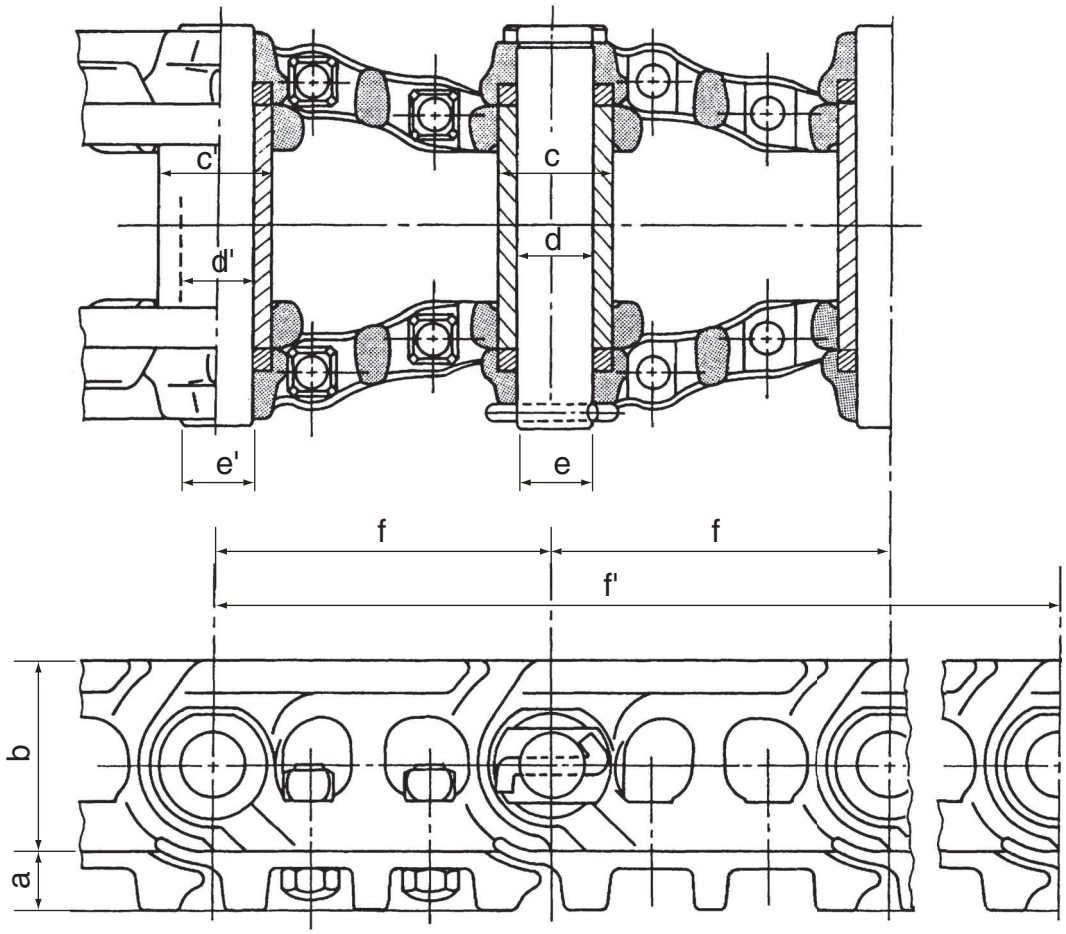
Gauge

unit in mm



BI14012-002

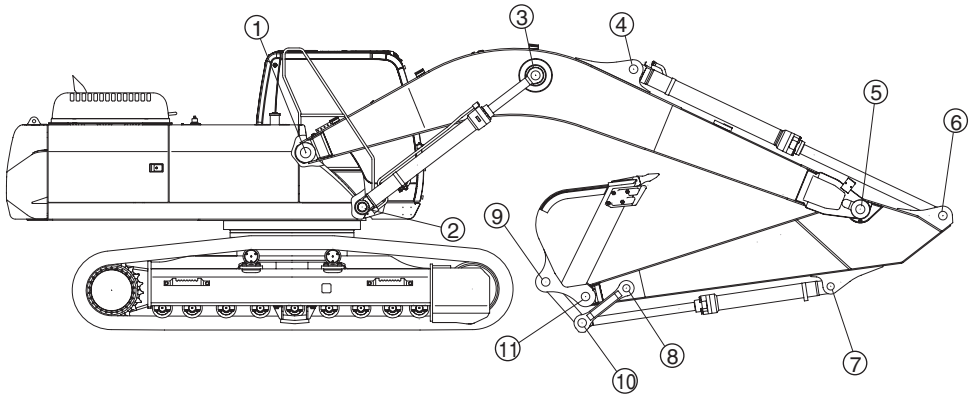
Track



SI14004-011

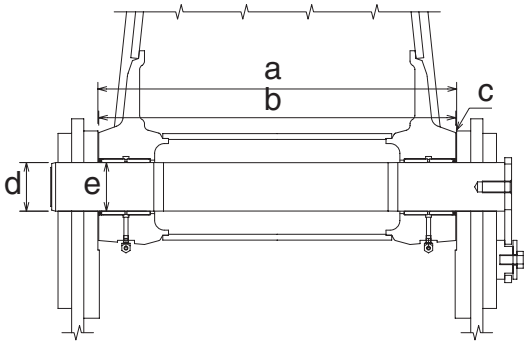
Part name	Code	Measured dimensions (mm)	Standard value (mm)	Usage limit (mm)	Judgment	Solution
Shoe plate	a		37	24	Acceptable/Unacceptable	Replacement
Link	b		116.4	111.4	Acceptable/Unacceptable	Cladding by welding or replacement
Master bushing	c	Ø	Ø66.65	Ø62.65	Acceptable/Unacceptable	Replacement
	d	Ø	Ø44.8	44.8	Acceptable/Unacceptable	
Master pin	e	Ø	Ø44.22	44.22	Acceptable/Unacceptable	Replacement
Link pitch	f		203.2	207.3	Acceptable/Unacceptable	Replacement
	f'		812.8	829.2	Acceptable/Unacceptable	
Track bushing	c'	Ø	Ø66.65	Ø62.65	Acceptable/Unacceptable	Replacement
	d'	Ø	Ø44.8	44.8	Acceptable/Unacceptable	
Track pin	e'	Ø	Ø44.5	44.5	Acceptable/Unacceptable	Replacement

DIMENSIONS AND WEAR LIMITS OF ATTACHEMENT MOBILE JOINTS



BI14010-001

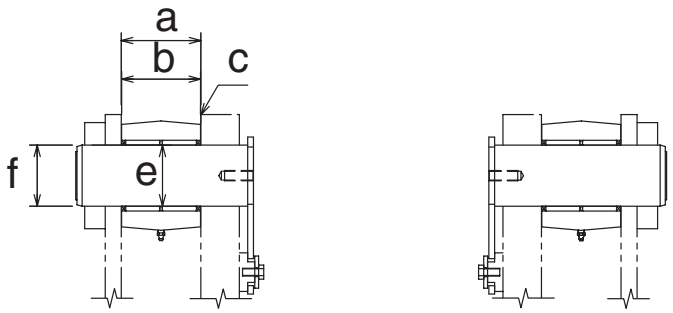
1. Boom foot/Frame



BI14010-001a

Mark		Dimension	
		mm	in
a (frame)	Standard	738	29.05
	Limit	746	29.36
b (boom)	Standard	734.5	28.91
	Limit	732.5	28.83
c (a - b) (clearance)	Standard	3.5 to 4.5	0.13 to 0.17
	Limit	Shim adjustment	
Ø d (shaft)	Standard	100	3.93
	Limit	99	3.89
Ø e (bushing)	Standard	100	3.93
	Limit	101.5	3.99

