Vibration

Service Manual - VM RANGE - TIER II

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Notes:

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Technical Data

Vibration System

VM 46

Vibration System	VMT46D	VMPD
1st vibration stage		
Frequency	1920 rpm (32Hz)	1920 rpm (32Hz)
Nominal amplitude	1.8 mm (0.07 in)	1.5mm (0.06 in)
Centrifugal force	102 kN	102 kN
2nd vibration stage		
Frequency	1920 rpm (32Hz)	1920 rpm (32Hz)
Nominal amplitude	1.8 mm (0.07 in)	1.5mm (0.06 in)
Centrifugal force	102 kN	102 kN

VM 75

Vibration System	VMT115D	VMPD
1st vibration stage		
Frequency	1740 rpm (29Hz)	1740 rpm (29Hz)
Nominal amplitude	1.95 mm (0.08 in)	1.95 mm (0.08 in)
Centrifugal force	138 kN	156 kN
2nd vibration stage		
Frequency	2160rpm (36Hz)	2160rpm (36Hz)
Nominal amplitude	0.8 mm (0.03 in)	0.8 mm (0.03 in)
Centrifugal force	84 kN	96 kN

VM 115

Vibration System	VMT115D/H	VMPD/HD
1st vibration stage		
Frequency	1860 rpm (31Hz)	1860 rpm (31Hz)
Nominal amplitude	1.95 mm (0.08 in)	1.95 mm (0.08 in)
Centrifugal force	261 kN	282 kN
2nd vibration stage		
Frequency	2160rpm (36Hz)	2160rpm (36Hz)
Nominal amplitude	0.9 mm (0.04 in)	0.9 mm (0.04 in)
Centrifugal force	163 kN	176 kN

VM 132

Vibration System	VMT132D	VM132PD
1st vibration stage		
Frequency	1740 rpm (29Hz)	1740 rpm (29Hz)
Nominal amplitude	2.0 mm (0.08 in)	2.0 mm (0.08 in)
Centrifugal force	282 kN	305 kN
2nd vibration stage		
Frequency	2160rpm (36Hz)	2160rpm (36Hz)
Nominal amplitude	0.8 mm (0.03 in)	0.8 mm (0.03 in)
Centrifugal force	174 kN	188 kN

VM 146

Vibration System	VMT146D	VM146PD
1st vibration stage		
Frequency	1740 rpm (29Hz)	1740 rpm (29Hz)
Nominal amplitude	2.0 mm (0.08 in)	2.0 mm (0.08 in)
Centrifugal force	297 kN	317 kN
2nd vibration stage		
Frequency	2160rpm (36Hz)	2160rpm (36Hz)
Nominal amplitude	0.8 mm (0.03 in)	0.8 mm (0.03 in)
Centrifugal force	192 kN	205 kN

VM 166

Vibration System	VMT166D	VM166PD
1st vibration stage		
Frequency	1740 rpm (29Hz)	1740 rpm (29Hz)
Nominal amplitude	1.8 mm (0.07 in)	1.8 mm (0.07 in)
Centrifugal force	301 kN	321 kN
2nd vibration stage		
Frequency	2100rpm (35Hz)	2100rpm (35Hz)
Nominal amplitude	0.8 mm (0.03 in)	0.8 mm (0.03 in)
Centrifugal force	195 kN	208 kN

VM 200

Vibration System	
1st vibration stage	
Frequency	1740 rpm (29Hz)
Nominal amplitude	2.0 mm (0.08 in)
Centrifugal force	370 kN
2nd vibration stage	
Frequency	2100rpm (35Hz)
Nominal amplitude	0.75 mm (0.03 in)
Centrifugal force	205 kN

Vibration System

Description

TL001

Basic Operation

The vibration circuit consists of a hydraulic pump providing oil to a vibration motor. The pump is a variable displacement axial piston design with bi-directional flow. The motor is a fixed displacement axial piston style.

The vibration motor is connected to a exciter shaft **1**. Connected to the vibrator shaft is an eccentric weight **2** and two over turning weights **3**. ⇨ *Fig 1. (L-5)*.

Push button switches on the operator's control panel provide the options of frequency as well as automatic `vibration off' in neutral. A thumb switch at the top of the forward reverse control handle enables the operator to start and stop vibration.

Two pressure relief valves in the vibration pump protect the vibration circuit from excessive pressure in the same manner as in the propulsion circuit. The pump is also designed with a pressure limiting valve. Start up pressure may be as high but will drop once the operating speed is obtained.

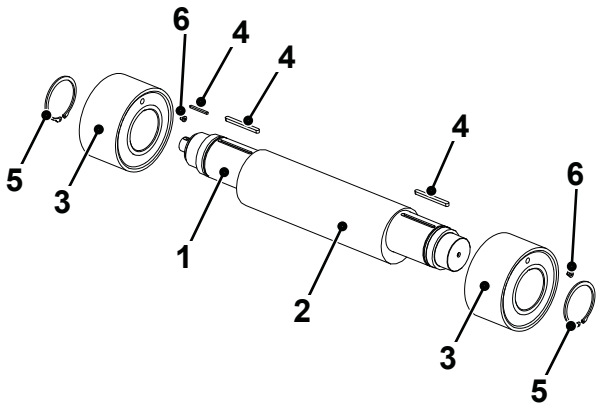

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Fig 1.

