



## Section E

# Hydraulics

[Section 1 - General Information](#)

[Section 2 - Care and Safety](#)

[Section 3 - Routine Maintenance](#)

[Section A - Attachments](#)

[Section C - Electrics](#)

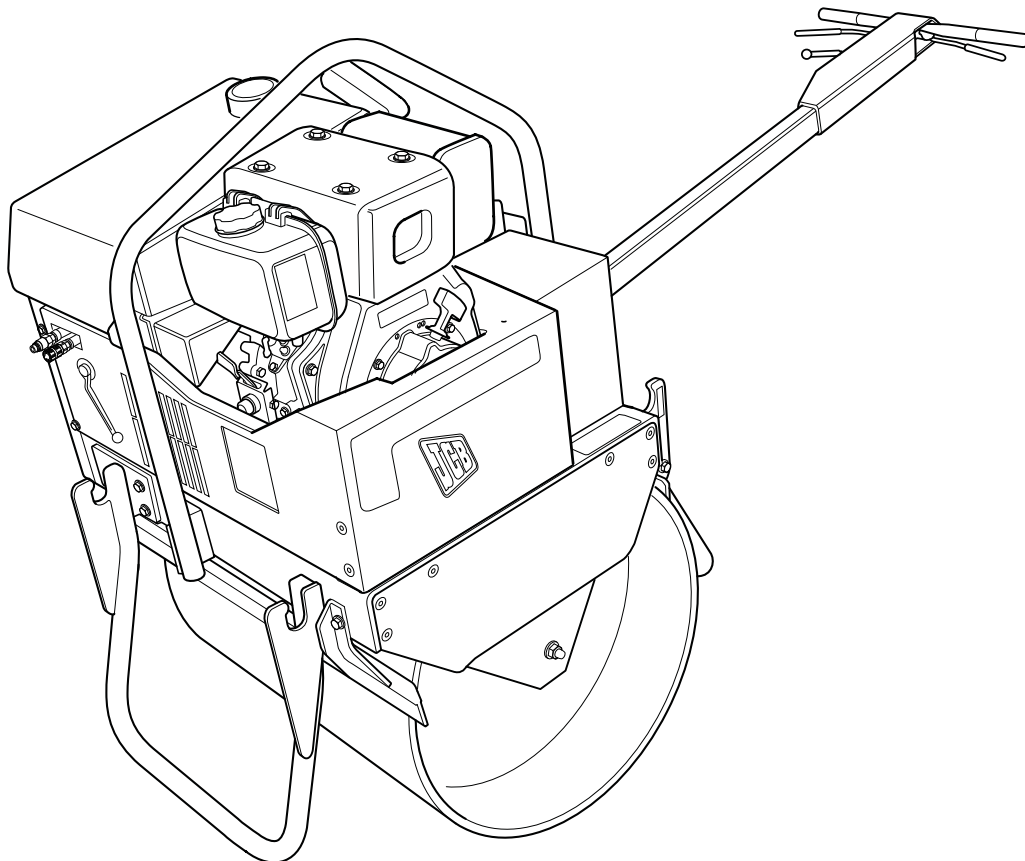
[Section E - Hydraulics](#)

[Section F - Transmission](#)

[Section G - Brakes](#)

[Section K - Engine](#)

[Section L - Vibration](#)



Publication No.  
**9803/9850-1**



Sample manual. Download All pages at

<https://www.arepairmanual.com/downloads/jcb-vms-71-vms-71-20-vms-71-30-service-repair-manual/>

World Class  
Customer Support



<b>Contents</b>	<b>Page No.</b>
<b>Technical Data</b>	
Main Components .....	E-1
Pumps .....	E-1
Motors .....	E-1
System Pressures .....	E-1
Travel Drive Hydraulic Pump .....	E-2
Travel Drive Hydraulic Drive Motor .....	E-3
Vibrator Drive Motor .....	E-3
Oil Tank Specifications .....	E-3
 <b>Basic Operation and Schematics</b>	
Description .....	E-5
Introduction .....	E-5
Hydraulic System Schematic VMS 71 .....	E-6
Hydraulic System Schematic VMS 71-20 and VMS 71-30 .....	E-7
Hydraulic System - Component Identification - VMS 71 .....	E-8
Hydraulic System - Component Identification VMS 71-20 and 71-30 .....	E-10
Hydraulic Circuit Operation - Travel .....	E-12
Hydraulic Circuit Operation - Vibrator - VMS 71 .....	E-13
Hydraulic Circuit Operation - Vibrator - VMS 71-20 and 71-30 .....	E-13
Hydraulic Circuit Operation - Attachments - VMS 71-20 and 71-30 ...	E-14
 <b>Fault Finding</b>	
Warnings .....	E-15
Hydraulic System .....	E-16
Drive System .....	E-17
Hydraulic Travel System Fault Diagnosis Tables - VMS 71, 71-20 and 71-30 .....	E-18
Vibration System Fault Diagnosis Tables - VMS 71, 71-20 and 71-30 .....	E-20
 <b>Service Procedures</b>	
Hydraulic Contamination .....	E-21
Hydraulic Fluid Quality .....	E-21
Effects of Contamination .....	E-21
Cleaning Operation .....	E-21
Contaminant Standards .....	E-22
Filters .....	E-22
Venting Hydraulic Pressure .....	E-23
Connecting/Disconnecting Hydraulic Hoses .....	E-24
Introduction .....	E-24
Connecting the Hoses .....	E-24
Disconnecting the Hoses .....	E-24
Quick Release Couplings .....	E-25
Connecting and Disconnecting .....	E-25
'Positional Type' Hydraulic Adaptors .....	E-27
Fitting Procedure .....	E-27
Return to Neutral Setting .....	E-28
Hydraulic Pressure Testing .....	E-31
Attachment Hydraulic Circuit .....	E-31
Removing and Replacing Components .....	E-32
 <b>Travel Drive Pump</b>	
Description .....	E-33



<b>Contents</b>	<b>Page No.</b>
<b>Travel Drive Motor</b>	
Description .....	E-35
<b>Vibrator Drive Pump</b>	
Description .....	E-37
<b>Vibrator Drive Motor</b>	
Description .....	E-39
<b>Hydraulic Oil Tank</b>	
Oil Tank Cover Removal and Replacement .....	E-41
Introduction .....	E-41
Removal .....	E-41
Replacement .....	E-42

# Technical Data

## Main Components

### Pumps

Table 1.

Item	Make	Model	Type
Transmission Hydraulic Pump	Hydro Gear	PG-DDEE-DA1X-XXXX	Variable displacement piston pump
Vibrator Hydraulic Pump	Sauer-Danfoss	SNP2/11DSC36	Gear pump

### Motors

Table 2.

Item	Make	Model	Type
Transmission Hydraulic Drive Motor	Sauer-Danfoss	OMR250 151-0716	Fixed displacement orbital motor
Vibrator Hydraulic Motor	Sauer-Danfoss	SNM2/11SC196LEP	Gear pump

### System Pressures

*Note: Relief valve pressure settings are factory set and should not require any further adjustment.*

Table 3.

System	Pressure Setting
Vibrator system relief valve	70 bar (1015 lbf/in <sup>2</sup> )
Travel drive system relief valve	120 bar (1740 lbf/in <sup>2</sup> )
Attachment relief valve	130 bar (1885 lbf/in <sup>2</sup> )
Charge pressure	3.4 bar (50 lbf/in <sup>2</sup> )



**Travel Drive Hydraulic Pump**

**Table 4.**

<b>Hydrogear PG Hydrostatic Axial Piston Pump.</b>		
<b>Displacement</b>	10.2 cc/rev	0.62 cu in/rev
<b>Input Speed</b>		
Maximum Unloaded	3600 rpm	
Minimum Loaded	1800 rpm	
<b>System Operating Pressure</b>		
Continuous	70 bar	1000 lb/in <sup>2</sup>
Intermittent	145 bar	2100 lb/in <sup>2</sup>
Peak	240 bar	3500 lb/in <sup>2</sup>
<b>Pump Performance</b>		
@2400 rpm / 69 bar, (1000 lb/in <sup>2</sup> )	23.1 l/min.	6.1 UK gal min.
@3000 rpm / 69 bar (1000 lb/in <sup>2</sup> )	28.8 l/min.	7.6 UK gal min.
@3600 rpm / 69 bar (1000 lb/in <sup>2</sup> )	34.8 l/min.	9.2 UK gal min.
<b>Case Pressure</b>		
Maximum at cold start	0.7 bar	10.0 lb/in <sup>2</sup>
Maximum continuous	0.3 bar	4.0 lb/in <sup>2</sup>
<b>Inlet Vacuum (Maximum continuous)</b>	101.6 mm/hg	4 inch/hg
<b>Charge Pump Displacement</b>		
<b>Auxiliary Pump Displacement</b>	3.2 cc/rev	0.19 cu in/rev
<b>Auxiliary Pump Relief Setting</b>	45 bar	650 lb/in <sup>2</sup>
<b>Auxiliary Pump Performance</b>		
@ 3200 rpm, 500lb/in <sup>2</sup> 70 SUS (13 Cst) oil, & 180° F / 82 ° C.	6.8 - 7.6 l/min.	1.5 to 1.7 UK gal min.
<b>Control Torque Required to Stroke Pump</b>		
(Approx. 20 ° External Stroke Angle)	9.6 Nm at 70 bar 6.8 Nm at 35 bar	7.1 lbf/ft at 1000 lb/in <sup>2</sup> 5.0 lbf/ft at 500lb/in <sup>2</sup>
<b>Pump Oil Temperature</b>		
Max intermittent (Hottest Point)	110 °C	230 °F
Normal Operating Range	-23 to 93 °C	-10 to 200 °F
<b>Fluid Viscosity Limits at 110 °C (230 °F)</b>		
Optimum SUS (cST)	13	70
Minimum (cST)	9	55
<b>Weight of Unit</b>	3.6 Kg	8 lbs
<b>Inlet filtration Requirement (micron)- Nominal</b>	25	

**Travel Drive Hydraulic Drive Motor**

**Table 5.**

<b>Sauer - Danfoss OMR 250</b>		
<b>Displacement</b>	249.3 cm <sup>3</sup>	15.26 inch <sup>3</sup>
<b>Maximum Torque</b>		
Continuous	300 Nm	2660 lbf.in
Intermittent	380 Nm	3360 lbf.in
Peak	600 Nm	5310 lbf.in
<b>Maximum Output</b>		
Continuous	6.0 kW	8.1 hp
Intermittent	8.0 kW	10.7 hp
<b>Maximum Pressure Drop</b>		
Continuous	80 bar	1160 lb/in <sup>2</sup>
Intermittent	110 bar	1600 lb/in <sup>2</sup>
Peak	200 bar	2900 lb/in <sup>2</sup>
<b>Maximum Oil Flow</b>		
Continuous	60 l/min	13.2 g/min
Intermittent	75 l/min	16.5 g/min
<b>Maximum Inlet Pressure</b>		
Continuous	175 bar	2540 lb/in <sup>2</sup>
Intermittent	200 bar	2900 lb/in <sup>2</sup>
Peak	225 bar	3260 lb/in <sup>2</sup>

**Vibrator Drive Motor**

**Table 6.**

<b>Sauer-Danfoss SNM2/11SC196LEP</b>		
Displacement	10.8 cm <sup>3</sup>	0.659 in <sup>3</sup>

**Oil Tank Specifications**

**Table 7.**

Capacity	12.0 Litres (2.64 gallons)
Cover Sealant	JCB Multi-gasket 4102/1212



Page left intentionally blank

# Basic Operation and Schematics

## Description

### Introduction

The hydraulic system is powered by a single cylinder air cooled diesel engine. The engine specifications vary according to the machine designation. **See Section K, Engine.**

The machine travel and vibrator/attachment hydraulic systems have separate pumps and motors but share the same hydraulic oil tank.