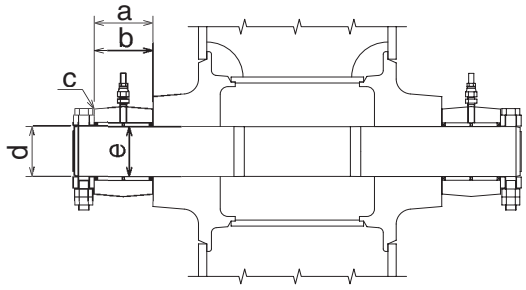
2. Boom cylinder foot/Frame



BI14010-001b

Mark		Dimension	
		mm	in
a (frame)	Standard	124	4.88
	Limit	130	5.11
b (cylinder)	Standard	123	4.84
	Limit	121	4.76
c (clearance) (a - b)	Standard	1.0 to 2.5	0.04 to 0.10
	Limit	Shim adjustment	
Ø d (shaft)	Standard	95	3.74
	Limit	94	3.70
Ø e (bushing)	Standard	95	3.74
	Limit	96.5	3.79

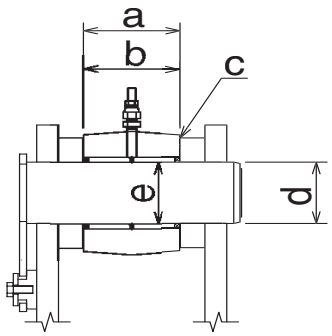
3. Boom cylinder head/Boom



BI14010-002a

Mark		Dimension	
		mm	in
a (cylinder)	Standard	113	4.44
	Limit	111	4.37
b (boom)	Standard	558	21.96
	Limit	554	21.81
c (clearance)	Standard	1.0 to 2.5	0.04 to 0.10
	Limit	Shim adjustment	
Ø d (shaft)	Standard	100	3.93
	Limit	99	3.89
Ø e (bushing)	Standard	100	3.93
	Limit	101.5	3.99

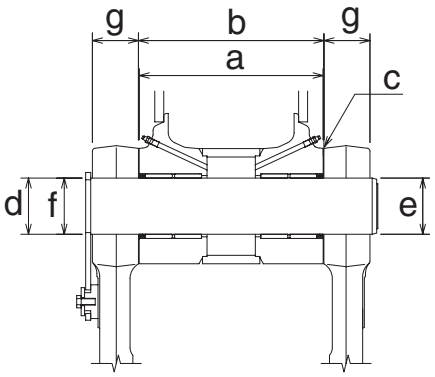
4. Arm cylinder foot/Boom



BI14010-002b

Mark		Dimension	
		mm	in
a (boom)	Standard	124	4.88
	Limit	130	5.11
b (cylinder)	Standard	123	4.84
	Limit	121	4.76
c (clearance) (a - b)	Standard	0.5 to 3.0	0.02 to 0.11
	Limit	Shim adjustment	
Ø d (shaft)	Standard	95	3.74
	Limit	94	3.70
Ø e (bushing)	Standard	95	3.74
	Limit	96.5	3.79

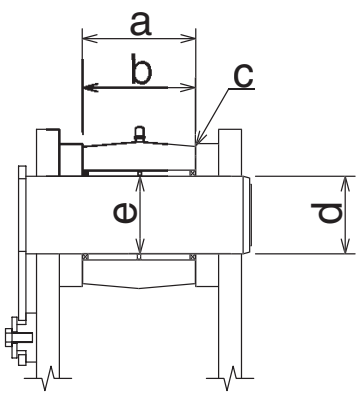
5. Boom/Arm



BI14010-003a

Mark		Dimension	
		mm	in
a (boom)	Standard	330	12.99
	Limit	333	13.11
b (arm)	Standard	327.5	12.89
	Limit	325.5	12.81
c (clearance) (a - b)	Standard	2.5 to 3.1	0.09 to 0.12
	Limit	Shim adjustment	
Ø d (shaft)	Standard	100	3.93
	Limit	99	3.89
Ø e (bushing arm)	Standard	100	3.93
	Limit	101.5	3.99
Ø f (bushing boom)	Standard	-	-
	Limit	116.5	4.58
g (boom)	Standard	82	3.22
	Limit	80	3.14

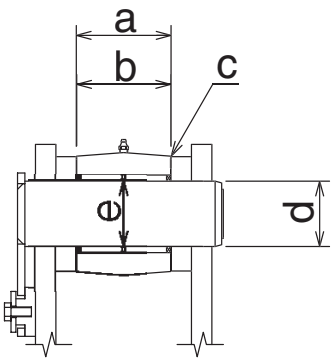
6. Arm cylinder head/Arm



BI14010-004a

Mark		Dimension	
		mm	in
a (arm)	Standard	139	5.47
	Limit	144	5.66
b (cylinder)	Standard	138	5.43
	Limit	136	5.35
c (clearance) (a - b)	Standard	0.5 to 3.0	0.02 to 0.12
	Limit	Shim adjustment	
Ø d (shaft)	Standard	95	3.74
	Limit	94	3.70
Ø e (bushing)	Standard	95	3.74
	Limit	96.5	3.79

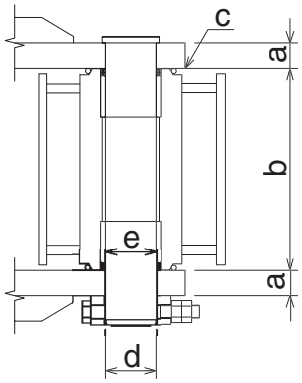
7. Bucket cylinder foot/Arm



BI14010-004b

Mark		Dimension	
		mm	in
a (arm)	Standard	116	4.56
	Limit	122	4.80
b (cylinder)	Standard	115	4.52
	Limit	113	4.44
c (clearance) (a - b)	Standard	0.5 to 3.0	0.02 to 0.12
	Limit	Shim adjustment	
Ø d (shaft)	Standard	80	3.14
	Limit	79	3.11
Ø e (bushing)	Standard	80	3.14
	Limit	81.5	3.20

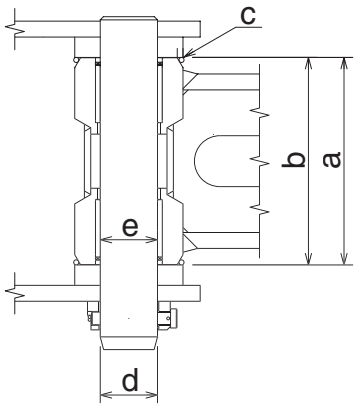
8. Connecting rod/Arm



BI14010-005a

Mark		Dimension	
		mm	in
a (link)	Standard	40	1.57
	Limit	38	1.49
b (arm)	Standard	317	12.48
	Limit	315	12.40
c (clearance)	Standard	1.0 to 1.5	0.04 to 0.06
	Limit	Shim adjustment	
Ø d (shaft)	Standard	80	3.14
	Limit	79	3.11
Ø e (bushing)	Standard	80	3.14
	Limit	81.5	3.20