1	Exciter shaft
2	Eccentric Weight
3	Overturning weight
4	Key
5	Snap ring
6	Drain plug

Vibration Frequency

The exciter shaft **A** includes an eccentric weight **B**. When the shaft is turned, a vibration is created. The frequency of the vibration is measured in Hertz (cycles per second). Frequency is dependant on the speed of the shaft rotation. ⇨ *Fig 2. (L-6)*

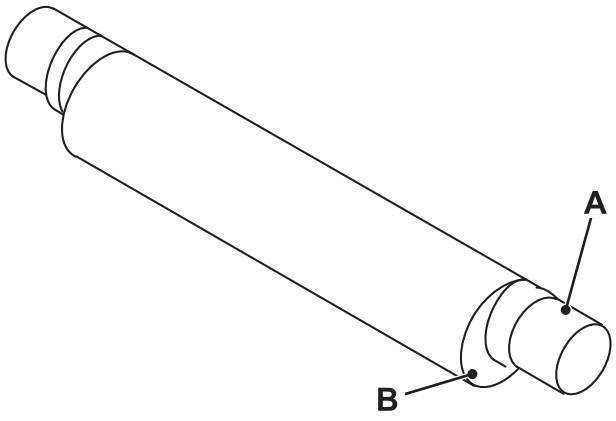

Fig 2.

The drums have two frequency ranges. When high frequency is desired, the solenoid controlled pump is stroked to provide oil at maximum flow per revolution to the vibration motor. This results in a higher vibration frequency while rotating the exciter shaft in a clockwise direction. When low frequency is desired, the solenoid controlled pump is stroked in the opposite direction to provide oil at a lower rate per revolution to the vibration motor. This results in a lower vibration frequency while rotating the shaft in a counter clockwise direction.

The shaft rotation can be high speed in one direction and low speed in the other direction. These two speeds create the two frequencies. **A** shows the low frequency and **B** shows the high frequency. ⇨ *Fig 3. (L-6)*

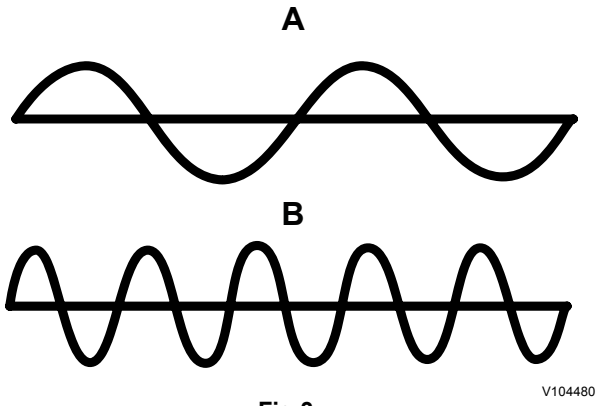

Fig 3.

Vibration Amplitude

One half the vertical distance that the drum travels is called the amplitude **A**. The amplitude for any given machine will vary depending on the soil conditions. The amplitude **A** and the height **B** the machine lifts itself off the ground will gradually increase as the soil becomes more dense or compacted. ⇨ *Fig 4. (L-7)*

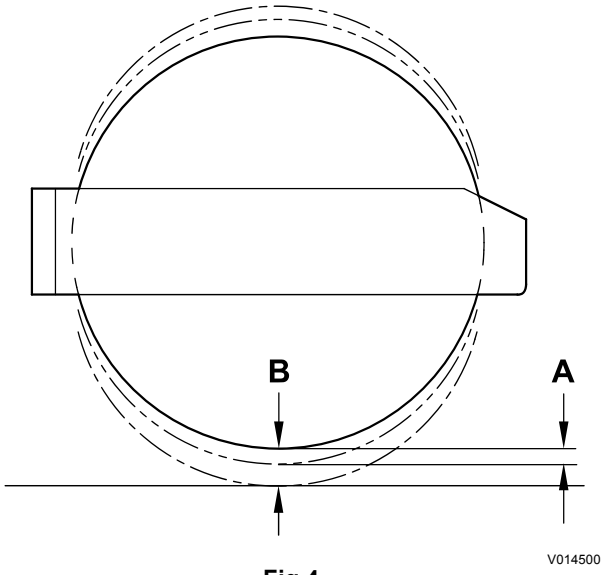

Fig 4.

The amplitude is changed by the use of overturning weights. ⇨ *Fig 1. (L-5)*.

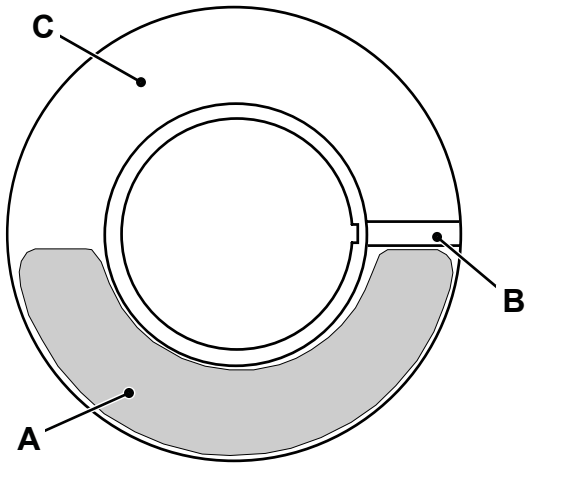

Fig 5.

Note: *When the vibration system is engaged it is possible to hear a loud noise made by the initial movement of the overturning weight* ***A****. The weight is free to move in the hollow area* ***C*** *and will touch one side of the end stop* ***B*** *when the exciter shaft is turned. Take care not to confuse this noise with a fault in the vibration system.* ⇨ *Fig 5. (L-7)*.