The machine can travel in forward and reverse directions. The reverse speed is slower. The travel drive system is hydrostatic. A chain drives the roller from the drive motor.

The vibrator system has a gear pump driving an orbital motor. The drive from the hydraulic motor to the vibrator shaft is through a V-belt. The vibrator shaft turns in one direction only.

**Important:** The VMS 71 vibrator motor and external attachments should not be used at the same time.

The hydraulic oil tank is built in to part of the machine frame and incorporates a filter inside the tank. An additional filter is located externally on the frame.

The filter in the tank is installed under the level of the hydraulic oil. This provides filtered oil to the travel charge circuit and vibration pump.

The VMS 71-20 and the 71-30 are equipped with quick release hydraulic couplings to allow external attachments to be powered. This hydraulic oil flow is supplied by the vibration circuit.

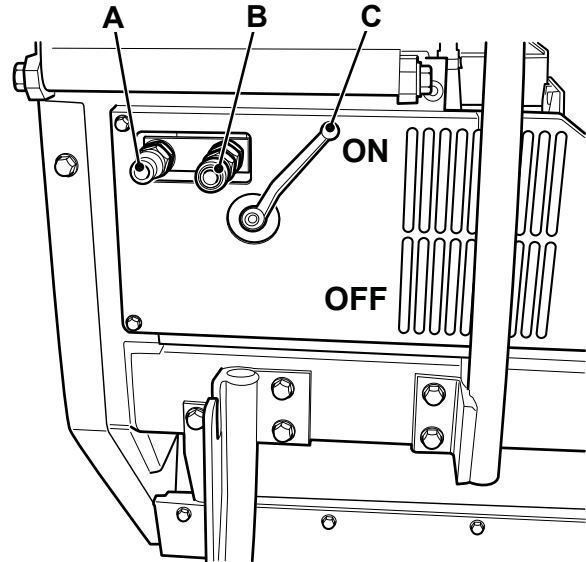


Fig 1.

Table 1.

Item	Description
A	Male Flat Face Coupling - Pressure Side
B	Female Flat Faced Coupling - Return Side
C	Attachment Lever

**Important:** Only JCB approved attachments should be used with the VMS 71-20 and 71-30. Damage or injury may result if non JCB approved equipment is used.

**Refer to approved breaker list in the handbook.**

Table 2.

Version	Attachment Maximum Flow Rate
VMS 71	N/A
VMS 71-20	20 L/min. (4.4 g/min.)
VMS 71-30	30 L/min. (6.6 g/min.)

### Hydraulic System Schematic VMS 71

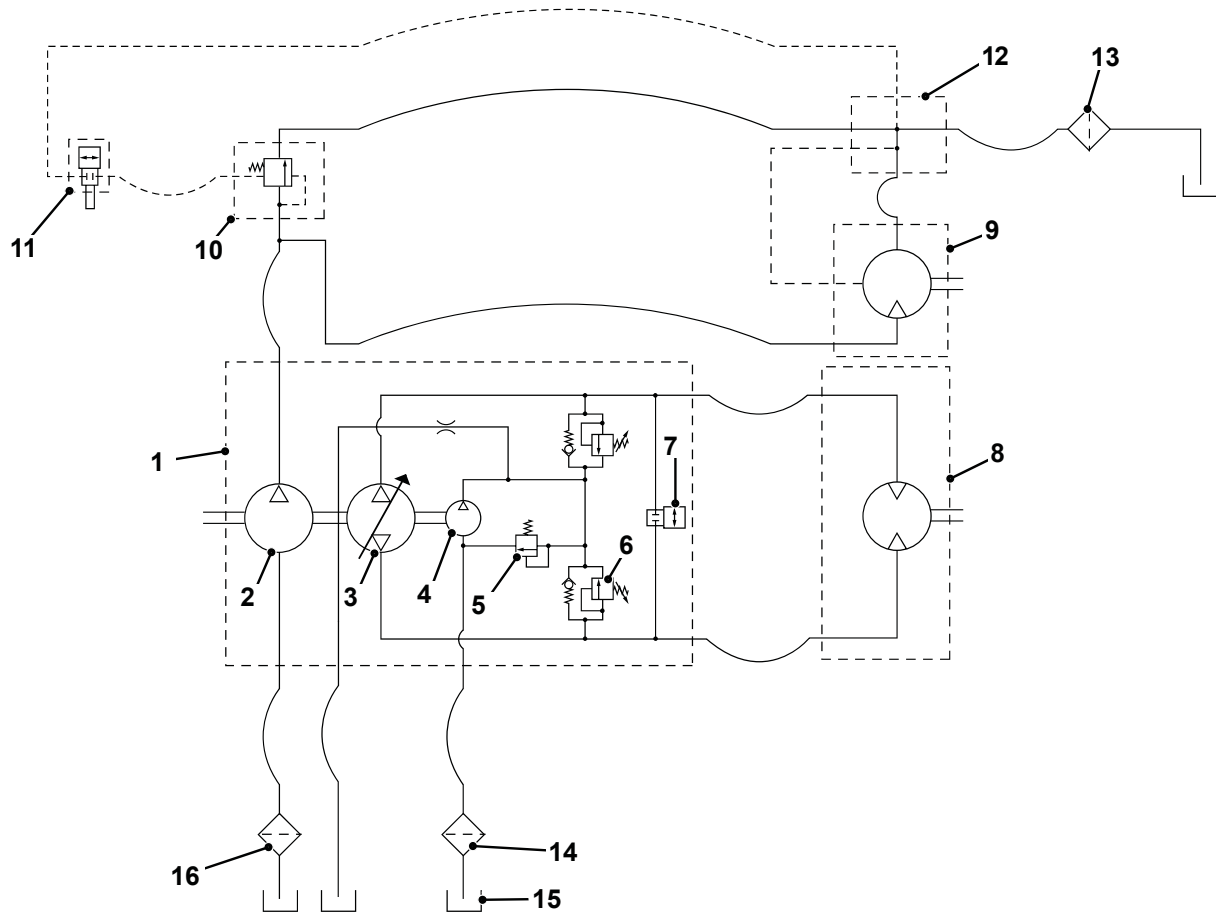


Fig 2.

Table 3.

Item	Description
1	Hydraulic Pump Assembly
2	Vibrator Drive Pump
3	Travel Drive Pump
4	Travel Drive Charge Pump
5	Charge Pressure Relief Valve
6	High Pressure Relief Valve
7	Bypass Valve
8	Travel Drive Motor
9	Vibrator Drive Motor
10	Ventable Relief Valve
11	Vibrator Hand Control Valve (Unloader)
12	Manifold
13	Filter - Return, Canister (External To Hydraulic Oil Tank)
14	Filter - Canister (In Hydraulic Oil Tank)
15	Hydraulic Oil Tank
16	Filter - Gauze (In Hydraulic Oil Tank)