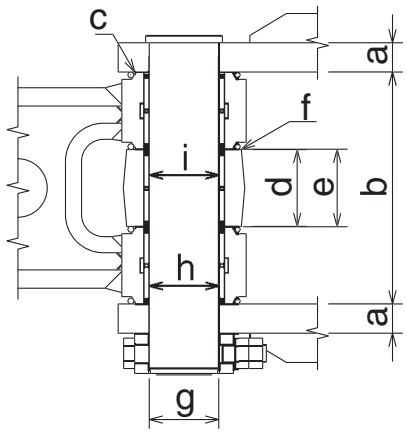
9. Compensator/Bucket



BI14010-005b

Mark		Dimension	
		mm	in
a (bucket)	Standard	326	12.83
	Limit	331	13.03
b (link)	Standard	325	12.79
	Limit	322	12.67
c (clearance) (a - b)	Standard	1.0 to 3.5	0.04 to .014
	Limit	Shim adjustment	
Ø d (shaft)	Standard	90	3.54
	Limit	89	3.50
Ø e (bushing)	Standard	90	3.54
	Limit	91.5	3.60

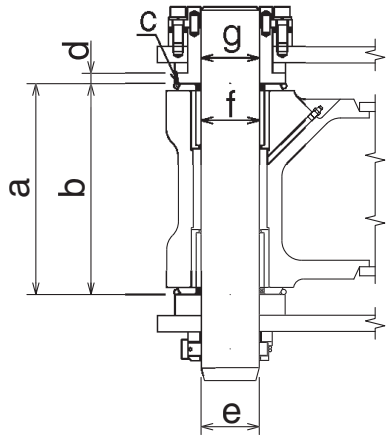
10. Connecting rod/Compensator/Bucket cylinder head



BI14010-006a

Mark		Dimension	
		mm	in
a (arm)	Standard	40	1.57
	Limit	38	1.49
b (bucket)	Standard	316	12.44
	Limit	314	12.36
c (clearance)	Standard	1.0 to 2.0	0.04 to 0.08
	Limit	Shim adjustment	
d (link)	Standard	106	4.17
	Limit	108	4.25
e (cylinder)	Standard	105	4.13
	Limit	103	4.05
f (clearance) (d - e)	Standard	1.0 to 2.0	0.04 to 0.08
	Limit	Shim adjustment	
Ø g (shaft)	Standard	95	3.74
	Limit	94	3.70
Ø h (bushing)	Standard	95	3.74
	Limit	96.5	3.79
Ø i (bushing)	Standard	95	3.74
	Limit	96.5	3.79

11. Arm/Bucket



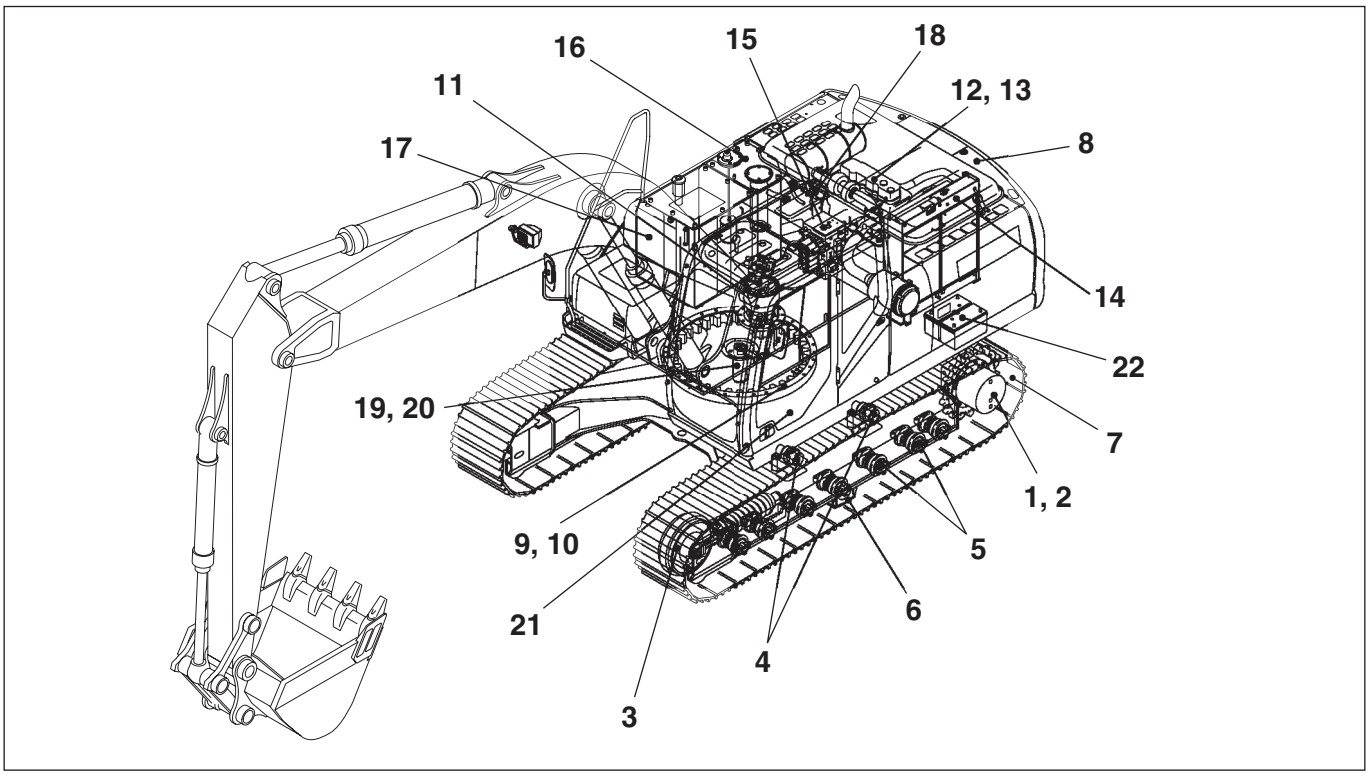
BI14010-007a

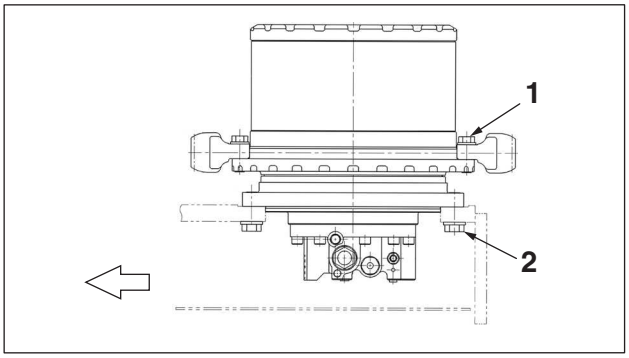
Mark		Dimension	
		mm	in
a (bucket)	Standard	326	12.83
	Limit	332	13.07
b (arm)	Standard	325	12.79
	Limit	323	12.71
c (clearance) (a - b)	Standard	0.7 to 3.8	0.027 to 0.14
	Limit	Shim adjustment	
d (bushing)	Standard	16	0.62
	Limit	10	0.39
Ø e (shaft)	Standard	90	3.54
	Limit	89	3.50
Ø f (bushing)	Standard	90	3.54
	Limit	91.5	3.60
Ø g (bushing)	Standard	90	3.54
	Limit	91.5	3.60