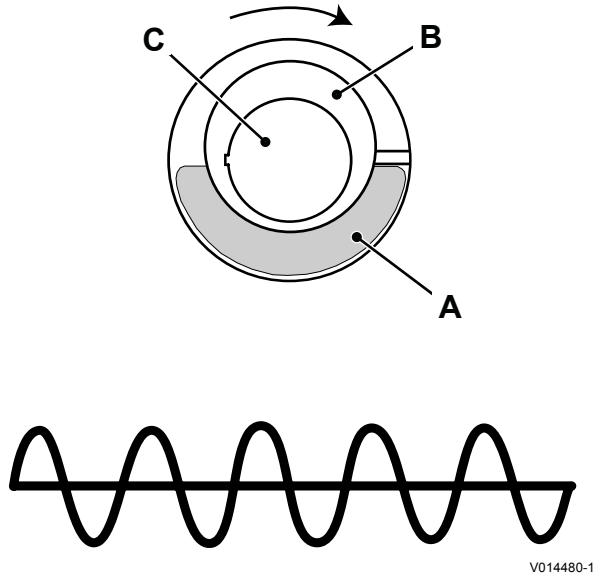

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Fig 6.

In the high speed direction the overturning weights **A** are on the opposite side to the eccentric weight **B** on the exciter shaft **C** and reduce the vibration created by the eccentric weight. LOW amplitude and high frequency is created. ⇨ *Fig 6. (L-8)*.

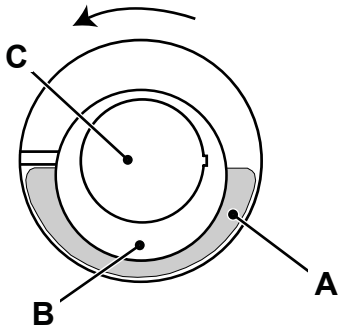

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Fig 7.

In the low speed direction the overturning weights **A** are on the same side as the eccentric weight **B** on the exciter shaft **C** and amplify the vibration created by the eccentric weight. HIGH amplitude and low frequency is created. ⇨ *Fig 7. (L-8)*.

Fault Finding

Vibration System

Diagnostics

Vibration frequency is related to the speed at which the vibration shaft is rotated and can be measured with a frequency meter ⇒ *Fig 1. (L-9)*. Low frequency problems will normally show up as a rough riding machine (often referred to as bucking). Operation at higher than recommended frequency will manifest itself as a shortened vibratory bearing life.

An increase or decrease in the shaft speed requires more or less flow from the vibration pump. Before making adjustments on the pump displacement controls always check that the engine operating speed is set to maximum rpm and pressure test the system to ensure that the system is functioning properly.

Measurement of Vibration System Performance

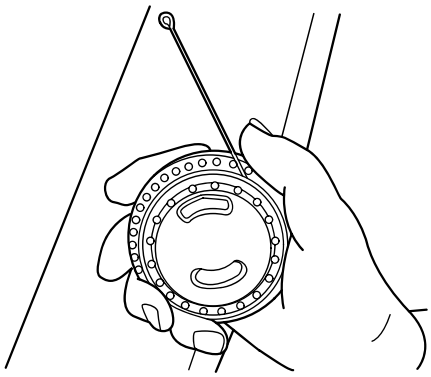

Fig 1.

This tool lets the Service Engineer measure the frequency of the vibrating drum (it will also measure engine speed on any type of machinery).

This tool means the service engineer can check the performance of the vibration system. The tool will help in accurate fault diagnosis

The following is intended for information only, please refer to operating instructions supplied with the tool. Always enure that the engine is operating at the correct RPM.

1 The tool is placed lightly onto the outside case of the running motor or vibrating drum.

2 Turn the top part of the tool to extend or retract the wire. When the wire is in resonance with the vibrations of the running motor or drum, it will vibrate in a "loop".

3 When the maximum "loop" is achieved the RPM or the Hertz value can be read from the respective scales.

Important: *When taking vibration measurements always ensure that an assistant is available to control the machine. As a precaution, always position yourself out of the direction of forward or reverse travel of the machine.*

Important: *Be aware that vibrating machinery may move in any direction and cause injury even when the propulsion system is not engaged.*

Important: *Be aware that vibrating drums and associated components could cause personal injury if touched. Take care when using measuring equipment*

Vibration System Hydraulic Fault Diagnosis Tables

Refer to ***Section E, Hydraulics,*** for further vibrator hydraulic system information.

Table 1. Engine stalls when vibrator engaged

Probable Cause	Action
Engine is cold and hydraulic oil is cold	Allow engine to warm up before using vibrator
Poor engine performance	Check engine performance

Table 2. Vibrator does not rotate / reduced vibrator performance

Probable Cause	Action
Engine is cold and hydraulic oil is cold	Allow engine to warm up before using vibrator
Engine speed low	Adjust to correct rpm setting
Poor engine performance	Check engine performance
Oil level low or oil is contaminated	Fill reservoir to correct level or change oil
Air trapped in hydraulic system	Purge hydraulic system
Inlet leak	Check all external lines and connections to pump inlet
Inlet strainer clogged	Clean Inlet strainer
Suspected internal damage to hydraulic system	Check pump by performing a flow test
Excessive loading on vibrator drive system	Remove cause of excessive loading.
Control linkage bent, loose or out of adjustment	Repair, adjust or replace linkage
Associated pipework or hoses leaking, damaged, trapped or kinked	Inspect and renew as required
Pressure relief valve out of adjustment or defective	Renew pressure relief valve (Non adjustable)