### Hydraulic System Schematic VMS 71-20 and VMS 71-30.

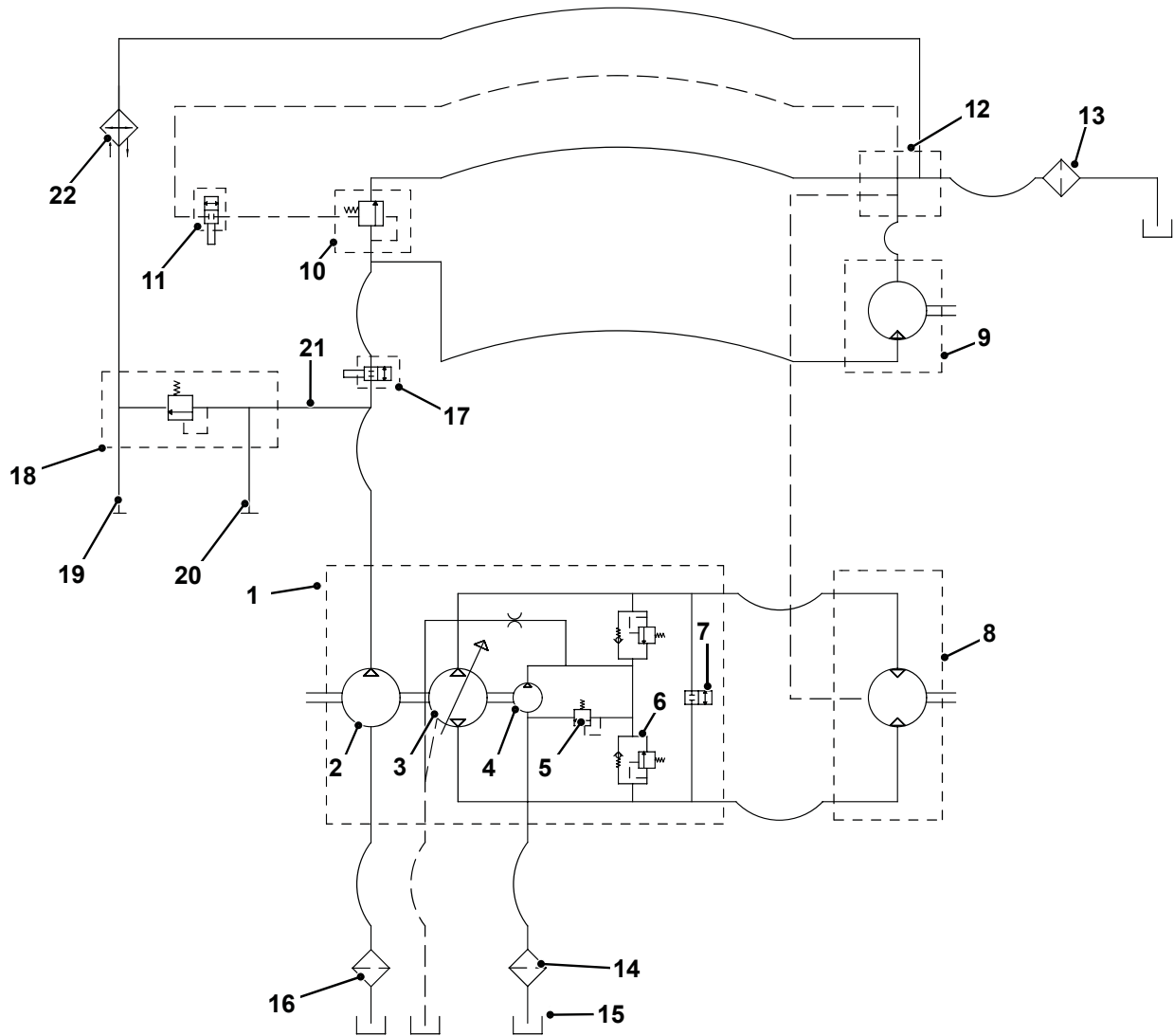


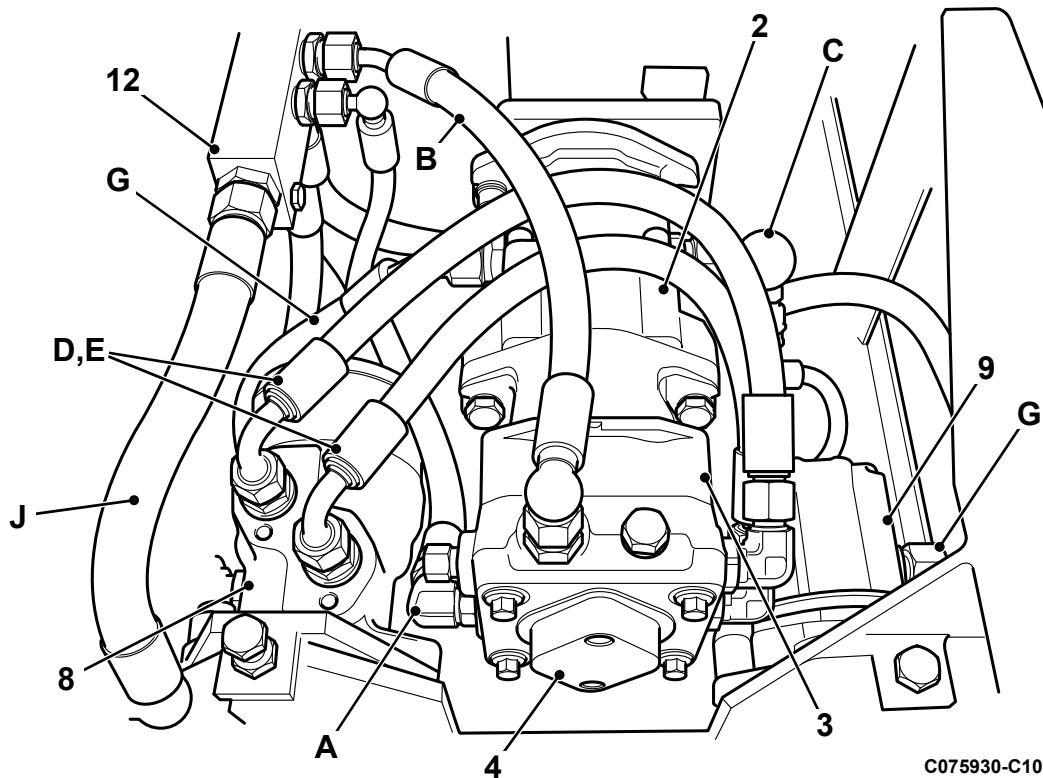
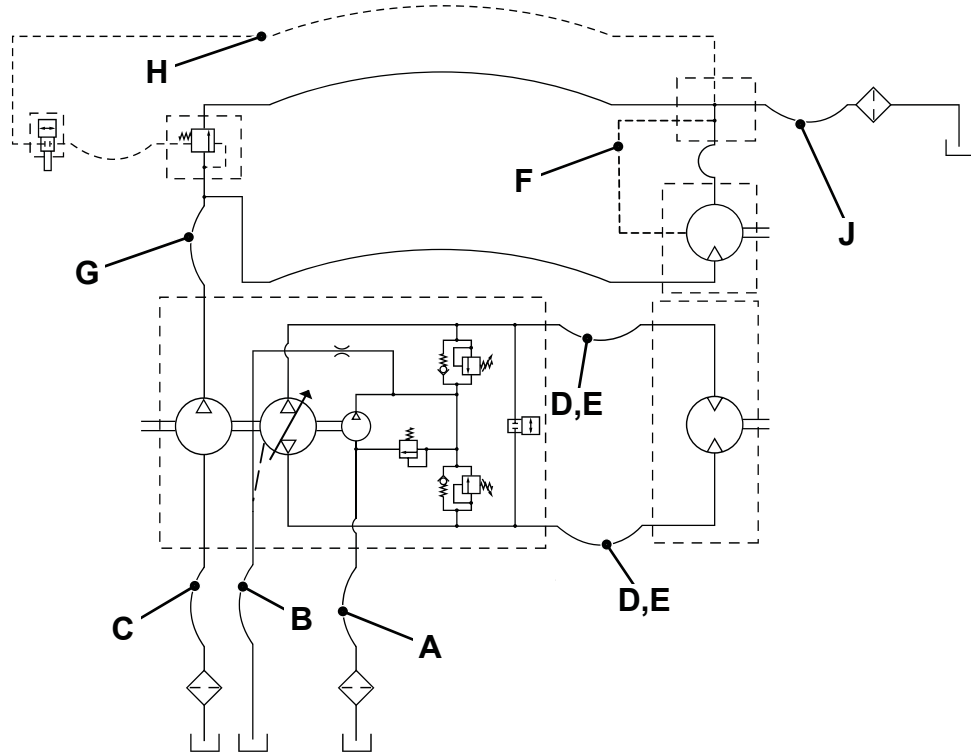
Fig 3.

Table 4.

Item	Description
1	Hydraulic Pump Assembly
2	Vibrator Drive Pump
3	Travel Drive Pump
4	Travel Drive Charge Pump
5	Charge Pressure Relief Valve
6	High Pressure Relief Valve
7	Bypass Valve
8	Travel Drive Motor
9	Vibrator Drive Motor
10	Ventable Relief Valve
11	Vibrator Hand Control Valve (Unloader)
12	Manifold

Item	Description
13	Filter - Return, Canister (External To Hydraulic Oil Tank)
14	Filter - Canister (In Hydraulic Oil Tank)
15	Hydraulic Oil Tank
16	Filter - Gauze (In Hydraulic Oil Tank)
17	Lever Valve
18	Coupling Manifold
19	Flat Faced Coupling (Female - Return)
20	Flat Faced Coupling (Male - Pressure)
21	Return Line From Coupling Manifold
22	Hydraulic Oil Cooler

**Hydraulic System - Component Identification - VMS 71**



C075930-C10

Fig 4.



**Table 5. Hydraulic System Pipe Identification**

<b>Item</b>	<b>Description</b>
<b>A</b>	Charge Pump Suction
<b>B</b>	Charge Pump Return
<b>C</b>	Vibration Hydraulic Pump Suction
<b>D</b>	Travel Hydraulic Motor Flow / Return
<b>E</b>	Travel Hydraulic Motor Flow / Return
<b>F</b>	Travel Drive Motor Case Drain
<b>G</b>	Vibrator Drive Motor Hydraulic Oil Supply
<b>H</b>	Vented Vibrator Pump Flow
<b>J</b>	Manifold Return

**Table 6. Component Key**

<b>Item</b>	<b>Description</b>
<b>2</b>	Vibrator Drive Pump
<b>3</b>	Travel Drive Pump
<b>4</b>	Travel Drive Charge Pump
<b>8</b>	Travel Drive Motor
<b>9</b>	Vibrator Drive Motor
<b>12</b>	Manifold

### Hydraulic System - Component Identification VMS 71-20 and 71-30

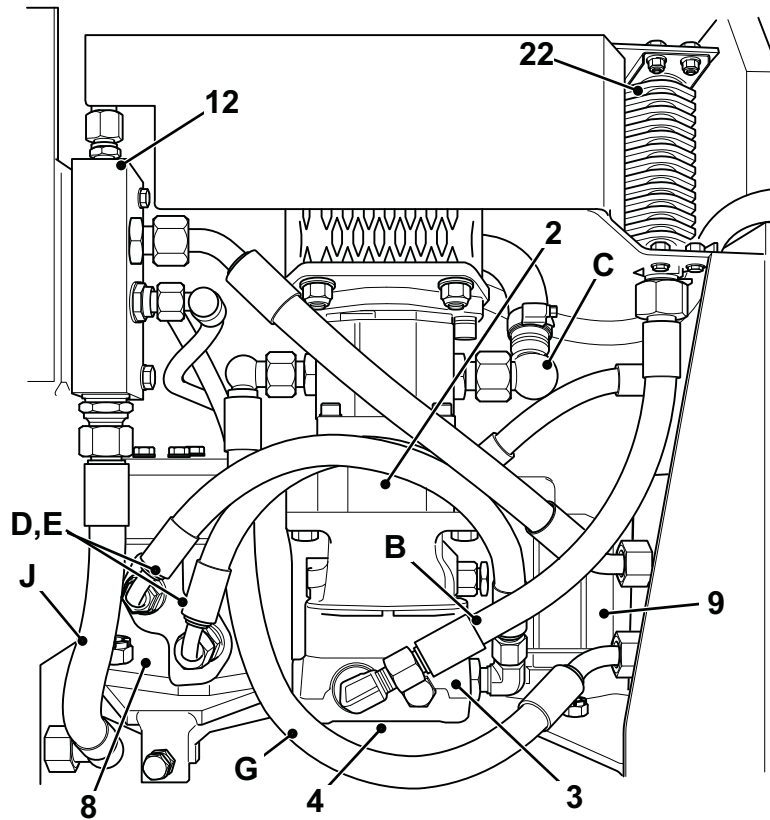
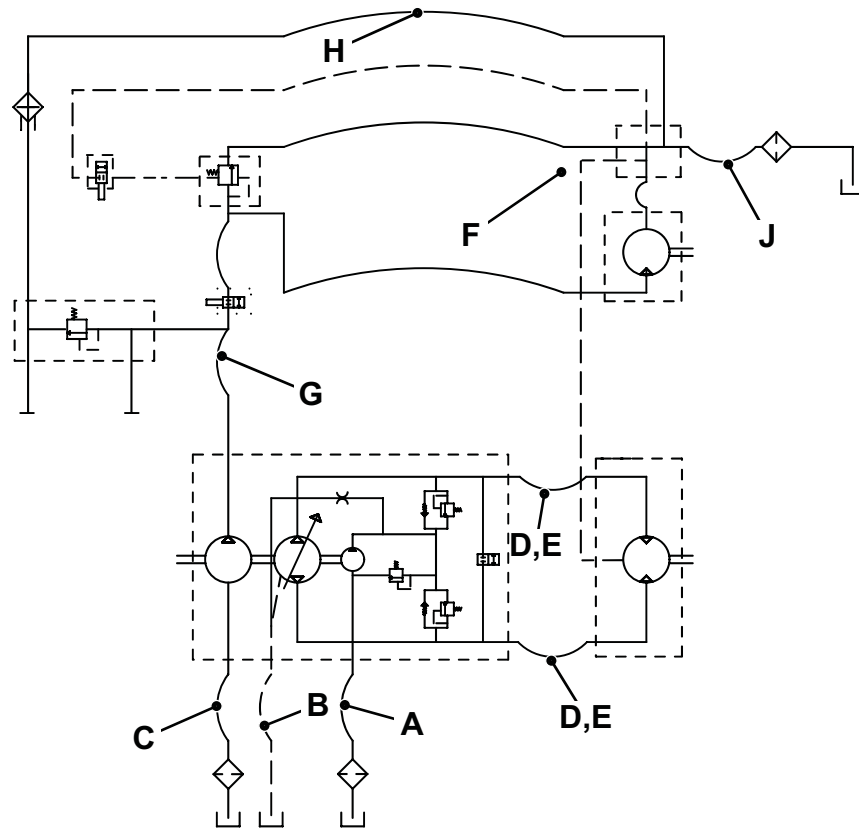