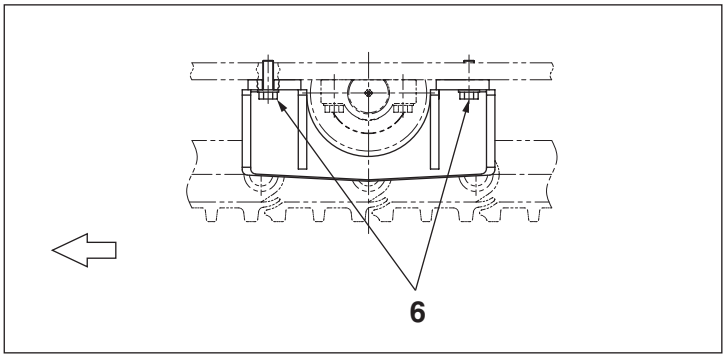
SPECIAL TORQUE SETTINGS

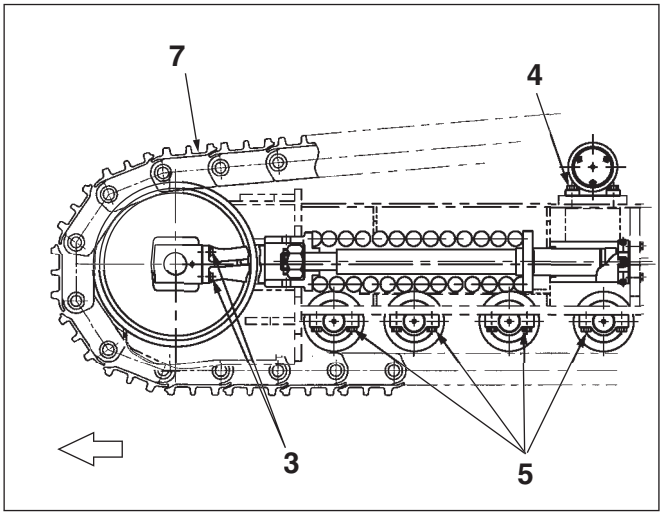
No.	Component	Screw	Wrench (mm)	Torque setting
1 *	Travel motor and reduction gear assembly	M24	36	900-1051 Nm (664 - 775 lb-ft)
2 *	Drive sprocket	M20	30	521-608 Nm (385-448 lb-ft)
3 *	Idler wheel	M16	24	267-312 Nm (197-230 lb-ft)
4 *	Upper roller	M20	30	521-608 Nm (385-448 lb-ft)
5 *	Lower roller	M20	30	521-608 Nm (385-448 lb-ft)
6 *	Track guard	M20	30	521-608 Nm (385-448 lb-ft)
7	Shoe bolt	M20	30	813-911 Nm (600-671 lb-ft)
8	Counterweight	M33	50	1548-1764 Nm (1142-1301 lb-ft)
9*	Turntable bearing (lower frame)	M24	36	784-914 Nm (579-674 lb-ft)
10*	Turntable (swing frame)	M24	36	784-914 Nm (579-674 lb-ft)
11 *	Swing unit	M24	36	784-914 Nm (579-674 lb-ft)
12 *	Engine (engine mount)	M12	19	109-127 Nm (80-94 lb-ft)
13 *	Engine bracket	M10	17	64-74 Nm (47.20-54.58 lb-ft)
14	Radiator	M16	24	147-177 Nm (109-130 lb-ft)
15 *	Hydraulic pump	M10	17	64-74 Nm (47.20-54.58 lb-ft)
		M20		367-496 Nm (271-365 lb-ft)
16 *	Hydraulic reservoir	M16	24	232-276 Nm (172-203 lb-ft)
17 *	Fuel reservoir	M16	24	232-276 Nm (172-203 lb-ft)
18 *	Control valve	M16	24	267-312 Nm (197-230 lb-ft)
19	Hydraulic swivel	M12	19	109-127 Nm (80-94 lb-ft)
20*		M16	24	267-312 Nm (197-230 lb-ft)
21	Cab	M16	24	245-294 Nm (181-216 lb-ft)
22	Battery	M10	17	16-20 Nm (11.8-14.75 lb-ft)

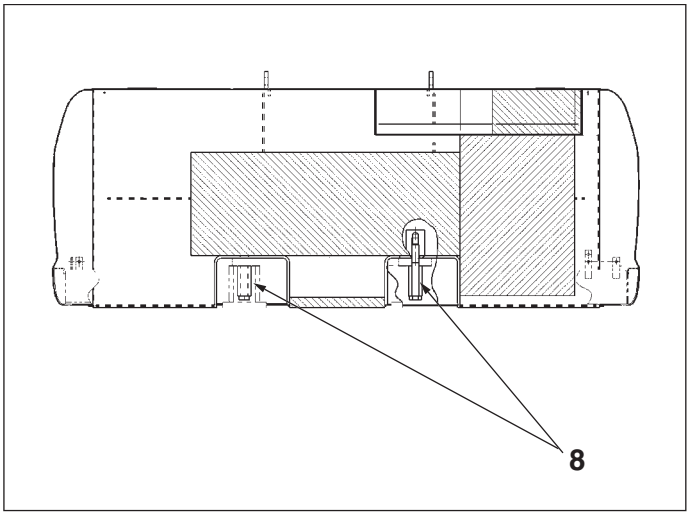
NOTE: *Use Loctite 262 or an equivalent on retaining screws of those components marked with an asterisk (*).*



