A division of Rig Technology Limited
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THULE RIGTECH

VSM 100

LINEAR MOTION

SHALE SHAKER

OPERATING MANUAL

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SECTION 1.0 -

GENERAL EQUIPMENT DETAILS

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SECTION 1.0 - GENERAL EQUIPMENT DETAILS

1.1 INTRODUCTION

The VSM 100 Shale Shaker is well proven to meet the demands of the oilfield drilling industry and is purpose built to provide a more efficient primary solids removal system.

1.2 EQUIPMENT DESCRIPTION

The VSM 100 Shale Shaker is designed on a modular basis thus enabling multi unit installations and flexible configurations to be achieved using standard equipment. The modular design construction is also advantageous on existing rig locations where the equipment can be easily installed into the shaker room through a standard shaker house door.

1.3 DESCRIPTION OF MAIN COMPONENTS

1.3.1 Basket/Head Assembly

The basket/head assembly is supplied in accordance with Thule Rigtech standard equipment design and manufacturing process. The vibratory head is fitted with two (2) electric motors which have been manufactured by Brook Hansen in accordance with Thule Rigtech's standard electric motor specification.

The electric motors drive counter rotating shafts which induce vibration into the basket/head assembly. The basket is mounted onto the skid base via four (4) springs.

1.3.2 Skid Base

The skid base is manufactured to form a fluid sump and is located under the basket/head assembly. It is used to collect the processed mud before it is returned to the mud tanks.

Each skid base is manufactured with two (2) exit gates, one at each side, which enables the mud to flow into either an adjacent link section or a site built ditch.

1.3 DESCRIPTION OF MAIN COMPONENTS (Continued)

1.3.3 Link Sections

The link sections between the shale shakers are used for the following functions:

Comment:

- Distribution of mud between skid bases
- Header tank dump/bypass facility
- Access walkway between shale shakers

The various options are achieved by opening/closing the appropriate sluice gates on the link section to divert the mud flow as required.

1.3.4 Header Tank Assembly

The header tank units supplied with standard equipment are of a shallow modular design with the following options available:

- Header tank only
- Header tank with splitter box
- Header tank link section
- Header tank link section complete with dump valve
- Header tank link section complete with splitter box and dump valve
- Feed chutes

The configuration of the header tank assembly will be dependent on the number of shale shakers installed.

1.3.5 HVAC Enclosures (where applicable)

The HVAC enclosures mounted onto the shale shakers are in accordance with Thule Rigtech standard design and manufacture but with the interface connection on the duct outlet modified to suit project requirements.

The HVAC enclosure is supplied with access doors at the front and on each side for operational and maintenance requirements.

1.3 **DESCRIPTION OF MAIN COMPONENTS** (Continued)

1.3.6 **Screens**

The wire mesh screen panels used on the VSM 100 Shale Shaker can be easily changed out to suit operational conditions.

The following screen types are used:

- Top Deck Screens (Scalping Screen)

  The top deck of the VSM 100 has a hook strip screen which is used to scalp off large volumes of solids thus protecting the finer mesh on the lower deck screens. This is achieved by using a top screen with mesh sizes ranging from 8 - 30. Manual tensioning is achieved using tensioning bolts located on each side of the top frame.

- Lower Deck Screens (Primary)

  The lower deck screen configuration on the VSM 100 comprises four (4) multipanel pretensioned screens. The two (2) screens at the rear of the shale shaker are mounted horizontally and the two (2) screens at the front are ramped. This screen configuration enables a larger surface area to be covered by a larger head of fluid. This results in a higher throughput capacity.

  The lower screens are retained in position by a pneumoseal clamping system which enables a fast changeout of screens to be achieved.

- Secondary Screens (Drying Screens)

  Optional mounting carriers are provided to enable secondary screens to be fitted to the front of the lower deck screens. This facility should be used to reduce fluid levels on cuttings when drilling with low toxicity or synthetic oil based muds.

  The secondary screens are fitted onto mounting carriers with four (4) bolt assemblies.

1.4 PRINCIPLE OF OPERATION

The configuration on each installation will vary depending on final equipment layout but the basic principle of operation is simple.

The mud return flowline is diverted into the splitter box on the header tank and the mud is evenly distributed into the main header box section by manually operating the. sliding gate valves which are located between the splitter box and the header tank.

The flow over each shaker is regulated by operating the three (3) sliding gate valves which are located at the feed chute/header tank interface. The processed mud flows through the shale shaker and is discharged back to the mud distribution gutter via the skid base outlet gates.

The cuttings from the shale shaker are transported over the screens to the front of the unit and discharged into the cuttings ditch. The shale shaker package has the facility to divert mud returning through the flowline directly into the cuttings ditch by closing the isolation gate valves within the main header tank and opening the dump valve in the bypass link section.

The VSM100 has the optional facility of being fitted with a specifically designed HVAC enclosure should this be required. The design of the enclosure is such that any fumes are contained within the enclosure whilst still allowing adequate access to the equipment for operational and maintenance activities.

1.5 STRENGTH OF COMPONENTS

The VSM 100 shale shaker was subjected to extensive testing during the final design stages, under actual working conditions, to confirm suitability of component materials.

The shale shakers have also undergone various minor design upgrades to ensure the equipment meets the requirements of the operating environment.

All the materials used in the manufacture of the shale shaker components are new and of suitable strength to meet the applied working conditions.

SECTION 2.0 -

TECHNICAL SPECIFICATION

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SECTION 2.0 - TECHNICAL SPECIFICATION

IMPORTANT NOTE:

The Specification below relates to Thule Rigtech's **STANDARD** VSM 100 Shale Shaker. All components listed are manufactured as standard items.

Different electrical and dimensional/weight configurations are available and the customer should contact Thule Rigtech directly for information on these.