Fig 5.



**Table 7. Hydraulic System Pipe Identification**

<b>Item</b>	<b>Description</b>
<b>A</b>	Charge Pump Suction
<b>B</b>	Charge Pump Return
<b>C</b>	Vibration Hydraulic Pump Suction
<b>D</b>	Travel Hydraulic Motor Flow / Return
<b>E</b>	Travel Hydraulic Motor Flow / Return
<b>F</b>	Travel Drive Motor Case Drain
<b>G</b>	Vibrator Drive Motor Hydraulic Oil Supply
<b>H</b>	Vented Vibrator Pump Flow
<b>J</b>	Manifold Return

**Table 8. Component Key**

<b>Item</b>	<b>Description</b>
<b>2</b>	Vibrator Drive Pump
<b>3</b>	Travel Drive Pump
<b>4</b>	Travel Drive Charge Pump
<b>8</b>	Travel Drive Motor
<b>9</b>	Vibrator Drive Motor
<b>12</b>	Manifold
<b>22</b>	Hydraulic Oil Cooler

### Hydraulic Circuit Operation - Travel

The travel system is a hydrostatic system. The same system is used on all variants.

The oil flow from the vibrator system is also used to supply external attachments on the applicable variants.

Moving the control handle mounted “see saw” drive lever effects stepless changing of the flow rate to the hydraulic motor (speed change). The drive lever uses a cable to operate the swashplate on the travel drive hydraulic pump **3**.

The travel hydraulic pump **3** charge oil supply is drawn from the hydraulic oil tank. It flows through the canister filter **14** located in the hydraulic oil tank and passes through a pipe to the charge pump **4**.

The output oil flow of the pump **3** is controlled by the amount that the pump swashplate is angled. As the pump pistons compress, they force oil into one of two pipes connected to the travel hydraulic drive motor.

As the angle of the pump **3** swashplate is increased, the amount of oil being pumped will increase and thus the motor speed will increase.

The drive lever can be moved from forward to “zero” position then to reverse. This effects a reversal of the flow to the hydraulic motor and thus a reversal of driving direction. **See Section 3, Operation.**

During the operation of the pump, fluid is lost from the hydraulic loop through leak paths designed into the pump for lubrication and cooling purposes (around pistons, under the rotating cylinder block, etc). This lost fluid returns to the reservoir through the return pipe **16**.

This fluid loss is compensated for by the charge pump **4**. The makeup flow is controlled (or directed) by the system check valves. The check valves are used to direct makeup fluid into the low pressure side of the closed loop.

#### Hydraulic Circuit Operation - Vibrator - VMS 71

The vibrator (and attachments where fitted) hydraulic system is not hydrostatic.

The vibrator system is controlled by a lever operated manual unloader valve **2-11**. It is mounted on the operators hand grip column. **See Section 3, Operation.**

The manual unloader valve **2-11** is connected to the ventable relief valve **2-10**. It is also connected to the manifold **2-12** and then to the hydraulic oil tank.

When the manual unloader valve lever on the hand grip column is operated, it can open or close the "vented" flow in the system.

The ventable relief valve is installed below the hydraulic pump assembly.

**1** The gear type vibrator hydraulic pump **2-2** draws oil from the hydraulic oil tank through a strainer **2-16**. Oil flow is now available to the ventable relief valve **2-10** and the vibrator drive motor **2-9**.

**2** With the hand controlled manual unloader valve **2-11** in the closed (vibrator off) position: -

Oil cannot pass the ventable relief valve **2-10** (unless oil pressure exceeds the relief valve pressure setting). The vibrator drive motor will now operate.

**3** With the hand controlled manual unloader valve **2-11** in the open (vibrator on) position: -

Oil can flow through the ventable relief valve **2-10**, manual unloader valve **2-11**, manifold **2-12**, return filter **2-13** and to the hydraulic oil tank.

The vibrator drive motor will not operate. There will be a small oil flow in the vibrator motor to prevent pump cavitation on rundown.

#### Hydraulic Circuit Operation - Vibrator - VMS 71-20 and 71-30

The vibrator hydraulic circuit operates in a similar way to the VMS 71. The VMS 71-20 and 71-30 incorporate additional components, one of which is a lever valve **3-17**.

The attachment lever valve **3-17** should be in the OFF (valve open) position for operation of the vibrator circuit. Any attachments must also be disconnected

**Important:** *The attachment lever must not be considered as an ON and OFF switch for hydraulic flow to the couplings. Hydraulic flow is ALWAYS permitted to flow from the couplings regardless of the position of the lever. Moving the lever to the OFF position will not stop the attachment.*

**Important:** *The VMS 71 vibrator motor and external attachments should not be used at the same time.*

**See section A - Optional Attachments.**

### Hydraulic Circuit Operation - Attachments - VMS 71-20 and 71-30

The following machines can be used to power attachments:

**Table 9.**

Version	Attachment Maximum Flow Rate
VMS 71-20	20 L / min. (4.4 g/min.)
VMS 71-30	30 L / min. (6.6 g/min.)

The hydraulic system for the VMS 71-20 and VMS 71-30 is similar to the VMS 71 version.

The attachment (and vibrator) hydraulic system is not hydrostatic.

The attachment lever valve **3-17** should be in the ON (valve closed) position for connection or operation of an attachment.

**Important:** *The attachment lever must not be considered as an ON and OFF switch for hydraulic flow to the couplings. Hydraulic flow is ALWAYS permitted to flow from the couplings regardless of the position of the lever A. Moving the lever to the OFF position will not stop the attachment.*

- 1** The gear type vibrator hydraulic pump **3-2** draws oil from the hydraulic oil tank through a strainer **3-16**. Oil flow is prevented from going to the vibration circuit by the attachment control lever valve **3-17** when it is set to the ON position.
- 2** Oil flows to the attachment hydraulic manifold **3-18** and is available at the flat face coupling **3-20**. An adjustable pressure relief valve is incorporated on the hydraulic manifold **3-18**. If the pressure relief valve operates, excess flow is returned to the hydraulic oil tank via **3-21** to manifold **3-12** and filter **3-13**.
- 3** Oil flow through an attachment (when fitted) is returned via the female flat faced coupling **3-19** and is returned to the hydraulic oil tank via **3-21** to manifold **3-12** and filter **3-13**.

# Fault Finding

## Warnings

### WARNING

#### Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10\_2

### CAUTION

Ensure that dirt etc. does not enter the hydraulic system during this job.

5-3-4-4

### CAUTION

Do not run the engine with the hydraulic tank filler cap removed.

5-3-4-1

### WARNING

Hydraulic fluid at system pressure can injure you. Relieve the system pressure before changing the Hydraulic filter element.

15-1-1-7

### CAUTION

If the fluid is cloudy, then water or air has contaminated the system. This could damage the hydraulic pump. Contact your JCB Distributor immediately.

12-5-1-4

### WARNING

#### Hydraulic Hoses

Damaged hoses can cause fatal accidents. Inspect the hoses regularly for:

- Damaged hose ends
- Chafed outer covers
- Ballooned outer covers
- Kinked or crushed hoses
- Embedded armouring in outer covers
- Displaced end fittings.

INT-3-3-2

### CAUTION

#### 'O' rings, Seals and Gaskets

Badly fitted, damaged or rotted 'O' rings, seals and gaskets can cause leakages and possible accidents. Renew whenever disturbed unless otherwise instructed. Do not use Trichloroethane or paint thinners near 'O' rings and seals.

INT-3-2-12

### Hydraulic System

The purpose of this section is to help you trace a particular fault. The tables identify possible causes and give a suggested action with specific tests where applicable.

- 1 Before you begin fault finding, read the fault finding safety information at the beginning of this section. Make sure you also read **Section 2, Care and Safety**.
- 2 Make any relevant electrical checks before moving on to the hydraulics.
- 3 Make simple checks before say, stripping a major hydraulic component.
- 4 Make sure that the hydraulic fluid is at the correct working temperature (50°C, 122°F).
- 5 If hydraulic contamination is found, be sure to remove ALL debris, and if possible identify its origin. It may be part of a component from elsewhere in the hydraulic circuit.
- 6 What ever the fault, check the condition of the hydraulic fluid. Drain and replace if necessary.
- 7 Renew any seals such as O-rings when re-assembling hydraulic components.