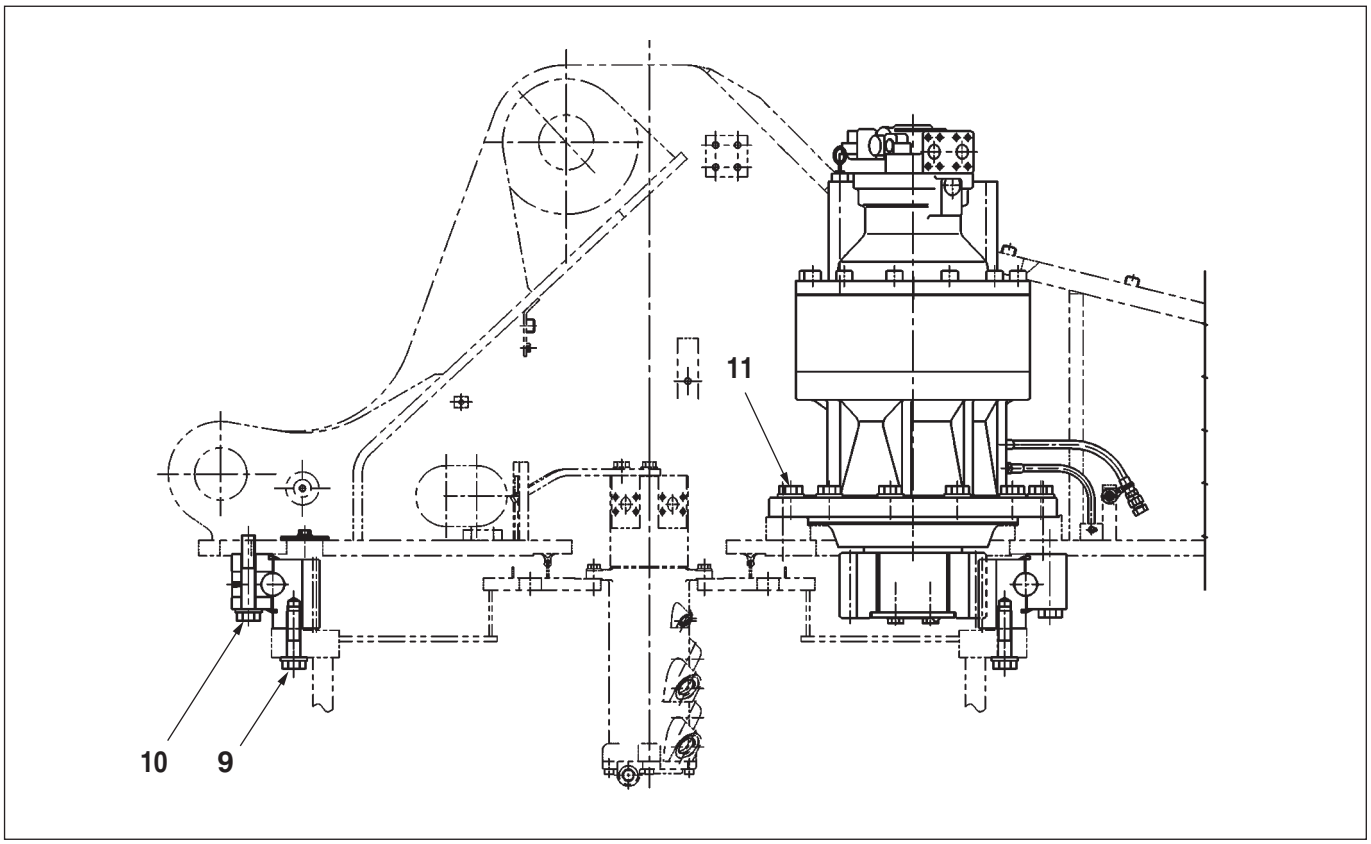


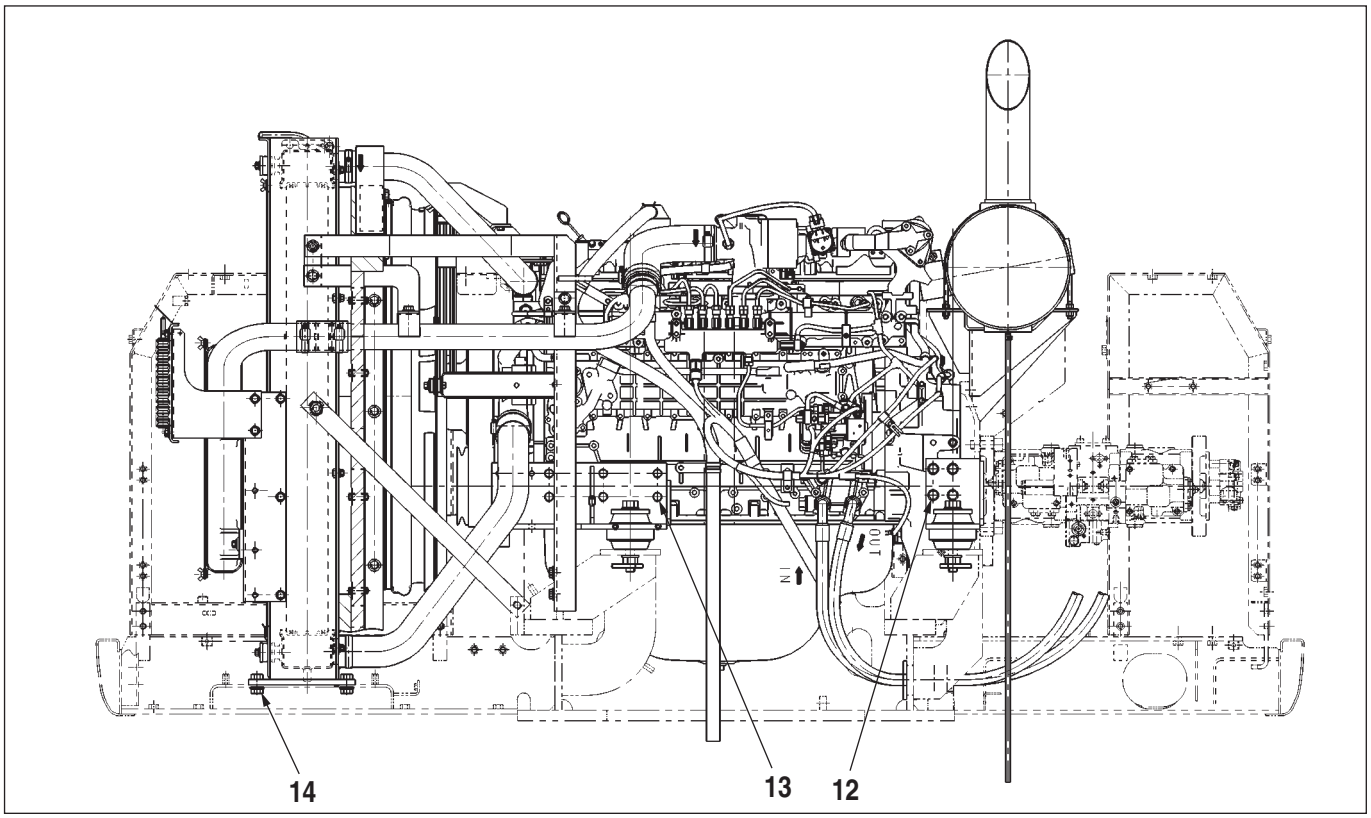




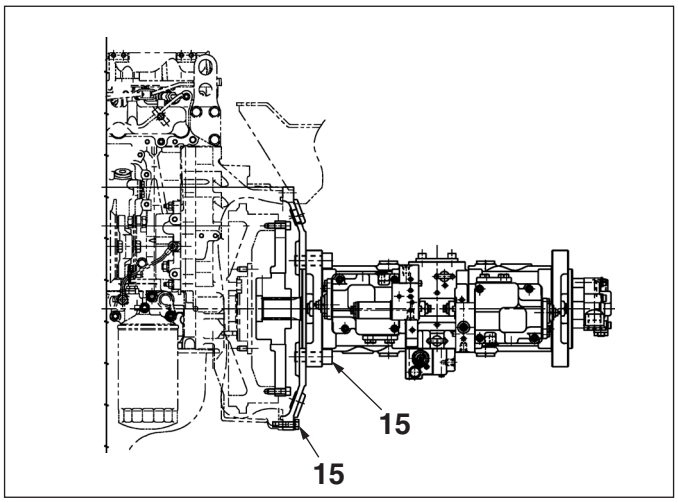


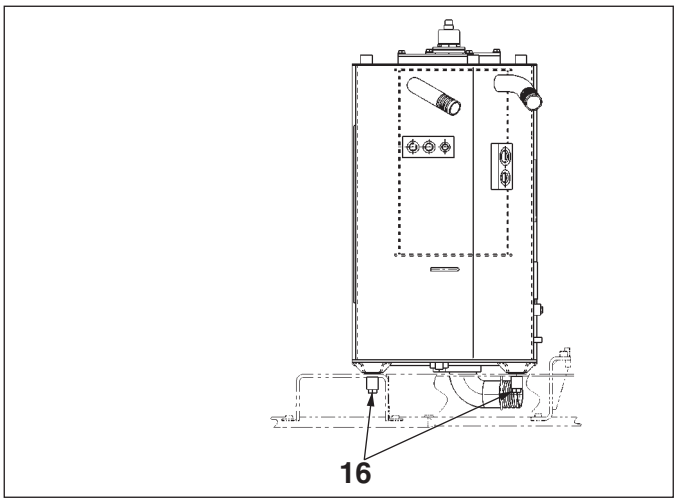
BI08003-001

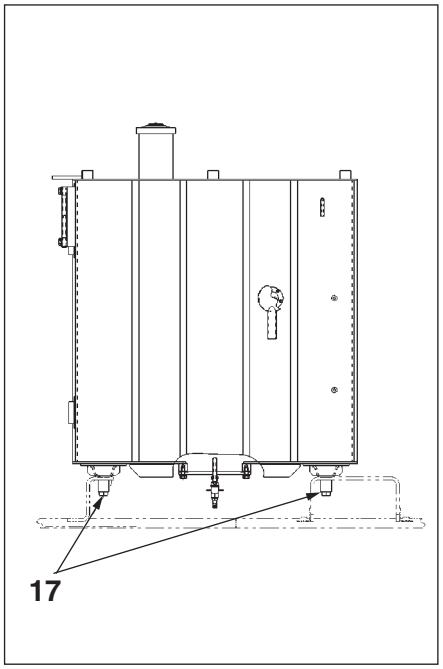


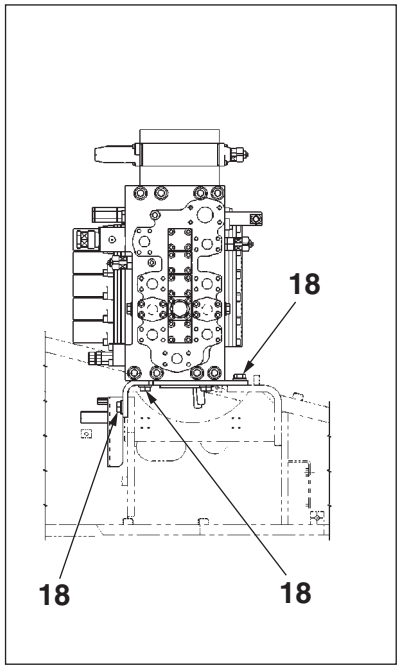


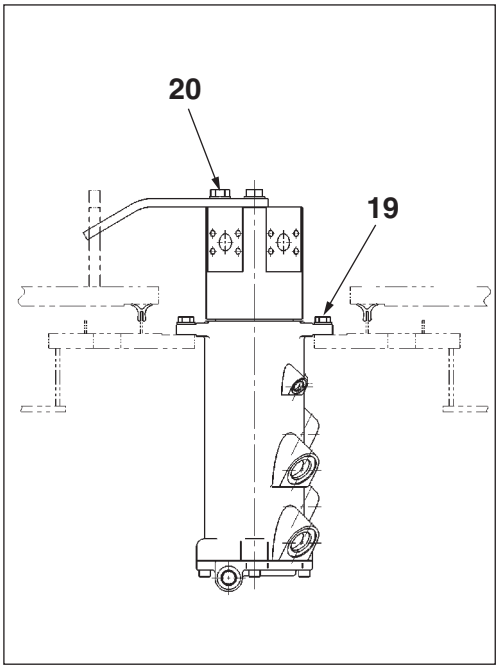
BI08003-002

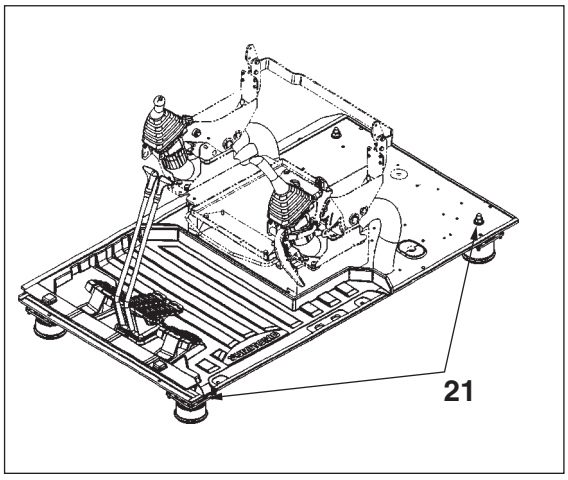


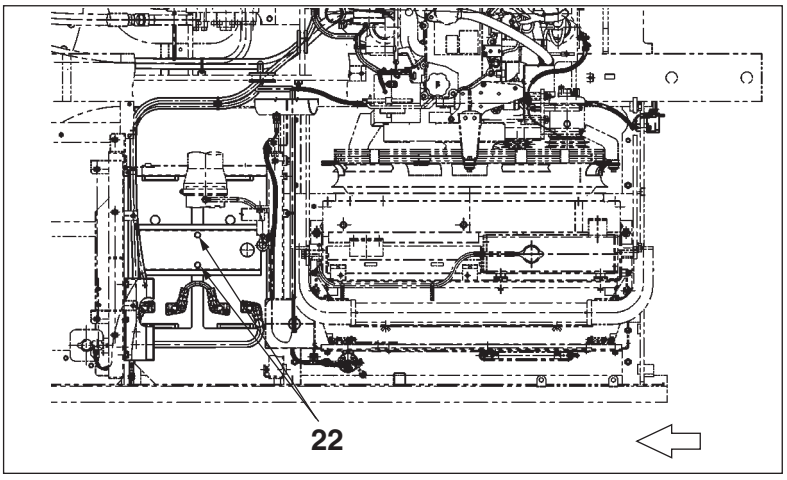










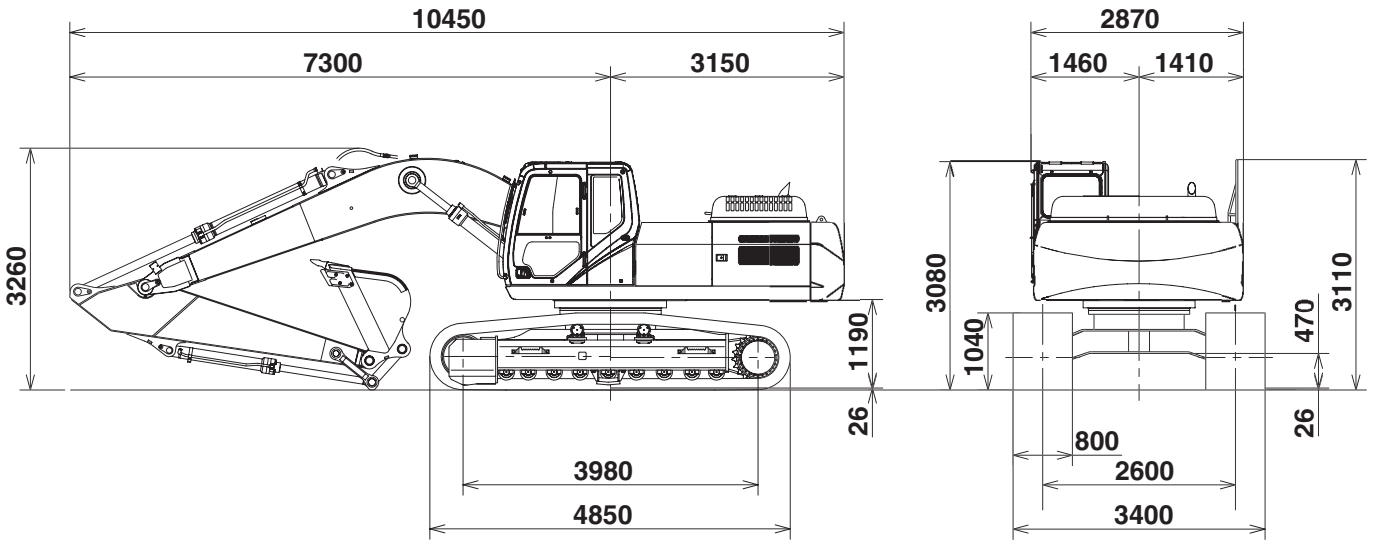


BI08003-003

MACHINE OVERALL DIMENSIONS

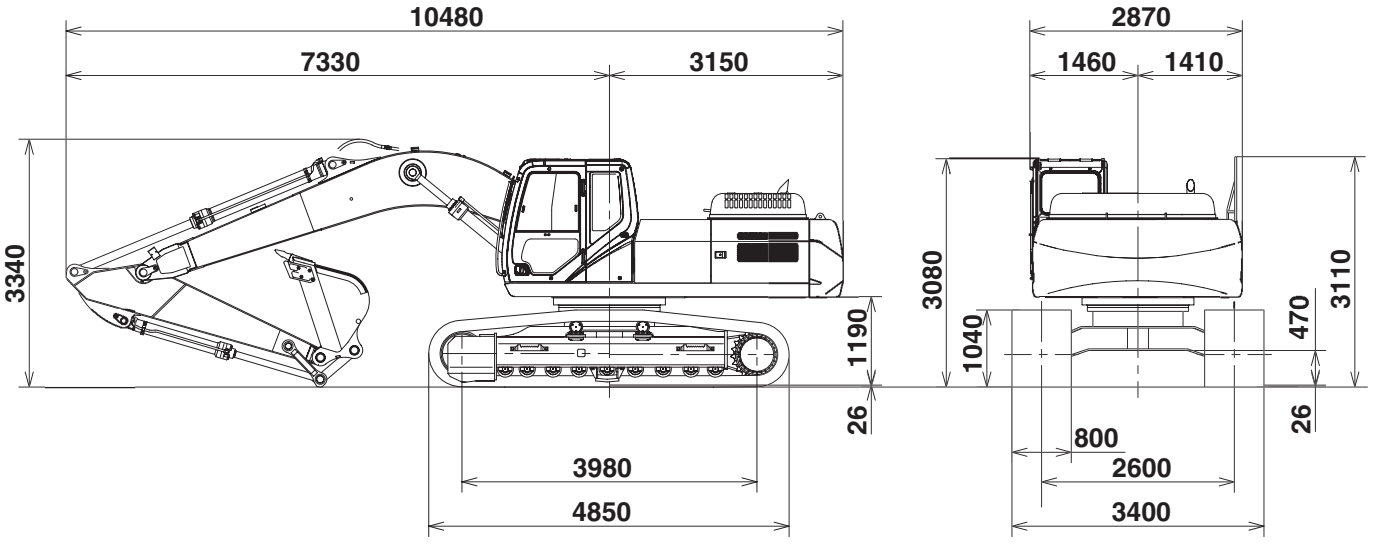