Vibration Coupling

Removal and Replacement

Removal

1 Park the machine on firm level ground.

2 Install the articulation safety lock **2**. ⇒ *Fig 2. (M-11)*.

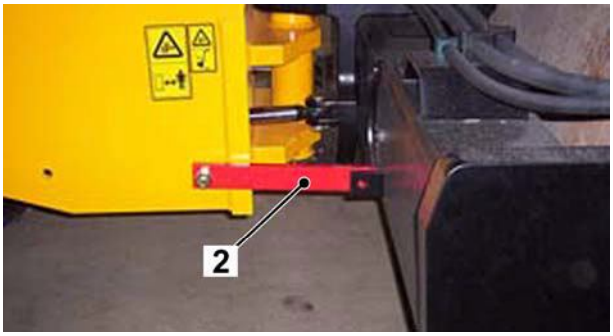

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Fig 2.

3 Using a suitable lifting equipment, raise the drum **3**. Lift approximately 20cm. ⇒ *Fig 3. (M-11)*.

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Fig 3.

4 Remove the vibration motor securing bolt **4**. ⇒ *Fig 4. (M-11)*.

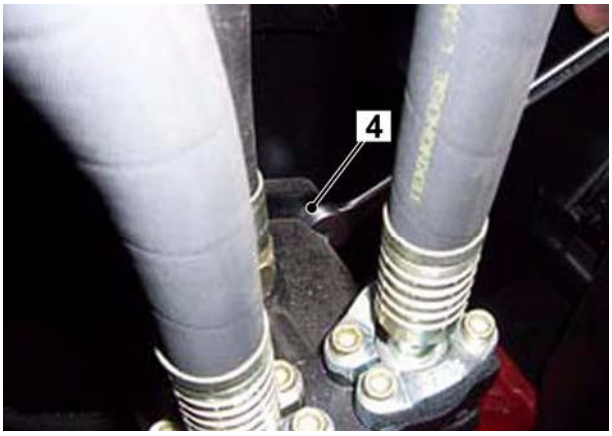

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Fig 4.

Note: *Do not disconnect the hydraulic hoses* ***6****.* ⇒ *Fig 6. (M-12)*.

5 Pull the vibration motor **5** from the motor housing. ⇒ *Fig 5. (M-11)*.

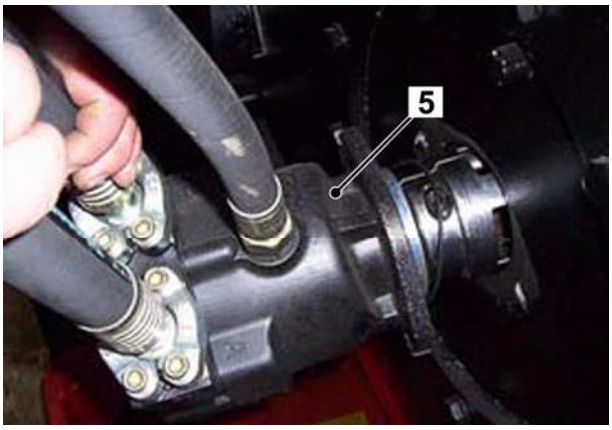

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Fig 5.

Note: *Do not disconnect the hydraulic hoses* ***6****.* ⇒ *Fig 6. (M-12)*.

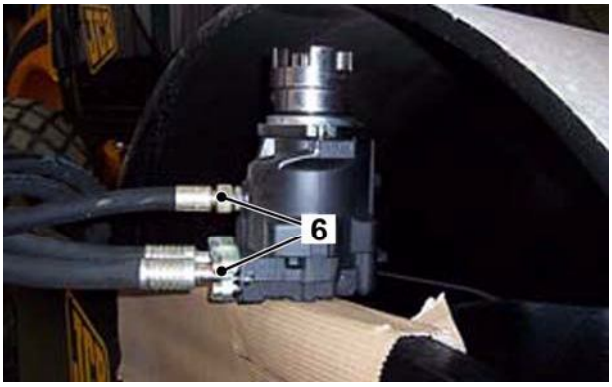

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Fig 6.

6 Visually check the vibration drive coupling **1**. ⇒ *Fig 7. (M-12)*.

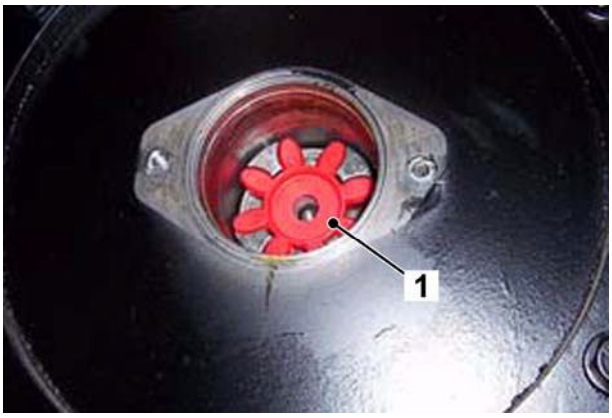

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Fig 7.

7 Check for damage, excessive wear (if unsure, replace the coupling).

Installation

8 The installation procedure is opposite of the removal procedure.

9 Make sure that the retaining holes are clean (if available use compressed air).

10 Apply loctite to the bolts and tighten to the torque of 80Nm.

Drum

Removal and Replacement

Removal

To remove the drum, proceed as follows:

⚠ WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11_2

⚠ WARNING

Take care when disconnecting hydraulic hoses and fittings as the oil will be HOT.