## Drive System

### Internal Leakage

All hydrostatic systems require charge pressure to function properly. This is because a hydrostatic system cannot operate at a negative pressure. The charge pump provides a positive pressure to the hydrostatic pump inlet. Hydrostatic systems are designed to leak a small amount of oil from the pumps and motors for lubrication of parts and cooling, and in some instances, leakage is strictly due to operating clearances while in others a flushing valve may be designed into the system. The greater the system pressure the higher the leakage rate. Fresh charge oil will make up for normal system losses including the oil discharged through the flushing valve.

When components fail, leakage under pressure increases tremendously and is noted by a drop in charge pressure (the charge pump is not capable of keeping up with the hydrostatic system leakage rate). The condition of a hydrostatic pump/motor circuit can be determined by a simple charge pressure test at maximum engine RPM and normal operating temperature. Under the previously mentioned conditions (RPM and temperature), compare the charge pressure readings with the hydrostatic system engaged at no load and maximum load. If these two charge pressure readings show a difference of more than 10%, between the loaded and no load conditions, the hydrostatic system has higher than desired leakage.

Remember, the failure of one component in a hydrostatic system can cause contamination throughout the entire system. Prior to installing the new or rebuilt components, the entire system must be disassembled and cleaned. This includes all pumps, motors, valves, coolers, hoses, and reservoirs.

Fault Descriptions		
1	No drive	⇒ <a href="#">Table 1. No Travel Drive (□ E-18)</a>
2	Unit is noisy	⇒ <a href="#">Table 2. Unit is noisy (□ E-18)</a>
3	Unit has no or low power	⇒ <a href="#">Table 3. Unit has no or low power (□ E-18)</a>
4	Unit operating hot	⇒ <a href="#">Table 4. Unit operating hot (□ E-19)</a>
5	Pump leaks oil	⇒ <a href="#">Table 5. Pump leaks oil (□ E-19)</a>
6	Vibration system fault diagnosis table	⇒ <a href="#">Table 6. Vibration System Faults (□ E-20)</a>

### Hydraulic Travel System Fault Diagnosis Tables - VMS 71, 71-20 and 71-30

**Table 1. No Travel Drive**

Fault	Probable Cause	Action
No travel drive	Control linkage bent, loose or out of adjustment	Repair, adjust or replace linkage
	Oil level low	Fill reservoir to correct level
	Drive chain broken	Replace drive chain
	Drive chain tensioned incorrectly	Adjust the tension of the drive chain correctly
	Bypass loose	Tighten pump bypass
	Inlet leak	Check all external lines and connections to pump inlet

**Table 2. Unit is noisy**

Fault	Probable Cause	Action
Unit is noisy	Excessive input speed	Adjust to correct rpm setting (see Yanmar engine manual)
	Oil level low or oil is contaminated	Fill reservoir to proper level or change oil
	Excessive loading	End the cause of excessive loading
	Air trapped in hydraulic system	Purge hydraulic system as per procedure
	Bypass loose	Tighten pump bypass
	Inlet leak, line or filter partially blocked or damaged	Check all external lines and connections and filter to pump inlet.

**Table 3. Unit has no or low power**

Fault	Probable Cause	Action
Unit has no or low power	Engine and hydraulic oil cold	Allow engine and hydraulic oil to warm up to warm up
	Engine speed low	Adjust to correct rpm setting (see Yanmar engine manual)
	Control linkage bent, loose or out of adjustment	Repair, adjust or replace linkage
	Drive belt slipping or pulley damaged	Repair or replace drive belt pulley
	Oil level low or oil is contaminated	Fill reservoir to proper level or change oil
	Excessive loading	End the cause of excessive loading
	Air trapped in hydraulic system	Purge hydraulic system
	Inlet leak	Check all external lines and connections to pump inlet
	Inlet filter clogged	Replace inlet filter
	Suspected internal damage	Check pump by performing a flow test



## Section E - Hydraulics Fault Finding

Hydraulic System

**Table 4. Unit operating hot**

<b>Fault</b>	<b>Probable Cause</b>	<b>Action</b>
Unit operating hot	Build up of debries  Oil level low or oil is contaminated Excessive loading Air trapped in hydraulic system Inlet leak	Remove debries from pump area Remove debries from oil cooler area (if fitted) Fill reservoir to proper level or change oil End the cause of excessive loading Purge hydraulic system Check all external lines and connections to pump inlet

**Table 5. Pump leaks oil**

<b>Fault</b>	<b>Probable Cause</b>	<b>Action</b>
Pump leaks oil	Damaged seals and gaskets Air trapped in hydraulic system	Remove debries, replace seals Purge hydraulic system



**Vibration System Fault Diagnosis Tables - VMS 71, 71-20 and 71-30**

**Table 6. Vibration System Faults**

<b>Fault</b>	<b>Probable Cause</b>	<b>Action</b>
Engine stalls when vibrator engaged	Engine is cold and hydraulic oil is cold	Allow engine to warm up before using vibrator
Vibrator does not rotate at full speed /reduced vibrator performance	Engine is cold and hydraulic oil is cold	Allow engine to warm up before using vibrator
	Engine speed low	Adjust to correct rpm setting (see Yanmar engine manual).
	Slipping drive belt	Check condition of drive belt and pulley, adjust or replace as necessary
	Drive belt broken	Replace drive belt
	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.	

# Service Procedures

## Hydraulic Contamination

TE-002\_2

### Hydraulic Fluid Quality

Construction machinery uses a large volume of fluid in the hydraulic system for power transmission, equipment lubrication, rust prevention and sealing. According to a survey conducted by a pump manufacturer, seventy per cent of the causes of problems in hydraulic equipment were attributable to inadequate maintenance of the quality of the hydraulic fluid. Therefore, it is obvious that control of the quality of the hydraulic fluid helps prevent hydraulic equipment problems and greatly improves safety and reliability. Furthermore from an economic angle it extends the life of the hydraulic fluid if quality is maintained.

### Effects of Contamination

Once inside the system, hydraulic circuit contaminants greatly effect the performance and life of hydraulic equipment. For example, contaminants in a hydraulic pump develop internal wear to cause internal leakage and hence lower discharges. Wear particles generated will circulate with the hydraulic fluid to cause further deterioration in the performance of this and other equipment. Contaminants also enter principal sliding sections of the equipment causing temporary malfunction, scuffing, sticking and leakage and can lead to major problems. The main contaminants can be classified as follows:

- 1 **Solid Particles** - sand, fibres, metallic particles, welding scale, sealing materials and wear particles etc.
- 2 **Liquid** - usually water and incompatible oils and greases.
- 3 **Gases** - Air, sulphur dioxide etc. which can create corrosive compounds if dissolved in the fluid.

These contaminants can appear during manufacture, assembly and operation.

### Cleaning Operation

The purpose of cleaning oil is to remove contaminants of all types and sludge by filtering hydraulic fluid through a

cleaning unit. → [Fig 1. \(□ E-21\)](#). General Bulletin 011 also refers.

#### Procedure

Connect the cleaning unit in place of the hydraulic filter. → [Fig 1. \(□ E-21\)](#). Run the system for sufficient time to pump all the hydraulic fluid through the unit. Disconnect the cleaning unit and reconnect the filter. Top up the system with clean hydraulic fluid as required.

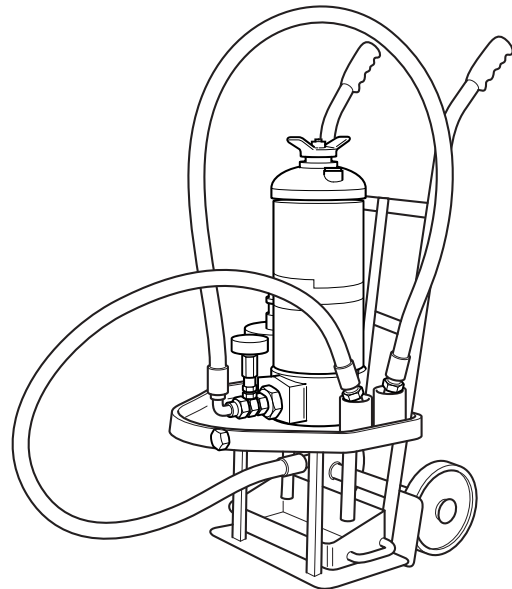


Fig 1. Cleaning Unit

### Contaminant Standards

Dirt that damages your system is in many cases too small to be seen with the eye. The particle size is measured in microns.

1 micron = 0.001 mm (0.0000394 in).

Listed below are a few typical comparisons:

- Red Blood Cell = 8 microns (0.008 mm, 0.000315 in)
- Human Hair = 70 microns (0.07 mm, 0.00275 in)
- Grain of Salt = 100 microns (0.1 mm, 0.00394 in)

Smallest particle visible to the naked eye is 40 microns (0.00157) approximately.

Standards will often be quoted to ISO (International Standards Organisation) for which literature can be obtained.

### Filters

The filter assembly fitted to all product ranges is designed to filter all the contamination that is generated through use to the required level of cleanliness. The filter must be serviced to the requirements of the machine Service Schedules.

To ensure optimum performance and reliability it is important that the machines hydraulic system is serviced periodically in accordance with the manufacturers requirements.

### Venting Hydraulic Pressure

#### **WARNING**

##### Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses or couplings, vent the pressure trapped in the hoses in accordance with the instructions given in this publication.

HYD-1-5

**Important:** This procedure is only to be used before disconnecting hydraulic hoses. Before removing any other hydraulic component refer to the relevant Removal procedure.

- 1 Park the machine and make it safe.
- 2 Carefully remove the hydraulic tank filler cap and vent the hydraulic pressure as follows:
  - a Operate the controls of the Vibrator on the operators handle on and off several times.
  - b Operate the forward and reverse control lever on the operators handle several times.
- 3 Refit the hydraulic tank filler cap.

## Connecting/Disconnecting Hydraulic Hoses

### Introduction

The following paragraphs describe how to connect and disconnect hydraulic hoses safely.

### Connecting the Hoses

- 1 Connect the hoses.
  - a For Quick Release Couplings refer to the correct data. [⇒ Quick Release Couplings \(□ E-25\)](#)
  - b For all other hose connections, use correct tools and ensure that connections are not cross-threaded. Support the weight of the hose until the connection is made. Do not exceed the recommended torque loading.

### WARNING

#### Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses and gloves. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10\_3

- 2 Check for leaks as follows:
  - a Start the engine.
  - b Operate the controls to pressurise the required hose.
  - c Switch off the engine. Remove the starter key. Check for signs of leakage at the hose connections.

### Disconnecting the Hoses

- 1 Vent the hydraulic pressure. [⇒ Venting Hydraulic Pressure \(□ E-23\)](#).
- 2 Disconnect the hoses.