The specifications were correct at time of printing. However, Thule Rigtech's policy is one of continuous development and therefore Thule Rigtech reserve the right to amend the equipment specification at their discretion. Thule Rigtech accept no liability for loss or damage incurred through the use of the data attached. It is recommended that the customer contact Thule Rigtech for a current status if in doubt.

2.1 EQUIPMENT SPECIFICATION

2.1.1 General

Equipment Type	-	Linear Motion Shale Shaker
Vibratory Motion Type	-	Linear
Angle of Motion	-	Fixed
Speed of Vibration	-	Fixed

2.1.2 Screening Arrangement

Screen Configuration	-	Dual Deck	
Screen Type	-	Scalping	- Removable Hook Strip
	-	Primary	- Pretensioned Multi-Panel : Repairable
	-	Secondary	- Pretensioned Panel
Solids Drying Deck	-	Optional Secondary Screen Module (Supplied)	
Scalping Screen Tensioning	-	Mechanical	- Hook Strip
Primary Screen Clamping	-	Pneumatic	
Secondary Screen Clamping	-	Mechanical	- Bolted fixing

2.1 EQUIPMENT SPECIFICATION (Continued)

2.1.2 Screening Arrangement (Continued)

Screen Angles	-	Scalping	-	0º
	-	Primary (rear)	-	0º
	-	Primary (front)	-	10º
	-	Secondary	-	5º
Screen Angle Adjustment	-	No	-	Fixed
Screen Areas	-	Scalping Screen Deck	-	1.39m^2 / 15 ft^2
	-	Primary Screen Deck	-	2.04m^2 / 22 ft^2
	-	Secondary Screen Deck	-	0.28m^2 / 3 ft^2
Mesh Sizes	-	Refer to Section 2.5		

2.1.3 Drive System

Drive System	-	Electrically Operated	-	Belt Driven

2.1.4 Air System

Air Supply Requirements	-	Pressure	-	80 - 90 psi
(for Pneumoseal Clamping System)	-	Capacity	-	0.5 ft^3m/in (intermittent)

2.1.5 Dimensions

Type of Unit:	Length:	Width:	Height:
Single	2715 mm	1870 mm	1504 mm
Dual	2715 mm	4070 mm	1504 mm
Triple	2965 mm	6270 mm	1504 mm
Quadruple	2965 mm	8470 mm	1504 mm
Quintuple	2965 mm	10670 mm	1504 mm

N.B. The above dimensions for triple, quadruple and quintuple units are based upon the header box being fitted with a 420 mm wide splitter box.

Please contact Thule Rigtech for details of this feature.

2.1 EQUIPMENT SPECIFICATION (Continued)

2.1.6 Dry Operating Weights

Single Unit	-	2080 kg
Dual Unit	-	4420 kg
Triple Unit	-	6845 kg
Quadruple Unit	-	9100 kg
Quintuple Unit	-	11360 kg

N.B. The above weights for triple, quadruple and quintuple units are based upon the header box being fitted with a 420 mm wide splitter box.
Please contact Thule Rigtech for details of this feature.

2.1.7 Screens - Boxed for Shipping

Scalping (Top) Screen	-	8.5 kg
Primary (Lower) Screen	-	13.5 kg
Secondary Screen	-	4 kg

2.2 ELECTRICAL SPECIFICATION

2.2.1 Drive Motor Specification

Make	-	Brook Hansen (Argus 55) IP56 (Specification adapted and modified to meet Thule Rigtech Requirements)		
Certification	-	BASEEFA to BS5501 Parts 1 & 5		
	-	EExd		
	-	Gas Group	-	IIB
	-	Temperature	-	T4
Rating	-	1.65kW		
Voltage	-	460V / 380V		
Frequency	-	60Hz / 50Hz		
Phase	-	3		

Full Load Current	-		60 Hz	50 Hz
		380V	N/A	4.3A
		400V	4.0A	4.1A
		415V	N/A	3.9A
		440V	3.8A	3.8A
		460V	3.6A	3.7A
		480V	3.4A	N/A

Full Load Speed	-	1720 RPM
Frame Size	-	AENV100LBC

2.2.2 Motor Starter Specification

Make	-	MEDC		
Certification	-	BASEEFA to BS5501 Parts 1 & 5		
	-	EExd		
	-	Gas Groups	-	IIA & IIB
	-	Temperature	-	T6
Approx. Dimensions	-	(W) 306 mm x (H) 266 mm x (D) 352 mm		
Approx. Weight	-	52 kg (including internal equipment)		
Material	-	Grey Iron		
Paint Finish	-	2 pack epoxy. Colour Pewter		
Ingress Protection	-	In accordance with IP65		

2.2 ELECTRICAL SPECIFICATION (Continued)

2.2.3 Motor Starter Internal Equipment

Main Fuses	-	NSD type to BS88 16 amp rated		
Control Fuses	-	Primary	-	Cartridge type to IEC 269-1 and IEC269-2, 1 amp rated
	-	Secondary	-	Cartridge type to IEC127, 2 amp rated
Contactors	-	4.5 kW AC3 DOL 3 pole		
Overload Relay	-	Thermal type adjustable from:		
		2.7 amp to 4 amp for 415 - 480V		
		4 amp to 6 amp for 380 - 440V		
	-	Reset Auto/Hand selectable		
Supply Voltage	-	Suitable for	-	380 / 440V 50 Hz 415 / 480V 60 Hz

Motor Starter Comprises:

Six (6)	Main Fuses (F1 to F6) (16 amp rated)
Two (2)	Contactors (C1 and C2)
Two (2)	N/C Auxiliary Contact Block (1 per contactor)
Two (2)	Thermal Overload Relays (OL/1 and OL/2)
One (1)	1 N° 110 V Stepdown Transformer
Three (3)	Control Fuses: two (2) - Primary PF1 & PF2 (1 amp rated) one (1) - Secondary CF1 (2 amp rated)
One (1)	Neutral Link
Fifteen (15)	Terminals: Type DK4Q
-	Unit c/w ten (10) M20 cable entries: 2 on left hand side face
	2 on right hand side face
	6 on bottom face