TRANS-1-2

1 Disconnect, label, and cap the hydraulic lines for the drum drive motor on the left side of the machine ⇨ *Fig 1. (L-14)*. Plug the motor ports

2 Disconnect, label, and cap the hydraulic lines for the vibration motor on the right side of the machine ⇨ *Fig 2. (L-15)*. Plug the motor ports.

⚠ WARNING

Working Under the Machine

Make the machine safe before getting beneath it. Ensure that any fitments on the machine are secure; engage the park brake, remove the starter key, disconnect the battery.

INT-3-3-8_2

3 Block and support the front frame of the machine.

4 Remove the drive motor adapter to frame bolts on the left side of the machine.

5 Remove the front and rear buffer brackets on the right side of the machine.

6 Remove the front scraper bar and roll or lift the drum out of the front frame.

Note: *VM115 Smooth drum = 4250 kg (9372 lbs) Padfoot drum = 4920 kg.(10848 lbs).*

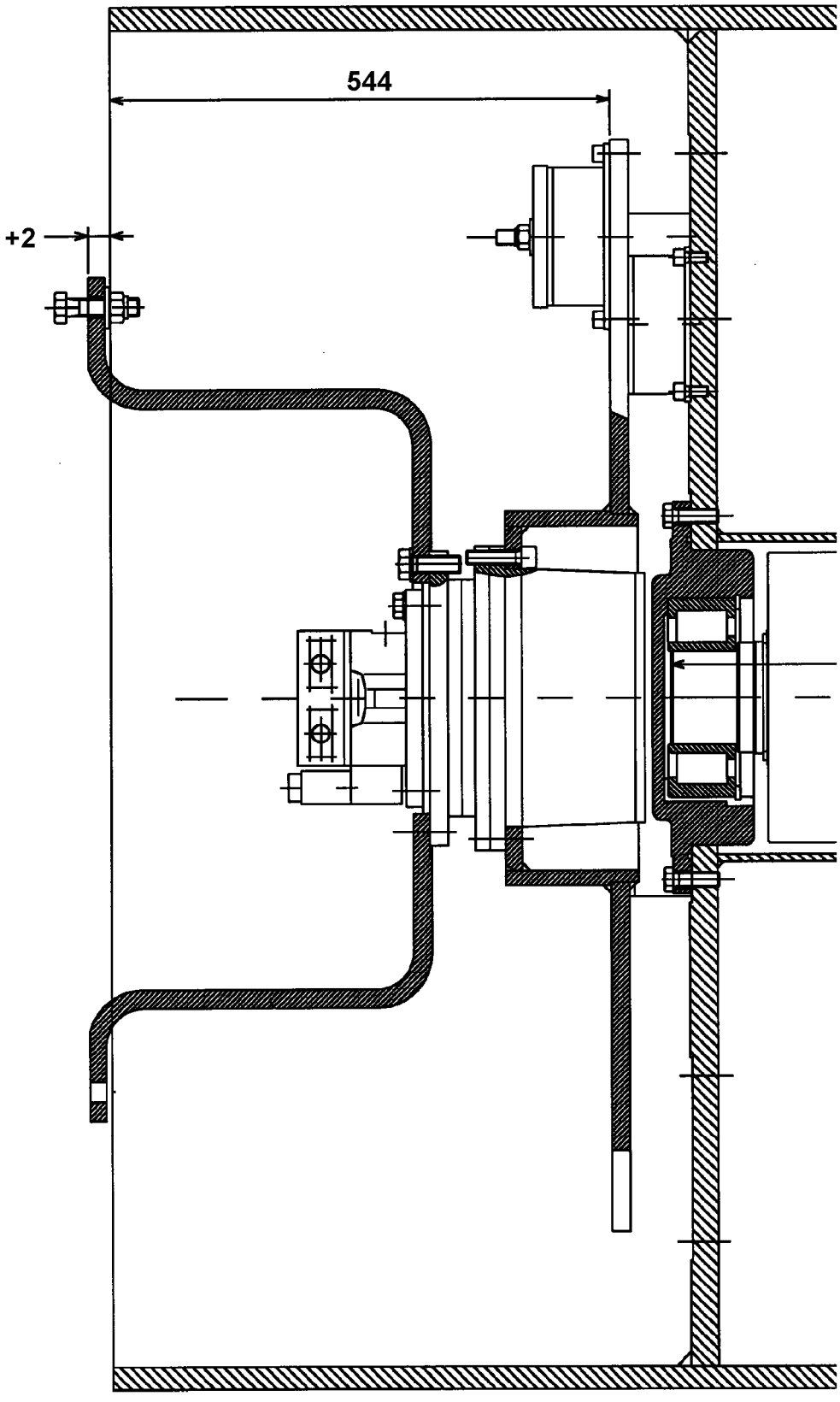

Fig 1. Drum - Left Side

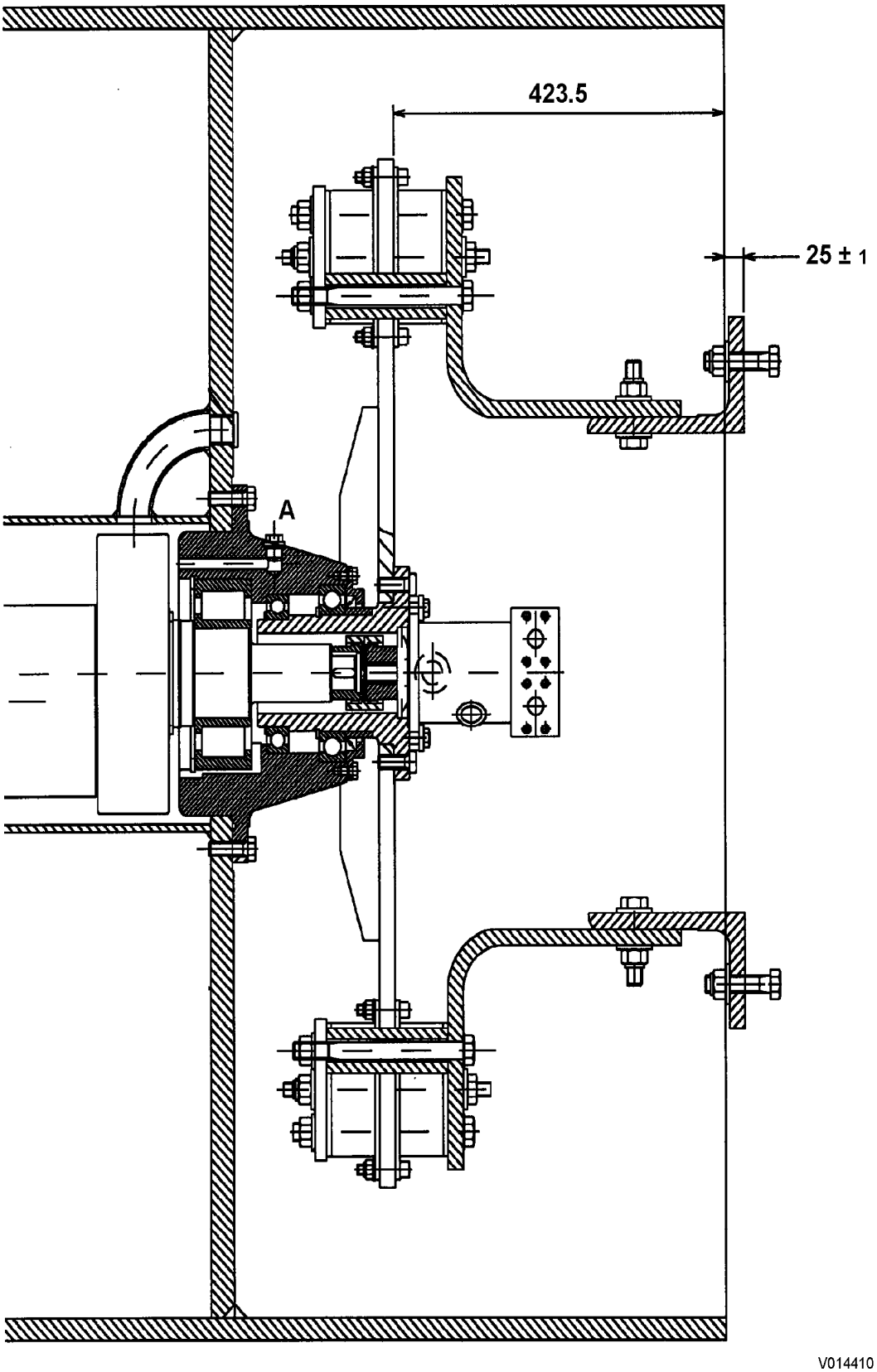

Fig 2. Drum - Right Side

Replacement

To replace the drum, proceed as follows:

1 Roll or lift the drum into position in the machine's front frame. The drum must be positioned for alignment of the drive motor bracket to the left side frame bolt holes.

2 Install the bolts in the front and rear buffer brackets on the right side of the machine. This will allow the machine frame to be lowered or raised as needed to complete alignment of the drive motor bracket on the left side of the machine.

Note: *To complete alignment of the left side gearbox and plate might require connecting the machine's brake system and using the hand pump to release the brake on the gearbox. (refer to the* ***Operators Manual*** *for releasing the brakes for towing)*