- a For Quick Release Couplings see the procedures in this section. [⇒ Quick Release Couplings \(□ E-25\)](#)
  - b For all other hose connections, plug both sides of the connection to prevent loss of fluid.
- 3 Check for leaks. See step 2. [⇒ Connecting the Hoses \(□ E-24\)](#)

## Quick Release Couplings

T4-001\_2

### Connecting and Disconnecting

Flat face quick release couplings allow the operator to remove and install attachments swiftly and efficiently. Generally, your machine pipework will be fitted with a female coupling **A** and a male coupling **B**. The optional attachment hoses will also be fitted with a female coupling **A** and a male coupling **B**. → [Fig 2. \(E-26\)](#).

The quick release couplings should be trouble free and relatively easy to connect and disconnect, provided they are kept clean and used correctly. The recommendations listed below should always apply when using flat face quick release couplings.

Finally, please read the correct fitting and releasing procedures before installing or removing any optional attachment fitted with quick release couplings.

### Quick Release Couplings - Do's and Don'ts

- Do wipe the two faces of the coupling and make sure they are clean before connecting.
- Do make sure the outside sleeve (female coupling) is pulled back when disconnecting.
- Do connect and disconnect a new coupling two or three times to 'work' the PTFE seals - sometimes a new coupling will stick if the seals have not been 'worked'.
- Do use a spanner on the hexagon flats of the coupling when fitting adaptors.
- Do use a rubber or hide hammer to disconnect a coupling if it sticks - sticking may occur if there is dirt present in the coupling.
- Don't attempt to re-connect a damaged half coupling - this will destroy the seals and necessitate replacing both half couplings.
- Don't leave the coupling where it may be run over by a machine or otherwise crushed - this will distort the coupling sleeve and prevent correct connection and disconnection.
- Don't clamp on the smooth diameter of the coupling when fitting adaptors - always use the hexagon.
- Don't try to turn the sleeve (female coupling) when the coupling has been disconnected - the locking ball will

wedge underneath the sleeve and destroy the coupling.

- Don't damage the faces of the couplings - this can prevent connection and disconnection, or damage seals and cause leakage.
- Don't try to dismantle the couplings - they are non serviceable parts. If a coupling is damaged it should be replaced with a new one.

### WARNING

**Hydraulic fluid at pressure can injure you. Make the machine safe before connecting or disconnecting quick release couplings; stop the engine and then operate the attachment control a few times to vent residual hydraulic pressure in the attachment hoses.**

2-4-1-11

### WARNING

**The external surfaces of the couplings must be clean before connecting or disconnecting. Ingress of dirt will cause fluid leaks and difficulty in connecting or disconnecting. You could be killed or seriously injured by faulty Quick Release Couplings.**

2-4-1-15

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.

#### Connecting Quick Release Couplings

- 1 Remove any residual hydraulic pressure trapped in the service line hose.
- 2 Wipe the two faces of the male and female couplings and make sure they are clean.
- 3 Make sure that ball **2-C** in the female coupling is located in one of its slots.
- 4 Fit the male coupling into the female coupling; To ensure that the coupling is not accidentally released, rotate sleeve **2-E** half a turn and make sure that the locking ball **2-C** does not align with the slot **2-D**.

#### Disconnecting Quick Release Couplings

- 1 Remove any residual hydraulic pressure trapped in the service line hose.
- 2 Align the slot **2-D** with ball **2-C**.
- 3 Pull back sleeve **2-E** to release the coupling.

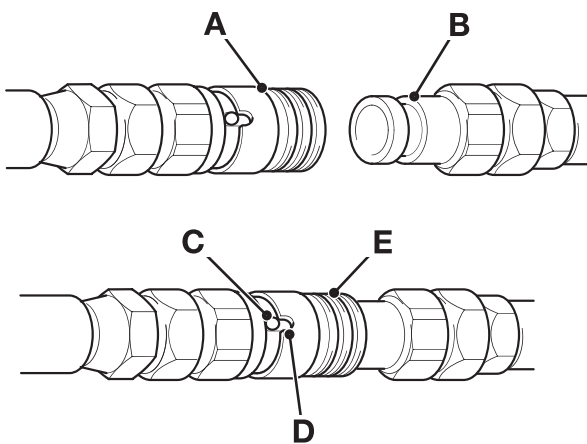


Fig 2.

### 'Positional Type' Hydraulic Adaptors

#### Fitting Procedure

On a typical machine, some hydraulic components may utilise 'Positional Type' SAE Hydraulic Adaptors. When fitting 'Positional Type' Hydraulic Adaptors it is important to adopt the following procedure. If this procedure is not followed correctly, damage to the 'O' ring seal **3-A** can occur resulting in oil leaks.

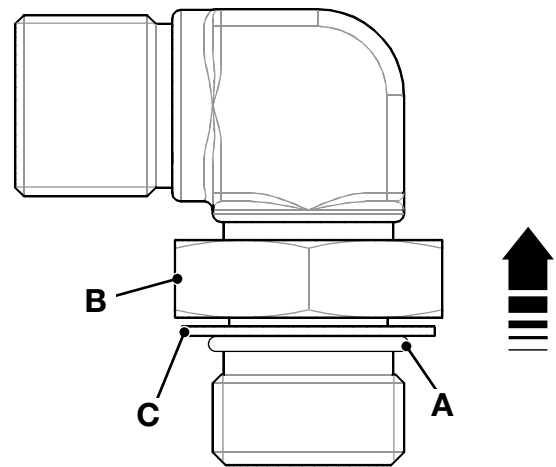
- 1 Ensure the locknut **3-B** is screwed back onto the body of the adaptor as far as possible as shown.
- 2 Check the 'O' ring backing washer **3-C** is a tight fit on the adaptor. Note that the washer should not move freely, if the washer is slack do not use the adaptor.
- 3 Check the 'O' ring **3-A** is fitted and that it is free from damage or nicks. Before fitting the adaptor, smear the 'O' ring with clean hydraulic fluid.

**Note:** The dimensions and shore hardness of the 'O' ring is critical. Should it become necessary to replace the 'O' ring, ensure that only JCB Genuine Parts are used.

- 4 Screw the adaptor into the port of the hydraulic component as far as possible, so that ALL the threads engage and the 'O' ring is correctly seated against the sealing face.
- 5 Set the angular position of the adaptor as required, then secure by tightening the locknut **3-B**.

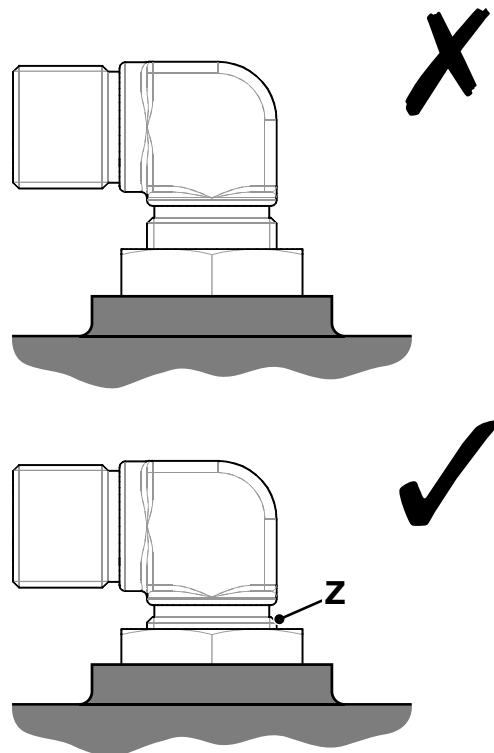
**Note:** When fitted correctly no more than one thread should be visible at **4-Z** as shown.

- 6 Torque tighten the locknut to 81 Nm (60 lbf ft).



449790

Fig 3.



449800

Fig 4.

### Return to Neutral Setting

The Hydrogear PG pump has a return to neutral mechanism fitted. It is designed to return the pump control (swash) lever to neutral when the operator releases the direction control lever.

**The VMS 71 neutral position is factory set and should not require further adjustment.**

If the machine creeps or moves when the direction control lever is set to NEUTRAL, swash plate adjustment is required.

Should components have to be removed or replaced, the return to neutral setting procedure is shown below.

#### CAUTION

**Hot oil and engine components can burn you. Make sure the engine is cool before doing this job.**

2-3-3-2

#### WARNING

##### Fluid Under Pressure

**Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.**

INT-3-1-10\_2

**Important:** Adjustment of machinery when running can result in personal injury or death. It is recommended that adjustments are carried out only when the engine is not running and that the engine is restarted each time to check the results of the adjustment.

- 1 Make sure that the engine is stopped and the machine is correctly parked and chocked on firm level ground.
- 2 Turn the battery isolator switch to the OFF position and remove the key.
- 3 Gain access to the hydraulic pump area by draining the water tank and pivoting the tank over. **See Section 3.**

- 4 Remove the drive belt cover. **See Section 3, Removal of the Drive Belt Cover.**

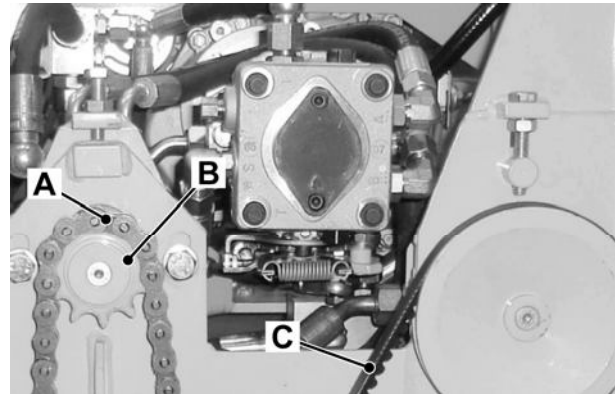


Fig 5.

- 5 Remove the drive chain **5-A** from the travel drive motor pinion **5-B**. Make sure you do not contaminate the vibrator drive belt **5-C** with chain lubricant. **See Section F, Transmission, Travel Drive Chain Removal and Replacement.**

Return to Neutral Setting

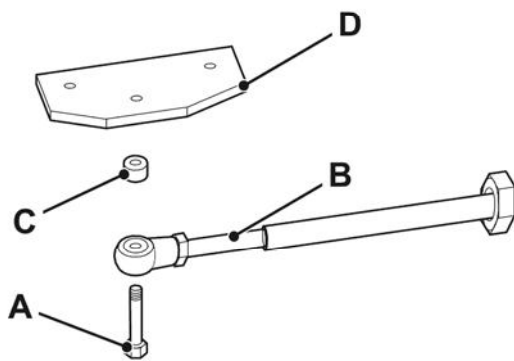
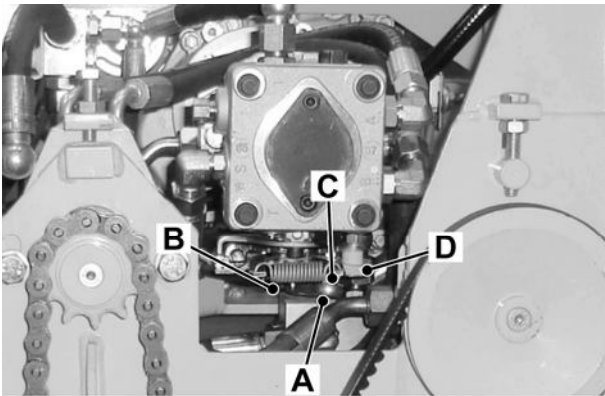


Fig 6.