2.2 ELECTRICAL SPECIFICATION (Continued)

2.2.4 Remote Push-Button Unit Specification

Make	-	MEDC
Certification	-	PTB No. EX85/1024
	-	EExde
	-	Gas Group - IIC
	-	Temperature - T6
Approx. Dimensions	-	(W) 90 mm x (H) 168 mm x (D) 130 mm
Approx. Weight	-	1.0 kg
Material	-	Glass reinforced polyester
Ingress Protection	-	IP65
Contact Ratings	-	AC11 500V 2.5 amp
Unit Comprises:	-	One (1) Start push-button (Momentary)
	-	One (1) Stop latched mushroom-button (Stay put)
	-	Unit c/w two (2) M20 cable entry

2.2.5 Emergency Stop Station Specification

Make	-	MEDC
Certification	-	PTB No: Ex 85 / 1024
	-	EExde
	-	Gas Group - IIC
	-	Temperature - T6
Ingress Protection	-	In accordance with IP65
Material	-	Glass reinforced Polyester
Approx. Weight	-	0.5 kg
Dimensions	-	(W) 90mm x (H) 100mm x (D) 135mm
Internal Equipt.	-	One (1) Latched Mushroom Button (Stayput) (Emergency Stop)
Entries	-	Two (2) (1 x bottom, 1 x top - plugged) M20

2.2 ELECTRICAL SPECIFICATION (Continued)

2.2.6 Safety Isolator Specification

Make	-	ABB
Certification	-	PTB No. Ex 88.B.1048
	-	EExde
	-	Gas Group - II C
	-	Temperature - T6
Ingress Protection	-	In accordance with IP65 to IEC529
Material	-	EN Polyamide
Approx Weight	-	1.6 kg
Dimensions	-	(W)110mm x (H) 150mm x (D)160mm
Type	-	4 Pole + Auxiliary
		Safety switch with lock off facility and cover interlock in the 'OFF' position
Rated Current	-	20amps
Rated Voltage	-	690V a.c.
Ambient Temp.	-	(-20) to (+40) ^{o}C
Area of Use	-	Zones 1 and 2
Entries	-	Two (2) (bottom) M20

2.3 PAINT SPECIFICATION

Manufacturer	-	W & J Leighs & Co.	
Surface Preparation	-	Shotblasted to SA 2½	
Coating Systems	-	Two Pack Epoxy	
Colours	-	Thule Green (R4754)	
	-	Golden Yellow (BS4800 : 08.6.51)	
Description	-	Primer: Epigrip J984 -	Two pack Epoxy zinc rich anti-corrosive primer
	-	High Build: Epigrip L653 -	Two Pack Epoxy/Resin hi-build containing anti-corrosive pigments
	-	Top Coat: Epigrip M262 -	Two Pack Epoxy/Resin pigmented with high quality light fast pigments

DFT	-	Primer	-	50 microns
	-	High Build	-	150 microns
	-	Top Coat	-	50 microns

2.4 RECOMMENDED CABLE SPECIFICATION

Type	:	6EXOL - 125 IEC 600V / 1000V	
Size	:	2.3 mm^2 (14 AW6)	
No. of Conductors	:	4	
Part Ref	:	U37 - 1-2 - 509 BS	
Nominal O/D	:	15.7 mm	
Approvals	:	UL	E111461
		Lloyds	89/0075
		DNV	E - 1675 through E - 1678
		CSA	LL80350
		ABS	93 - BT52174 - X
		CCG	9400 - 20
		USCG	1987 / 9304
Construction	: i)	Conductor	Soft annealed tinned copper per ASTM B-33. Flexible stranding to Class S (IEC 228)
	ii)	Insulation	Chemically cross linked, non chlorinated thermosetting flame retardant polyolefin (XLPO)
	iii)	Armour	Basket weave wire armour per IEEE 45 and IEC 92-3, Bronze
	iv)	Base Jacket	Heavy duty Arctic grade neoprene
	v)	Outer Jacket	Same as base jacket
Properties	:	Flame retardant tested in accordance with IEEE 45 UL Temperature rating 100°C Flame test meets requirements of IEEE 45, IEC 92-3 and IEC 332-3 Tested for compatibility with PETROFREE, ENVIROMUL and XP-07 muds and base fluids	
Application	:	For machine installations with presence of vibrations on mobile drilling units, aboard ships and offshore fixed and floating production facilities.	

2.5 SCREEN DATA

2.5.1 Scalping Screens

Mesh Size:	Part No:	Aperture (Microns):	Open Area %:
8	100/SS/08	2465	60
10	100/SS/10	1976	61
20	100/SS/20	895	49
30	100/SS/30	567	45

2.5.2 Primary Screens

Mesh Size:	Part No:	Aperture (Microns):	Open Area %:
52	100/PRI/52	340	48
84	100/PRI/84	215	49
105	100/PRI/105	165	45
120	100/PRI/120	150	49
145	100/PRI/145	120	46
165	100/PRI/165	105	45
180	100/PRI/180	91	42
200	100/PRI/200	87	47
230	100/PRI/230	75	46

2.5.3 Secondary Screens

Mesh Size:	Part No:	Aperture (Microns):	Open Area %:
100H	100/SEC/100H	557 x 184	40
84	100/SEC/80	215	49

N.B. The above are STANDARD specification screens. Other screen specifications are available on request. Please contact Thule Rigtech for details.

2.6 TORQUE SETTING CHART

All bolts and threads on the equipment are of metric sizes and constructed from high tensile stainless steel (U.O.N.)