NOTE: *Numbers are subject to change without notice due to design change or other reasons. The figures give values that include the shoe lug height (26 mm (1.02 in))*

Standard arm (3.18 m (125.20 in))



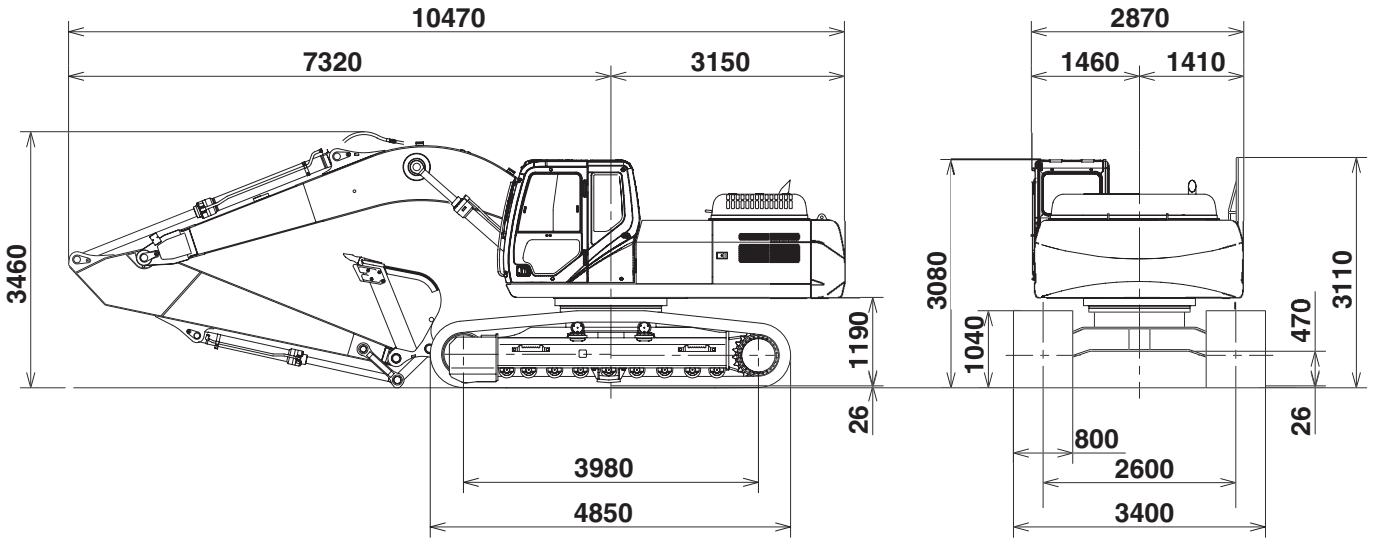
BB03003-007

Short arm (2.65 m (104.33 in))



BB03003-008

Long arm (3.6 m (141.73))



BB03003-009

NOTES

Section

2000

REMOVAL AND INSTALLATION OF THE ENGINE

Printed in France
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REMOVAL AND INSTALLATION OF THE ENGINE ASSEMBLY

Caution:	Keep away from fire. Be sure to release hydraulic pressure before beginning work. The air