Table 1.

Item	Description
A	Control Cable Fastening Screw
B	Control Cable - Forward and Reverse
C	Spacer - Control Cable Ball Joint
D	Extension Plate - Swash Lever Control

- 6 Remove the control cable fastening screw **6-A** to the pump linkage.
- 7 Make sure that the vibrator control lever is set in the OFF position. **See Section 3.**
- 8 Insert the key in to the battery isolator and turn to the ON position. Start the engine and set to run speed.
- 9 Check for rotation of the travel drive motor.

- 10 If the motor does not rotate, go to step 11. If it does rotate, note the direction of rotation. Go to step 14.
- 11 Make sure the engine is stopped and turn the battery isolator switch to OFF. Remove the battery isolator key.

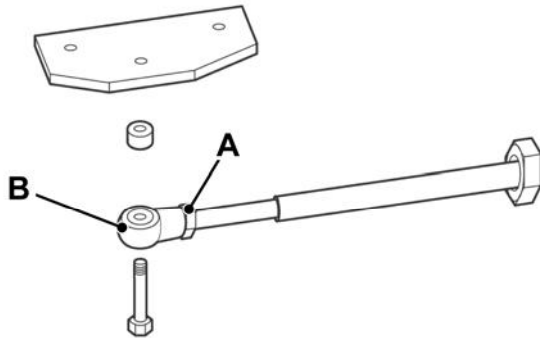


Fig 7.

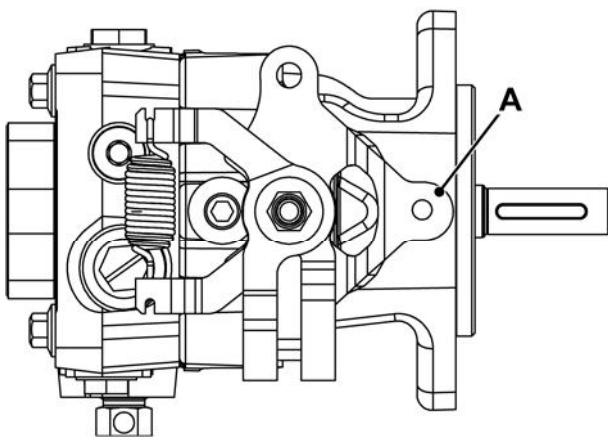


Fig 8.

- 12 Re-attach the control cable to the travel drive pump. Whilst doing so, **make sure that:** -

The travel drive hand control lever remains in the NEUTRAL position

The travel drive pump control lever **8-A** does not move at all. Adjust the linkage by undoing locknut **7-A** and turning ball joint **7-B** as required. Tighten the locknut to the correct torque when adjustment is completed.

- 13 Recheck the return to neutral operation by repeating steps 7 to 9.

If the motor does not rotate, go to step 19. If it does rotate, go to step 14.

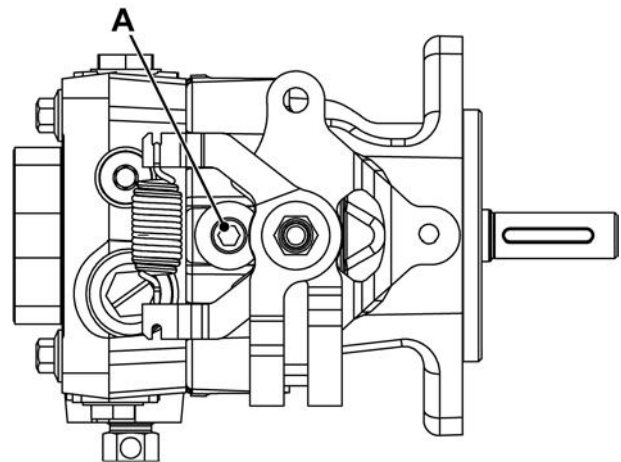


Fig 9.

- 14 Stop the engine. Turn the battery isolator switch OFF and remove the key.

- 15 Loosen the RTN adjustment screw **9-A** until the control arm can be rotated.

- 16 Rotate the control arm in the correct direction and tighten the RTN adjustment screw. Make a note of the adjustment so that further adjustment can be determined more easily.

- 17 Insert the battery isolator key and turn to the ON position. Start the engine and recheck that the travel drive motor does not rotate. If it still rotates, note the direction of rotation of the travel drive motor. Stop the engine. Turn the battery isolator switch to OFF and remove the key

- 18 Repeat steps 15 to 17 as required. If the travel drive motor does not rotate, go to step 19.

- 19 Make sure that the engine is stopped. Turn the battery isolator switch to OFF and remove the key. Make sure that all adjustment fasteners are correctly tightened. Reassemble the machine. Reassembly is the reversal of steps 1 to 8. **See Section F, Transmission, Travel Drive Chain Removal and Replacement.**

## Hydraulic Pressure Testing

### Attachment Hydraulic Circuit

The attachment hydraulic circuit can be pressure tested using the following method:

Before you begin pressure testing, read the safety information at the beginning of this manual. **See section 2, Safety and section 2, Procedures.**

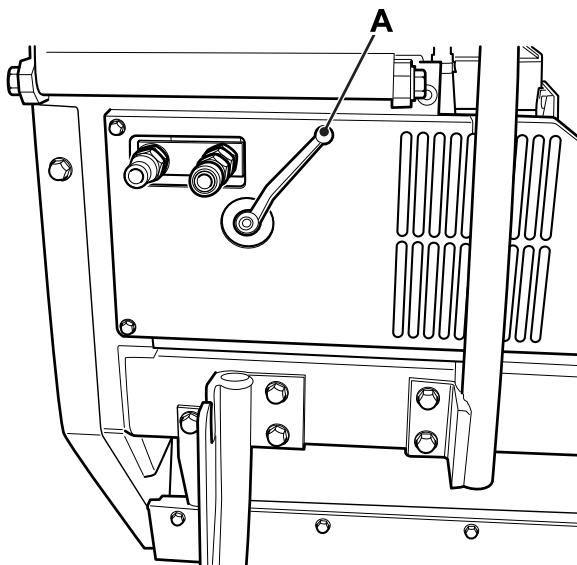


Fig 10.

- 1 Switch off the engine and leave for one minute. Make sure that the attachment lever valve **10-A** is in the OFF position. This will make sure that circuit pressure is vented.

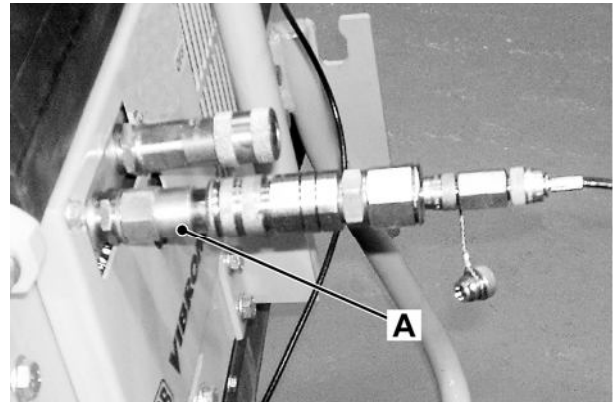


Fig 11.

- 2 Connect the correct pressure measurement equipment to the flat face coupling on the output flow side **11-A**.
- 3 Start and warm up the engine and hydraulic system if required.
- 4 To measure the system pressure:
  - Set the engine to maximum speed position
  - Turn the attachment lever valve **10-A** to the ON position
  - Record the pressure reading
- 5 When the reading is taken, turn the attachment lever valve **10-A** to the OFF position.
  - Set the engine to idle for 30 seconds and then turn off the engine
- 6 Do not disturb any hydraulic connections for a minute to allow hydraulic pressure to vent.

**Note:** The attachment hydraulic manifold incorporates a pressure relief valve which is factory set. Further adjustment should not be required.



## **Removing and Replacing Components**

Renewal of oil seals, gaskets, etc. and any component showing obvious signs of wear or damage is expected as a matter of course. It is expected that components will be cleaned and lubricated where appropriate and that any open hose or pipe connections is blanked to prevent excessive loss of hydraulic fluid and the ingress of dirt.

# Travel Drive Pump

## Description

The JCB Vibromax VMS 71 is equipped with a Hydro-Gear PG hydrostatic axial piston pump, → [Fig 2. \(□ E-34\)](#). It features a cradle swashplate with a direct proportional displacement control and a fixed displacement gear rotor charge pump.

Oil from an external reservoir and filter is pumped into the closed loop by a charge pump. Fluid not required to replenish the closed loop flows either into the pump housing through a cooling orifice, or back to the charge pump inlet through the charge pressure relief valve.

Check or shock valves are included in the pump end cap to control the makeup oil flow for the system.

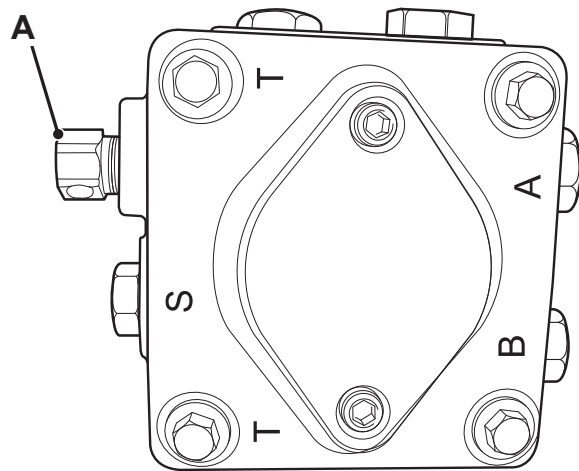
To allow movement of the machine in the event of a engine failure, a screwtype bypass valve **2-A** is fitted. The valve permits low speed movement of the machine over a short distance. The bypass valve is fully opened when unscrewed two and a half (2.5) turns maximum. Before doing this procedure, make sure you refer to: ***Operators Handbook, Operation, Moving a Disabled Machine.***

The bypass valve allows oil to be routed from one side of the pump/motor circuit to the other, thus allowing the motor to turn with minimal resistance.