M 8	-	34 Nm (25 lbf.ft)
M10	-	68 Nm (50 lbf.ft)
M12	-	118 Nm (87 lbf.ft)
M16	-	293 Nm (216 lbf.ft)
M20	-	570 Nm (420 lbf.ft)
3/8" BSW (Taperlock Grub Screw)	-	20 Nm (15 lbf.ft)
7/16" BSW (Taperlock Grub Screw)	-	30 Nm (22 lbf.ft)

2.7 RECOMMENDED LUBRICANTS

Main Shaft Bearings	-	Shell Retinax LX2
Outrigger Bearings	-	Sealed for life
Belt Tensioner Roller	-	Sealed for life
Electric Motor Bearings	-	Sealed for life

2.8 NOISE DATA

Noise data was obtained from a noise test carried out on a single VSM 100 Shale Shaker unit which was operating under test conditions only.

		OCTAVE BAND CENTRE FREQUENCY								
LIN	dBA	31.5	63	125	250	500	1k	2k	4k	8k
80.0	79.5	68.3	57.3	70.6	66.1	68.4	75.8	73.1	70.4	64.2

Note: The sound pressure levels are measured at 1m and are the logarithmic mean of measurement results from five (5) locations around the Shaker.

SECTION 3.0 - INSTALLATION

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SECTION 3.0 - INSTALLATION

3.1 UNPACKING. LIFTING and HANDLING INSTRUCTIONS

3.1.1 Introduction

This section details the unpacking, lifting and handling instructions for Thule Rigtech Standard VSM 100 Shale Shaker equipment

3.1.2 Unpacking

The equipment will be delivered to site as palletised units and will consist of the following packages:

- Shale Shaker Assemblies comprising - Vibratory Head/Basket with or without the skid base and header tank
- Link Section(s)

The total number of packages delivered will depend on the quantity and configuration of the system required. Final packing details will be available on dispatch.

The equipment shall be unpacked by removing the polythene protective outer cover and by cutting the fixing bands which are used to retain the equipment onto the pallets.

Note: Transportation brackets are used to retain the basket onto the skid base and these should remain secured in position until the equipment is sited in its final location.

3.1 **UNPACKING, LIFTING and HANDLING INSTRUCTIONS** (Continued)

3.1.3 **Lifting and Handling**

The VSM 100 shaker is designed on a modular basis and can be dis-assembled into the following discrete components for installation (if required):

Description:	Lifting Method:	Notes:
Head Assy.	Soft slings around the drive head cross-tube	-
Basket Assy.	Soft slings around the basket or alternatively four (4) x Lifting Eyebolts can be fixed to the basket spring mounts.	Spring mounting may be removed to further reduce the basket size

Note : If eyebolts are used please ensure full certification is available.

Warning: Basket assembly must not be lifted by top frame or vibratory head

Top Frame	Soft slings/man-handle
Header Tank	Soft slings around the box section cross members at the top of the tank
Skid Base	Four (4) x padeyes - One (1) at each corner
Feed Chute	Soft slings/man-handle

For details of lifting configurations refer to Drawing No: 107-149 in Section 9.0

3.1.4 **Safe Working Load**

The safe working load for the skid base is as follows:

Padeyes for skid base (four (4) per skid) S.W.L. = 5.5kN (0.560T) per padeye.

3.1.5 **Inspection of as Delivered Condition**

On delivery, the packages must be visually inspected for any signs of damage. Any damaged areas shall be highlighted to Thule Rigtech and a further check carried out during unpacking for any damage to the equipment. Any further damage must be reported to Thule Rigtech immediately.

After unpacking, examine the contents carefully and verify that the shipment is complete according to the packing list/delivery note. Any discrepancies must be reported to Thule Rigtech immediately.

3.1 UNPACKING. LIFTING and HANDLING INSTRUCTIONS (Continued)

3.1.6 Check List for Inspection of as Delivered Condition

		(PLEASE TICK FOR APPROVAL)	
		Documents in order	**Documents not in order**
i)	Packing list/delivery note approved and complete	☐	☐
		No Damage Witnessed	**Damage Witnessed**
ii)	Check that there is no internal damage to packages and if any, check inside for any damage to equipment	☐	☐
		Equipment complete to PO	**Equipment not complete to PO**
iii)	Contents are in good condition and all components are supplied in accordance with Packing List	☐	☐

3.1.7 Removal of Preservation

Any preservation compounds, if used, shall be removed using soft brushes and copious amounts of fresh water.

Flanged connections (if applicable) which have been blanked can be removed using a suitable spanner.

3.1.8 Checklist for Removal of Preservation

		(PLEASE TICK FOR APPROVAL)	
		Completed	**N/A**
i)	Remove preservation compounds with fresh water	☐	☐
		Complete No Damage	**Flange Damage**
ii)	Remove plastic caps and connectors from all flanges and pipe ends prior to piping hook-up	☐	☐

3.2 INSTALLATION

3.2. 1 Introduction

The shale shaker package is designed on a modular basis and will be transported to site in packages to suit.

The palletised packages can be easily manoeuvred into position by forklift or other suitable mechanical handling device.

3.2.2 Siting of Equipment

The VSM 100 is supplied with an integral skid base and can be positioned directly onto the deck or above the sand traps as required.

Note: Structural checks must be carried out on the deck beams to ensure capability of supporting the applied loads from the shale shaker assembly.

To ensure the package is installed correctly the tolerances on deck levels should be + 25mm.

Link sections can be installed between single shaker units to allow underflow between the header tanks and skid base. Multiple shaker configurations can be thus achieved.

3.2.3 Location

The final location of the equipment will depend on a number of factors and since each installation will differ, each case should be carefully considered. Prior to installing equipment a full installation survey should be carried out by a Thule Rigtech service engineer.

As a guide the following areas should be addressed when considering equipment location.

- **Relationship to Flowline**

  The shaker distribution chute must be located below the bell nipple to ensure sufficient fall from and to thus avoid back up and/or spillage from the flowline.

3.2.3 **INSTALLATION - Location** (Continued)

- **Flowline Pipework**

  Flowline pipework should not include sharp bends or traps for the accumulation of solids. Open ditches/troughs should be used where possible.