3 Tighten and torque the motor bracket and buffer bracket bolts.

4 Install the hydraulic hoses on both the vibration and drive motors.

Note: *Fill all motor ports with clean hydraulic oil prior to hose installation.*

5 Start the machine engine and allow the hydraulic systems to develop charge pressure. Allow the engine to run at low idle for several minutes without loading to fill and flush the system.

6 It may be necessary to bleed the brake system at the brake ports.

Exciter Bearing

Removal

To remove the exciter bearings ⇨ *Fig 3. (L-18)* and ⇨ *Fig 4. (L-19)*, proceed as follows:

1 Remove the drum from the machine ⇨ *Removal (L-13)* and drain the exciter shaft oil.

2 Remove the drum drive motor, gearbox, and drive plate from the left side of the drum.

3 Stand the drum on its end with the vibration motor facing upward.

Note: *Smooth drum = 4250 kg (9372 lbs) Padfoot drum = 4920 kg) (10848 lbs) .*

4 Remove the vibration motor and motor coupling.

5 Remove frame angle plates from buffer plate **4**.

6 Remove capscrews **5** from the bearing flange **8** and use two jacking screws to remove the housing from the drum. Install lifting eyes into the bolt holes in bearing flange **3** and remove the assembly.

Note: *The complete right side bearing cover assembly will be lifted out as a unit . Care should be taken not to damage the exciter shaft. The exciter bearing cone will come out with the flange.*

7 Remove capscrews **22** from bearing flange **8** and separate the bearing flange **3** and bearings from the bearing flange **8**.