The bypass valve must be fully closed during normal operation.

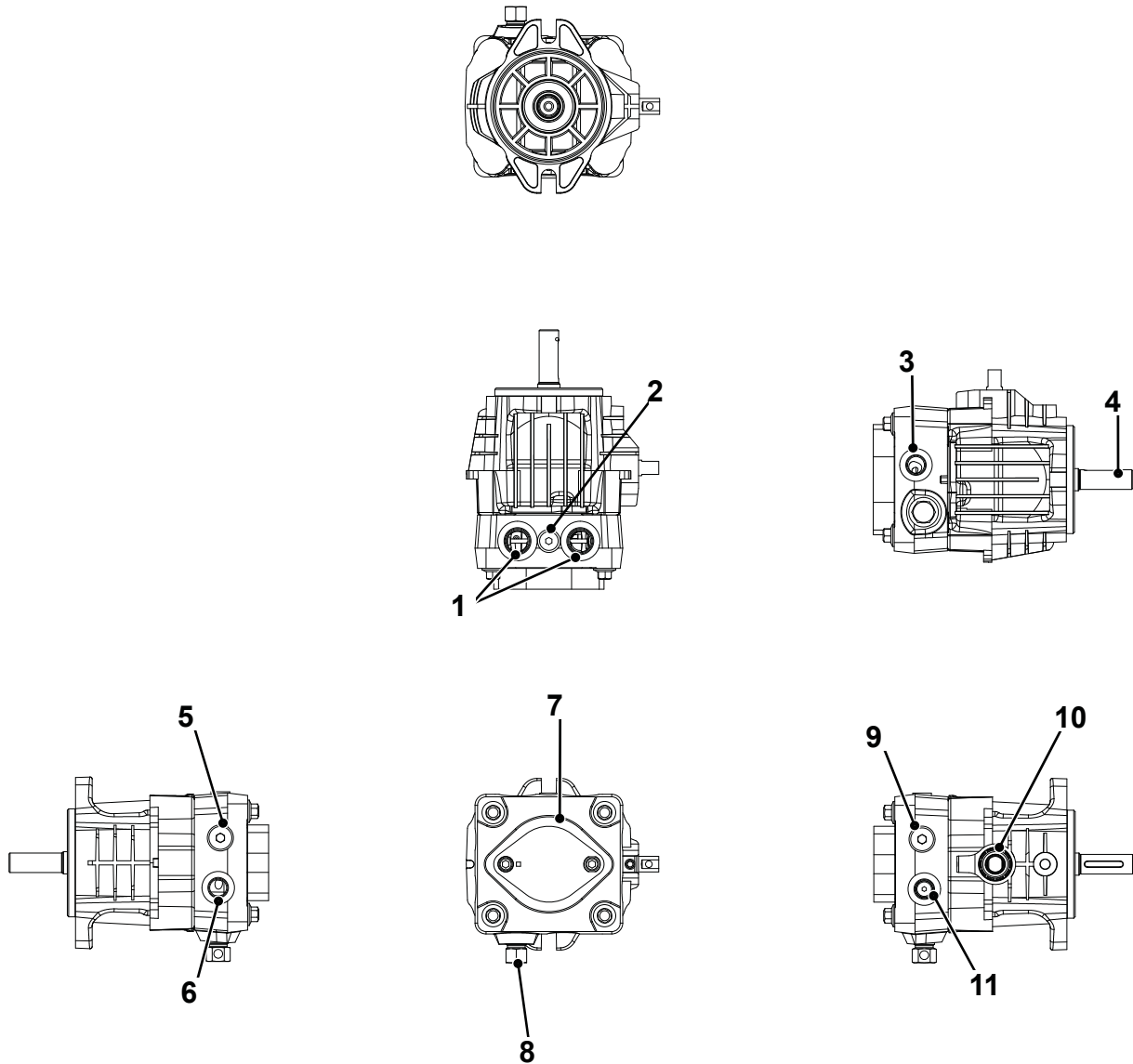
See → [Technical Data \(□ E-1\)](#).

For further information, see the Hydrogear service manual.



C076240-C2

Fig 1.



**Fig 2. Travel Drive Pump**

**Table 1.**

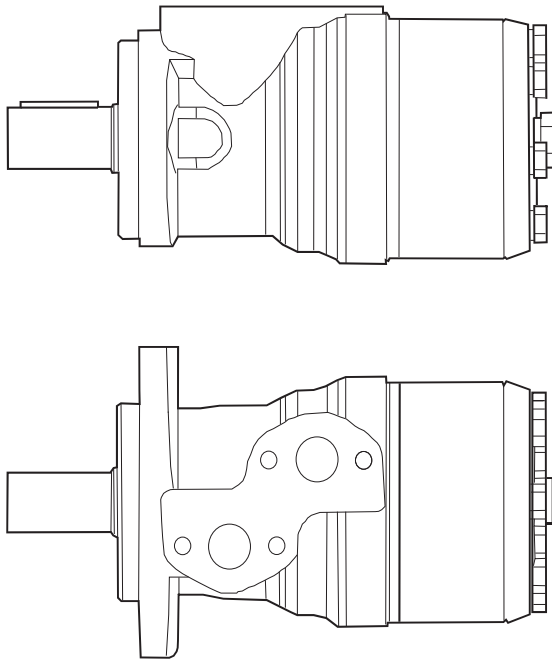
Item	Description
1	"A" and "B" Ports
2	Charge Pressure Diagnostic Port
3	Inlet
4	Input Shaft
5	Standard Check Valve or SCR
6	Case Drain Option

Item	Description
7	Charge Cover
8	Bypass Valve
9	Standard Check Valve or SCR
10	Trunnion Arm
11	Case Drain Option

# Travel Drive Motor

## Description

The VMS 71 is fitted with a Sauer-Danfoss OMR 250 fixed displacement orbital motor → [Fig 1.](#) ([E-35](#)).



**Fig 1.**

See → [Technical Data](#) ([E-1](#))

For further information see the Sauer-Danfoss service manual.



Page left intentionally blank

# Vibrator Drive Pump

## Description

The hydraulic pump is a unidirectional gear pump.

⇒ [Technical Data \(E-1\)](#).

For further information see the Sauer-Danfoss service manual.



## Section E - Hydraulics Vibrator Drive Pump

Description

Page left intentionally blank

# Vibrator Drive Motor

## Description

The hydraulic motor is a bidirectional gear motor with an anti cavitation check valve fitted.

See → [Technical Data \(E-1\)](#).

For further information, please refer to the Sauer-Danfoss motor manual.



Page left intentionally blank

# Hydraulic Oil Tank

## Oil Tank Cover Removal and Replacement

### Introduction

The hydraulic oil tank is fabricated as part of the machine end cover.

Installed inside the tank is a canister type oil filter and a gauze strainer.

The top cover can be resealed using JCB Multi-gasket, part number 4102/1212.

The tank has a top cover **2-B** that can be removed to access the inside of the tank.

### Removal

- 1 Drain off the contents of the water tank **1**, prior to parking the machine in the working area. **See section 3- Draining the sprinkler system.**
- 2 Park the machine on firm level ground and switch off the engine - follow the parking procedure **See Section 3- Stopping and parking the machine.**
- 3 Vent the hydraulic circuits. **See section E, Service Procedures.**
- 4 Isolate the battery using the battery isolator switch.
- 5 Loosen the nut **1-A** securing the water tank and lift the tank over on its pivot gain better access.

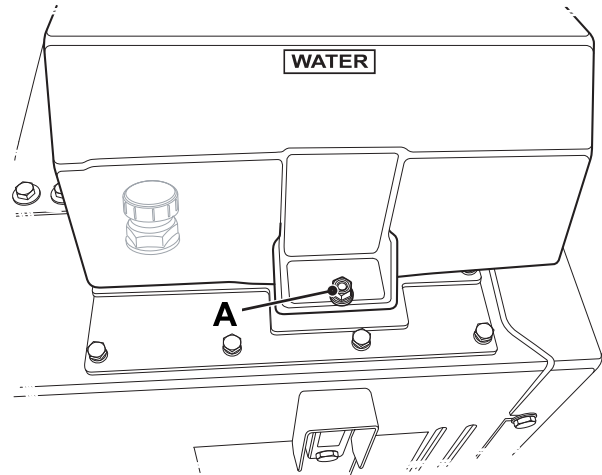
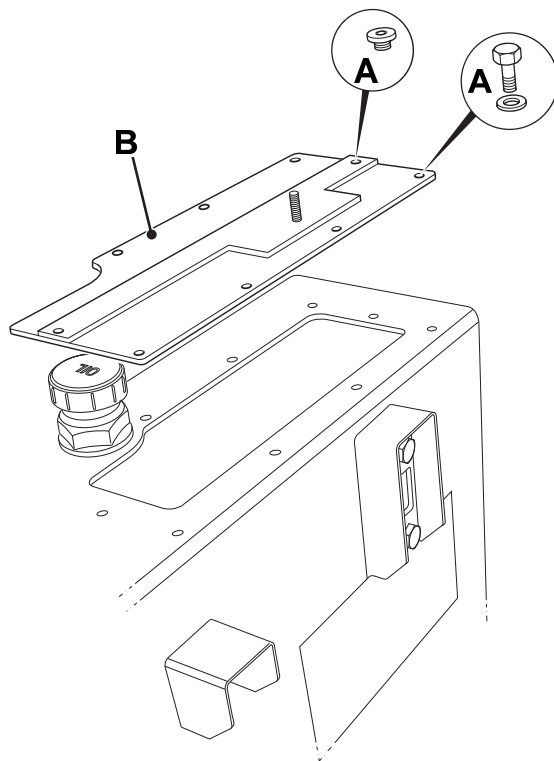


Fig 1.

- 6 Remove the 9 bolts securing the hydraulic fluid reservoir cover **2-B**. Remove the cover.



**Fig 2.**

### Replacement

- 1 Remove any residue of silicone sealant from the top cover and tank. Make Sure that the mating surfaces are clean, dry and oil free.
- 2 Clean bolts for refitting and renew sealing washers if required
- 3 Apply the correct sealant on the mating face of the tank.

**Note:** Do not apply too much sealant as the residue may contaminate the hydraulic oil.

- 4 Refit tank cover and gradually tighten the cover bolts to the correct torque.
- 5 Check hydraulic oil level. Adjust if required.
- 6 Refit water tank and tighten securing nut to the correct torque.



**Page left intentionally blank**