  Where possible a flowline direct dump capability should be provided.

- **Flowline Connections**

  The flowline can enter the header box either from the rear or vertically from the top. On triple, quadruple, quintuple (or larger) configurations, a splitter box is supplied as standard to ensure that the optimum flow distribution is achieved.

  Valves are fitted in specific link sections of multiple units for dumping/bypassing and cleaning purposes.

- **Underflow Discharge**

  Shaker skid bases are provided with discharge gates on either side and should be connected to channel the underflow discharge to an appropriate location.

3.3 UTILITY REQUIREMENTS

The utility requirements for each shaker is as follows:

3.3.1 Electrical Power

Each shale shaker is fitted with two (2) x 1.65kW, 3 phase electric motors.

The following table lists the full load current values for different voltage/frequency combinations applicable to the VSM 100:

	Frequency:	
Voltage:	**60Hz**	**50Hz**
380	N/A	4.3A
400	4.0A	4.1A
415	N/A	3.9A
440	3.8A	3.8A
460	3.6A	3.7A
480	3.4A	N/A

3.3 **UTILITY REQUIREMENTS** (Continued)

3.3.2 **Air Supply**

An air supply is required to inflate the pneumoseal clamping system.

Pressure range	:	85 - 90 psi
Flowrate	:	0.5 ft^3/min (intermittent)

3.3.3 **Water Supply**

i) Spray Bar Assembly

A continuous drill water supply of 23 litres/hour is required per shaker for the spray bar when water based mud is being used

ii) Washdown

A high pressure wash gun is required for cleaning and washing down the shakers and screens. The cleaning medium must be suitable for the drilling fluid used.

3.4 **RETROFIT INSTALLATIONS**

The modular designed VSM 100 basket can be fitted directly onto VSM 120 and Brandt skids. Simple conversion kits are fitted to the existing skids and the VSM 100 baskets installed as direct replacements. The retrofit option should only be considered following an installation survey by Thule Rigtech.

Retrofit Kits:	Components Required for Single Unit:	
VSM 120	Two (2)	Mounting spring adapter brackets
	One (1)	Distribution chute
Brandt	Four (4)	Mounting spring adapter brackets
	One (1)	Distribution chute
	Two (2)	Front flow diverter plates

3 5 MECHANICAL INSTALLATION

The overall installation of the shaker will depend upon a number of factors including:

- Number of shakers to be installed
- Retrofitting to existing skid bases
- Supply of header tanks

The following steps should be used as a guideline for the installation of a complete shaker package which includes skid bases, link sections and header tanks. In certain locations the full workscope detailed below may not be required. However, this workscope would apply to the most common offshore scenario.

The installation to be carried out as follows:

i) Remove the distribution chute from the header tank.

ii) Release the transportation brackets (four (4) per Shaker) and lift the basket/head assembly off the skid base.

iii) Lift the header tank from the skid base.

iv) Unbolt the drive head assembly and lift it clear of the basket.

v) Position the skid base(s) and link section(s) as required. These are installed in sequence of skid-link section-skid-link section, etc.

vi) Assemble the header tank sections to the skid bases.

vii) Align the skid/header tank assembly and carry out a dimensional check.

viii) Fully weld the skid bases to the deck at the padeye locations with an 6mm fillet weld

ix) Fully seal weld the link sections to the skid bases and header tanks.

x) Seal weld joints between the header tank sections.

xi) Lower the basket assemblies on to skid bases - install the mounting springs and rubber pads.

3.5 **MECHANICAL INSTALLATION** (Continued)

xii) Install the drive heads onto the basket assemblies and torque the securing bolts to the specified settings (Refer to Section 2.5).

xiii) Re-install the distribution chutes.

xiv) Carry out the electrical hook-up of the motors. (See Section 3.6 for complete electrical hook-up).

xv) Position the pneumatic clamping panels as required.

xvi) Install a suitable air line from the control panels to shaker pneumatic clamping systems. The air line should be terminated using flexible polythene hose.

xvii) Install the spray bar assemblies onto the support posts (or support legs of fume extraction enclosures) and hook-up the drill water supply.

xviii) Paint damaged areas/weld areas with existing paint system.

3.6 ELECTRICAL INSTALLATION

For wiring details please refer to the Electrical Schematic Drawing - 107-110 in Section 9 of this Manual.

Cable Specification can be found in Section 2.4

i) **Starter Enclosure**

The unit is certified Zone 1 and has an ingress rating of IP65.

If the starter enclosure is sited within the shaker room, ensure that it is positioned away from areas subject to mud or water ingress.

The enclosure should be easily accessible and located at between 0.6m and 1.0m above the servicing level - a maximum height of 1.7m is preferred.

Warning: Hot spots on components can occur within the starter enclosure. A stainless steel notice on the outside of the enclosure warns against this hazard. The enclosure should not be opened whenever explosive gases are present and should be left for at least 30 minutes after the power has been isolated for the components to cool down.

ii) **Safety Isolator**

The unit is certified Zone 1 and has an ingress rating of IP65.

It should be sited alongside the starter enclosure in an area free from mud or water ingress. The recommended height of the operating handle is 1.7m above the servicing level.

Warning: The safety isolator must be locked OFF whilst any maintenance is being carried out on any part of the electrical system.

iii) **Remote Start/Stop Station**

The unit is certified Zone 1 and has an ingress rating of IP65.

The remote Start/Stop Station must be sited within the shaker area such that the operator can ensure that no exposed persons are in the danger zone around the machine.

It should be readily accessible for service and maintenance and mounted in such a manner as to minimise the possibility of damage from other handling or mobile equipment.

3.6 **ELECTRICAL INSTALLATION** (Continued)

iii) **Remote Start/Stop Station** (Continued)

Care should be taken to ensure that it is not placed in a hazardous situation when being operated and that the possibility of inadvertent operation is minimised.