conditioner circuit is filled with high-pressure gas, so there is the danger of gas splaying out when loosening lines. Do not use open flames and do not allow sparks near the battery.

Caution:	Be sure to stop the engine before beginning work. Be sure to inspect the wire rope and other lifting equipment before beginning work. Do not stand or pass under the suspended load.

1 Removal of the engine

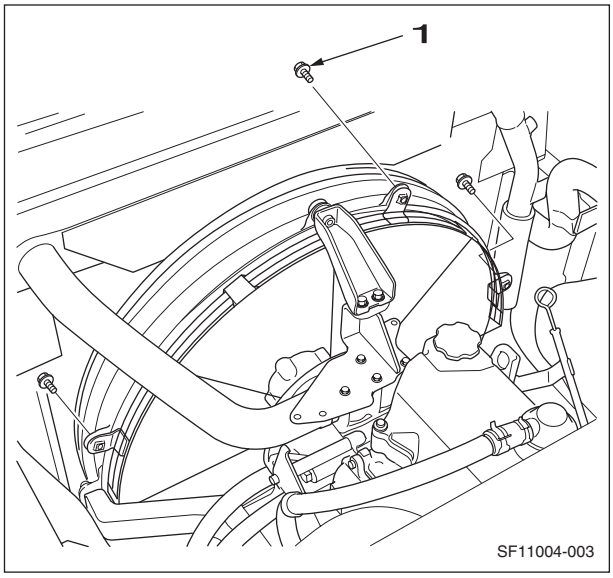
[1] Drain the engine oil.
(For details, see "Operator's Manual".)

[2] Drain the coolant from the radiator.
(For details, see "Operator's Manual".)