8 Remove snap ring **11** and pull the exciter bearing cone **10**, with an internal puller, out of flange **8**.

9 Remove snap ring **14** from the bearing flange shaft **3** and pull bearing **15** off the shaft. Repeat these steps with snap ring **16** and bearing **17**.

10 Remove the shaft seal **18**, ring **19**, and cover **21** from the bearing flange shaft. If required the bearing shaft **3** can now be unscrewed from buffer plate **4**.

11 Use the exciter shaft lifting device or a suitable lifting eye to secure and remove the exciter shaft from the drum.

12 Lay the drum back on its side and remove the exciter bearing housing from the left side of the drum.

13 Use the correct bearing pullers to remove the exciter bearing parts from the exciter shaft and housing.

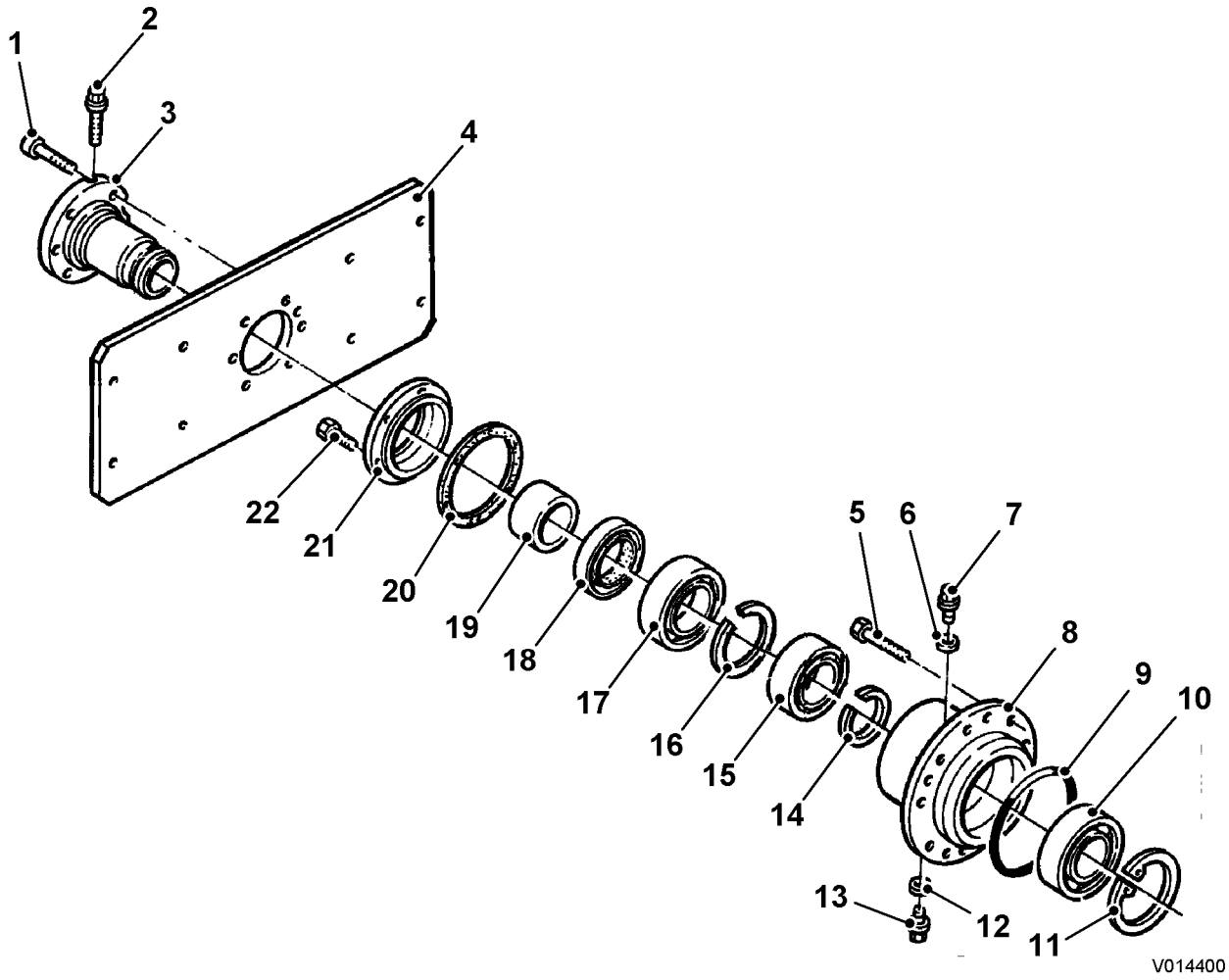

Fig 3. Right Side Bearing Cover

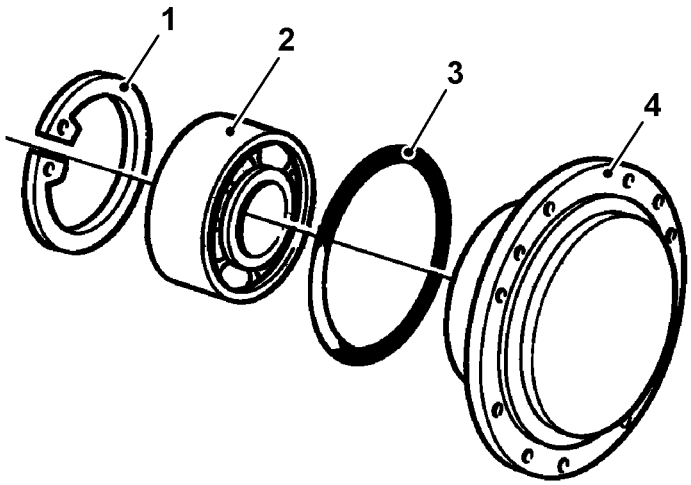

Fig 4. Left Side Bearing Cover

Replacement

To replace the exciter bearing, ⇒ *Fig 3. (L-18)* and ⇒ *Fig 4. (L-19)* proceed as follows:

1 Clean the exciter shaft housing in the drum.

2 Heat the inner bearing races and press the race onto the exciter shaft.

3 Install a new bearing into the left side cover and install the retaining ring. Install the left side bearing cover, using a new "O"-ring seal, into the left side of the drum. Apply Loctite 271 and torque the 16mm bolts to 190 Nm (140 ft. lbs).

4 Stand the drum on end with the vibration motor side up.

5 Install the exciter shaft using the proper lifting device to avoid shaft or bearing damage.

6 Add the proper amount of oil to the exciter housing. CLP DIN 51517/3 (Mobil Gear 629).

7 Pre-assemble the right side bearing assembly ⇒ *Fig 5. (L-20)*.

8 Press the bearing **7** into the bearing flange and install snap ring **8**.

9 Attach bearing flange **1** to buffer plate **2**.

10 Install ring **3** and onto the flange shaft **1**.

11 Install shaft seal ring **12** into the seal retainer and place the retainer over the flange shaft.

12 Press bearing **4** onto the bearing flange shaft **1** and install snap ring **10**.

13 Press bearing **5** onto the bearing flange shaft **1** and install snap ring **6**.

14 Install the assemble bearing flange shaft **1** into the VIB. bearing housing using gasket **11** and the six 10mm capscrews. Use Loctite 271 and torque to 44 Nm (32 ft.lbs).

15 Install the completed drive bearing housing assembly onto the drum using a new O-ring **9**. Care must be taken not to damage the exciter shaft and bearings. Install the 16mm capscrews using Loctite 271 and torque to 190 Nm (140 ft. lbs).

16 Check the vibration shaft for the correct end play (1.8mm to 3.8mm). With the drive coupling halves installed, check for the 4mm shaft to motor clearance ⇒ *Fig 6. (L-20)*.

17 Install a new vibration motor "O"-ring and mount the vibration motor using capscrew and washer.

18 Reinstall the drum into the machine.

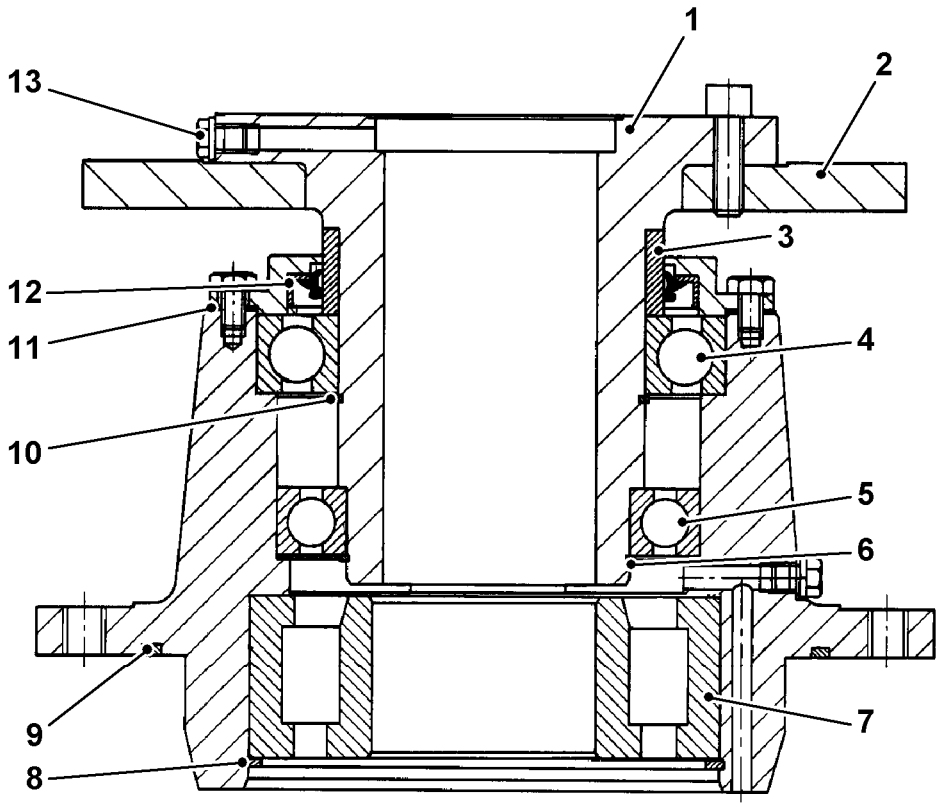

Fig 5.

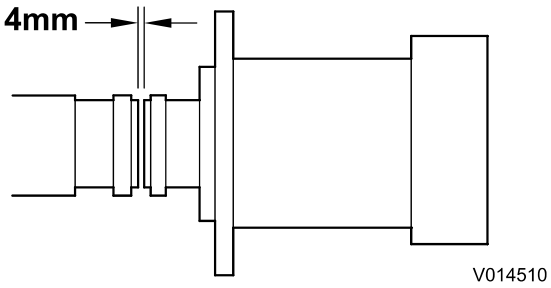

Fig 6. VIB shaft to VIB motor clearance