The unit should be mounted not less than 0.6m above the servicing level - a height of 1.7m is recommended.

iv) **Emergency Stop Start Station**

The unit is certified Zone 1 and has an ingress rating of IP65.

The unit must be positioned for easy access and for non-hazardous operation by the operator or others who may need to use it. Measures against inadvertent operation should not impair accessibility.

iv) **Emergency Stop Start Station**

The unit should be mounted not less than 0 6m above the servicing level and within easy reach of the normal working position of the operator. The ideal position is central on the shaker, above and slightly forward of the drive head, supported from above the shaker.

The emergency stop should NOT be used as a functional stop for the machine but should be tested on a regular basis to ensure reliable switching. Weekly testing is recommended.

v) **Bonding Arrangement**

For details of earth bonding for the equipment refer to Drawing 107-133 in Section 9.

SECTION 4.0 - COMMISSIONING

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SECTION 4.0 - COMMISSIONING PROCEDURES

Commissioning requirements are minimal and consist of the following steps:

Note: A Checklist to be completed for each Shale Shaker

4.1 PRE-COMMISSIONING PROCEDURES

Shale Shaker - Serial No: _____ **R.H. Motor - Serial No:** _____

L.H. Motor - Serial No: _____

(Please Tick on Completion)

i)	Isolate rig power supply - One (1).	☐
ii)	Remove the two (2) vibratory head end covers.	☐
iii)	Check tension of triple V belt drive arrangements. Depending on size of pulley fitted it should be possible to deflect the belts at mid-span between 3-4mm with 15 Newtons force. Tension is adjusted by moving the belt tensioner assembly.	☐
iv)	Check pulleys and taperlocks are securely tightened to 20Nm.	☐
v)	Supply two (2) shots of grease (Shell Retinax LX2) to each of the four (4) main drive shaft bearings. Two (2) grease nipples are located at each side of the head for this purpose.	☐
vi)	Check motor starter overload setting is correct and ensure auto/hand reset lever on overload is set to the 'A' or auto setting.	☐
vii)	Check motor and control circuit(s) insulation resistance.	☐
viii)	Record resistance on attached Insulation Resistance Record Sheets	☐
ix)	Reconnect rig power supplies and check the direction of electric motors and main drive shafts. Motors should be wired for clockwise rotation resulting in counter rotation of the main shafts. (Refer to Drawing No:107-130 - Sect. 9.0)	☐
viii)	Replace end covers.	☐
ix)	Connect rig air supply to pneumoseal clamping systems and inflate to 80 - 90 psi Monitor for a period of 30 minutes to ensure pneumoseal remains inflated.	☐

***** The unit is now ready for general use *****

Signature: ..... **Date:.....**
(Commissioning Engineer)

4.2 COMMISSIONING PROCEDURES

4.2.1 After machines are operating, the following checks can be carried out:

i) Check visually and by ear for any spurious noises - i.e. loose bolts, etc., coming from the basket and vibratory head.

ii) Inspect rubber pneumoseal clamping hose assemblies for leaks and any areas of quick wear

iii) Check pressure setting on air regulator valve. This should be set at an operational value of 80 psi.

iv) The rotational speed of the shafts can be checked by use of a tachometer through the hole allocated in the end covers. The nose of the meter rod can be pressed onto the shaft end. The reading should be 1720 RPM.

v) The current drawn by the motors can be checked utilising an ammeter. The readings will depend on supply voltage. Refer to Section 3.3.1 for Current Readings.

vi) The operating temperature of the main shaft bearings can also be monitored using an LED display thermometer. The normal operating temperature should lie between 65^{o}C to 80^{o}C but after at least twelve (12) hours continuous running, this will reduce. (Bearing can safely operate up to a temperature of 100^{o}C)

vii) Check that after twelve (12) hours of continuous running, all main bearings are lubricated using two (2) shots of Shell or Retinax LX2 grease to the four (4) nipples, two (2) on each side of the vibratory unit on each VSM 100 machine.

4.2 **COMMISSIONING PROCEDURES** (Continued)

Note: A Checklist to be completed for each Shale Shaker

4.2.2 **CHECK LIST**

Shale Shaker - Serial No: _____ **R.H. Motor - Serial No:** _____

L.H. Motor - Serial No: _____

		(Please Tick)	
		Pass	**Fail**
i)	Visual and noise check If fail - try to locate loose bolts and tighten	☐	☐
		Pass	**Fail**
ii)	Inspection of clamping system If fail - change claming system	☐	☐
		O.K.	**Re-adjust**
iii)	Inspection of air regulator	☐	☐
		O.K.	**Problem**
iv)	Tachometer shaft speed check If a problem arises please contact Thule Rigtech	☐	☐
		O.K.	**Problem**
v)	Current drawn by motors If a problem arises please contact Thule Rigtech	☐	☐
		Pass	**Fail**
vi)	Assessment of bearing operating temperature over twelve (12) hours running (See Test Running Sheet)	☐	☐
		Done	**Not Done**
vii)	Re-check grease application times Every twelve (12) hours of continuous running	☐	☐

Signature: ..... **Date:.....**
(Commissioning Engineer)

4.2 **COMMISSIONING PROCEDURES** (Continued)

4.2.3 **TEST RUNNING**

Note: A Checklist to be completed for each Shale Shaker

Shale Shaker - Serial No: _____ **R.H. Motor - Serial No:** _____

L.H. Motor - Serial No: _____

		(Please Tick) O.K.	Fail/Problem
i)	Connect motors for clockwise rotation so that main shafts of Shaker rotate in opposite directions	☐	☐
ii)	Recharge grease system before switching on	☐	☐
iii)	Fit wedge frames, pneumoclamping systems and screens	☐	☐
iv)	Check air pressure is 85 - 90 psi	☐	☐
v)	Check air hose for any visible defects	☐	☐
vi)	Run unit for twelve (12) hours and record bearing housing temperatures	☐	☐