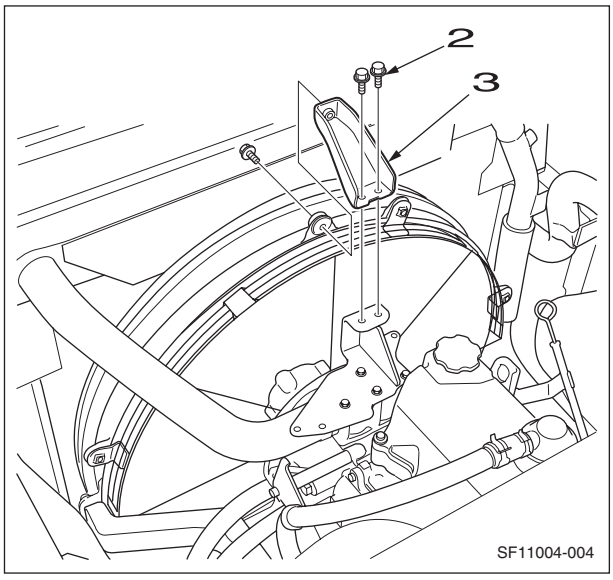
[3] Remove the engine hood.
(For details, see "Removal and Installation of Engine Hood".)

[4] Remove the pump.
(For details, see "Removal and Installation of Pump")

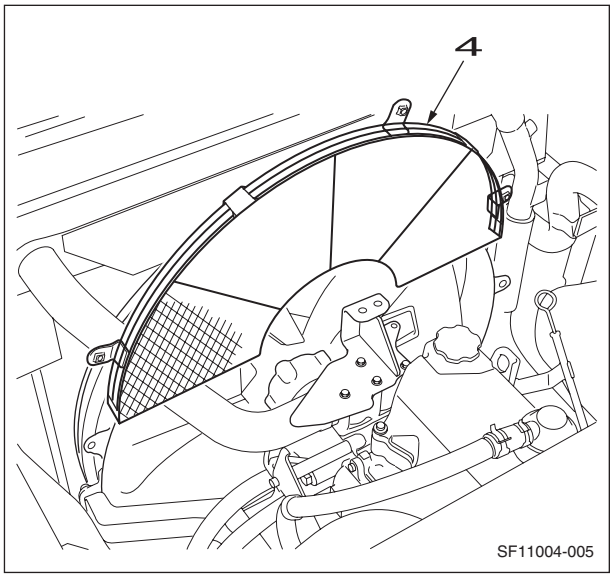
[5] Disassemble the retaining screws (1).



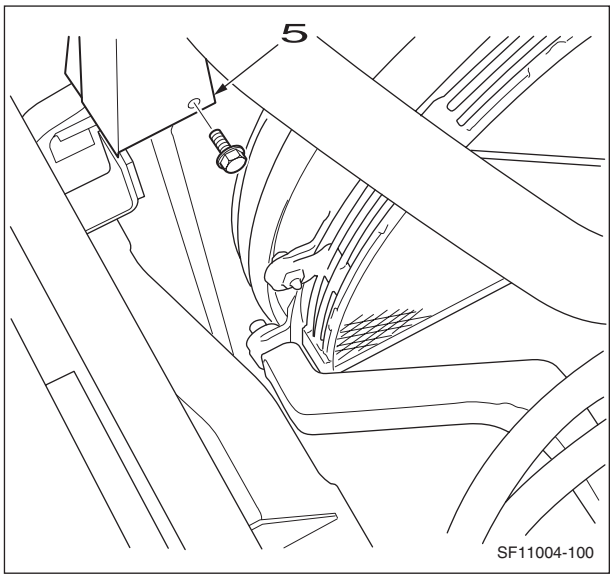
[6] Remove the 3 bolts (2), and then remove the bracket (3).



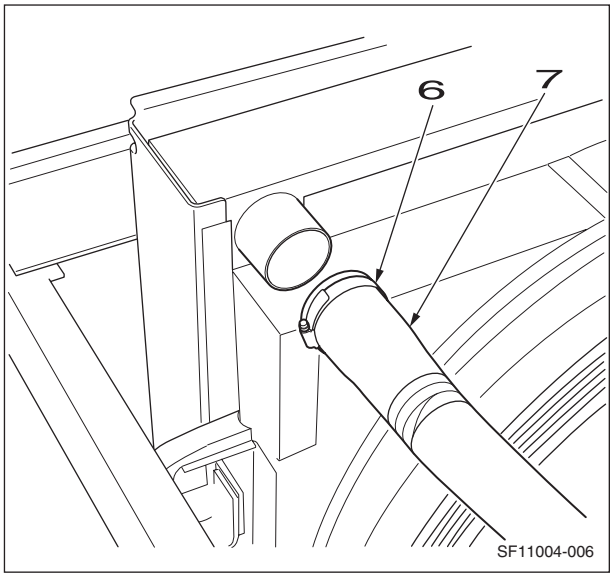
[7] Remove the fan guard (4).



[8] Remove the 4 bolts, and then remove the fan guide rubber (5).

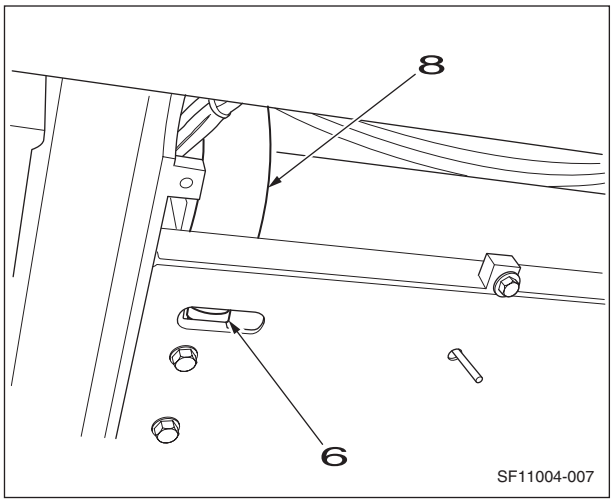


[9] Loosen the hoseband (6), and then remove the upper hose (7) from the radiator.



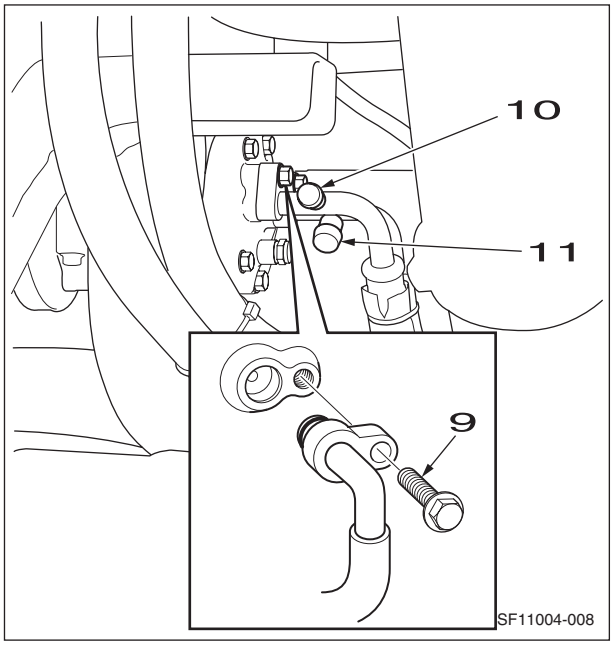
[10]Loosen the hoseband (6), and then remove the lower hose (8) from the radiator.

- Use caps to cover the radiator and hoses and prevent the entry of water, dust or dirt.
- Before removing the radiator hoses, completely drain the coolant.



[11]Loosen the line bolts (9) in 2 locations, and then remove the 2 lines (10) and (11) from the compressor.

- Always remove the low-pressure pipe (10) first.
- Attach caps or plugs to the compressor and pipes to prevent any entry of water, dust or dirt.



[12]Loosen the hoseband (12) on the inter cooler, and then remove the hose (13).

- Use caps to cover the pipe and hose and prevent the entry of water, dust or dirt