		4 Hours	8 Hours	12 Hours
Small Drive	Pulley	☐ °C	☐ °C	☐ °C
	Free End	☐ °C	☐ °C	☐ °C
Large Drive	Pulley	☐ °C	☐ °C	☐ °C
	Free End	☐ °C	☐ °C	☐ °C
Motor	Amps L/H	☐	☐	☐
	Amps R/H	☐	☐	☐

Signature: ..... **Date:.....**

(Commissioning Engineer)

4.3 COMMISSIONING - SCREEN FITTING PROCEDURE (Continued)

4.3.1 Top Deck - Hook Strip Screens

i) Slacken off the ten (10) top frame tension rail bolts.

ii) Check top frame extrusion rubbers are in place and clean. These rubbers are fitted to two (2) support rails running from the front to the back of the Shaker.

iii) With the tension rails fully slackened, slide the hook strip screen onto the tension rails ensuring the back edge of the screen is seated properly on top of the back support rail.

iv) Hand tighten tension bolts, pulling the screen down onto the rubber supports.

v) Adjust tension bolts such that the screen is central to the side rails.

vi) Tighten tension bolt nuts using a torque wrench to the correct torque. Tighten bolts in the sequence shown below. Lock tension nuts with threaded cover nuts.

		Screen Size	Torque	
Back of Unit			lbf/ft	Nm
(3)	(4)	8 Mesh	35 -38	47 - 52
(7)	(8)	10 Mesh	35 - 38	47 - 52
(1)	(2)	20 Mesh	32 -35	43 - 47
(9)	(10)	30 Mesh	32 - 35	43 - 47
(5)	(6)			
Front of Unit				

4.3.2 Lower Deck Screens (Primary)

i) Turn pneumoseal ball valve to vent position.

ii) Withdraw one front screen 10^{o} wedge piece approximately 18" from the front of the basket, leaving the wedge piece to rest on the side rails.

4.3 COMMISSIONING - SCREEN FITTING PROCEDURE (Continued)

4.3.2 Lower Deck Screens (Primary) (Continued)

iii) With the screen 'U' channel facing the operator, slide the rear screen down the wedge piece. Move to the side of the shaker and lift the rear of the screen onto the rear screen rails.

iv) With the screen 'U' channel facing the operator, slide the front screen down the wedge piece. Continue pushing until the rear of the front screen locates in the 'U' channel on the rear screen. Push both screens fully home.

v) Slide the wedge piece forward until locating dowels on the underside of the wedge are located in the holes in the basket rails.

vi) Repeat the same procedure with the second wedge piece.

4.3.3 Secondary Screens (Drying Screens)

(To be fitted when drilling with oil based mud)

i) Turn pneumoseal ball valve to 'VENT' position.

ii) Withdraw wedge piece 20 - 30cm from the front of the basket, leaving the front primary screen in position.

iii) Remove four (4) M10 set screws from the secondary screen carrier.

iv) Place secondary screen into carrier frame with silicon strips facing the front.

v) Replace and tighten the four (4) M10 set screws.

vi) Slide wedge piece fully home, ensuring locating pins on underside of wedge are in position.

vii) Repeat the procedure with the second wedge piece.

SECTION 5.0 - OPERATION

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SECTION 5.0 - OPERATION

5.1 GENERAL

Operation of the unit is simple. Operating speed, stroke angle and screen angles are fixed and require no adjustment for varying operating conditions.

NOTE : **Under no circumstances should the unit speed or basket angle be tampered with as this could result in severe screen or mechanical problems.**

5.2 SCREEN FITTING PROCEDURE

5.2.1 Top Deck - Hook Strip Screens

i) Slacken off the ten (10) top frame tension rail bolts.

ii) Check top frame extrusion rubbers are in place and clean. These rubbers are fitted to two (2) support rails running from the front to the back of the shaker.

iii) With tension rails fully slackened slide the hook strip screen onto the tension rails, ensuring the back edge of the screen is seated properly onto the back support rail.

iv) Hand tighten tension bolts, pulling the screen down onto the rubber supports.

v) Adjust tension bolts such that screen is central to side rails.

vi) Tighten tension bolt nuts using a torque wrench to correct torque. Tighten bolts in the sequence shown below. Lock tension nuts with threaded cover nuts.

		Screen Size:	Torque:	
Back			lbf/ft	Nm
(3)	(4)	8 mesh	35-38	47-52
(7)	(8)	10 mesh	35-38	47-52
(1)	(2)	20 mesh	32-35	43-47
(9)	(10)	30 mesh	32-35	43-47
(5)	(6)			
Front				

5.2 **SCREEN FITTING PROCEDURE** (Continued)

5.2.2 **Lower Deck Screens (Primary)**

i) Turn pneumoseal ball valve to vent position.

ii) Withdraw one front screen 10° wedge piece approximately 18" from the front of the basket, leaving the wedge piece to rest on the side support rails.

iii) With the screen 'U' channel facing the operator, slide the rear screen down the wedge piece. Move to the side of the shaker and lift the rear of the screen onto the rear screen rails.

iv) With the screen 'U' channel facing the operator, slide the front screen down the wedge piece. Continue pushing until the rear of the front screen locates in the 'U' channel on the rear screen. Push both screens fully home.

v) Slide wedge piece forward until locating dowels on underside of wedge are located in the holes in the basket rails.

vi) Repeat same procedure with second wedge piece.

vii) Re-inflate pneumoseal.

5.2.3 **Secondary Screens (Drying Screens)**

i) Turn pneumoseal ball valve to 'vent' position.

ii) Withdraw wedge piece 20-30 cm from front of basket, leaving front primary screen in position.

iii) Remove four (4) M10 set screws from secondary screen carrier.

iv) Place secondary screen into carrier frame with silicon strips facing the front.

v) Replace and tighten four (4) M10 set screws.

vi) Slide wedge piece fully home, ensuring locating pins on underside of wedge are in position.

5.2 **SCREEN FITTING PROCEDURE** (Continued)

5.2.3 **Secondary Screens (Drying Screens)** (Continued)

vii) Repeat procedure with second wedge piece.

viii) Re-inflate pneumoseal.

NOTE: On occasions where the facilities of the secondary screens are not required carrier frames may be removed from wedge pieces. These should be replaced with the Solids Deflector Plates - See Drawing No: 100-100 Sht 2.

5.3 **UNIT START UP PROCEDURE**

i) Ensure rig air supply is available and pressure regulator is set at 80 - 90 PSI.

ii) Turn ball valve to 'on' position, checking pneumoseals are fully inflated.

iii) Switch remote push button/starter unit to 'on' position.

iv) Open sluice gate on header box/feed chute.

v) Adjust flow until the level of fluid is approximately 6"- 8" on W.B.M, 10"-15" on O.B.M from the discharge end of the front screen. The fluid level can be adjusted by controlling the volume of fluid entering the feed chute or by careful selection of mesh size.

***NOTE*: Do not attempt to operate the unit with a higher level of fluid than has been recommended. To do so could result in screen overload and premature screen failure.**

vi) Secondary Screens

Where secondary screens are in use solids from the primary screens will fall onto the lower secondary screens for further drying. This facility is particularly useful in areas where Oil Based Muds are used.

Secondary screens are available in two (2) mesh sizes and are generally of a coarser mesh than the upper deck primary screens.

Refer to Section 7.0 - Screen Information

5.4 UNIT SHUT DOWN PROCEDURE

i) Close sluice gate on header box/feed chute.

ii) Continue to run unit until mud already on screens has been processed.

iii) Thoroughly clean down basket/head assembly and screens using appropriate medium. For water based muds use steam or high pressure water. For oil based muds use base oil gun.

iv) Switch remote push button/starter unit to 'off' position.

v) Turn ball valve to vent position.

NOTE:

i) ***DO NOT*** turn air supply to vent prior to switching off machine. This can cause structural damage to the basket assembly and excessive wear to the clamping systems.

ii) When the unit is out of use for long periods, all screens should be removed, cleaned thoroughly, dried and either re-boxed or stored in a safe, dry area.

5.5 TROUBLESHOOTING

	Symptom:	Probable Cause:	Remedial Action:
5.5.1	**Electrical:**		
i)	Both motors fail to rotate	Main supply down	Check isolator Check supply Check fuses
ii)	One motor fails to rotate	Thermal overload setting	Reset overload to correct setting
iii)	One motor fails after start-up	Fuses blown Electric motor faulty	Check fuses Change electric motor
5.5.2	**Mechanical:**		
i)	Both drive shafts fail to rotate	Bearing failure Broken belts Slack belts	Replace bearings Replace belts Re-tension belts **See Sections: 6.3.1/6.3.4**
ii)	One drive shaft fails to rotate	Bearing failure Broken belts Slack belts Damage to outrigger assembly	Replace bearings Replace belts Re-tension belts **See Sections: 6.3.1/6.3.4** Check assy. Replace if necessary **See Section 6.3.2**
iii)	Bearing failure	Wrong grease Grease system/seal failure Vent hole in head blocked	Use recommended grease **See Section 6.3.4** Check grease passage Ensure hole in head is clear
iv)	Belt failure	Wrong tension Belt wear Incorrect speed	Check belt tension **See Section 6.3.1** Check pulley alignment Check pulley size
v)	Pneumatic clamping failure	Incorrect pressure Incorrectly fitted screens Incorrectly fitted wedge frames	Check air supply and pressure pressure is correct (80-90 psi) Check screens are properly located Check wedge frames are properly located
vi)	Solid transportation limited	Shaft rotation Belt damaged Damaged screen Angle of basket	Check shaft rotation Check tension Replace screen Operate unit in horizontal position only.

5.5 **TROUBLESHOOTING** (Continued)

Symptom:	Probable Cause:	Remedial Action:
5.5.2 **Mechanical:** (Cont'd)		
vi) Solid transportation limited (Cont'd)	Hook strip screen tension	Check tension of hook strip bolts (35 - 40 ft. lb)
	Spray bars off (WBM)	Use spray bars
vii) Short screen life	Too fine screen	Change to coarser mesh
	Premature damage	Check storage and handling
	Angle of basket	Check basket is operated in horizontal position
	Inadequate washdown facilities	High pressure clean with appropriate fluid.
	Incorrect fluid level	Adjust to 10 - 15" beach OBM
	Spray bars off (WBM)	Adjust to 6 - 8" beach WBM
viii) Excessive noise	Loose bolts	Check torques on all bolted assys.
	Pneumatic clamping system	Check pressure
	Screen wedge frames	Locate properly
	Incorrect tension of hook strip	Check torque (35 - 40 ft. lb) on scalping screens
	Bearing failure	Replace bearings
	Noisy seals	Grease seals
ix) Unusual vibrations	Weakened mounting spring	Change mounting spring
	Incorrect shaft rotation	Check belt tension

5.5.3 **Additional Recommendations for Water Based Drilling Fluids**

Symptom:	Remedial Action:
i) Lack of bottom screen transportation	Fit finer primary screens and ensure beach length is 6 - 8" Rotate screens allowing one set to be used as a back-up. Clean back-up screens from rear with high pressure wash gun. Ensure adequate washdown facilities are available i.e. High pressure wash gun Install spray bar system (Contact Thule Rigtech)
ii) Lack of top screen transportation	Remove front gate in distribution chute and allow fluid to wash over onto screen Check screen tension (Recommended 35 - 40 ft. lb)

SECTION 6.0 - MAINTENANCE

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SECTION 6.0 - MAINTENANCE

6.1 USEFUL MAINTENANCE PROCEDURES

Before detailing the recommended maintenance procedures, the following general hints on machine maintenance and safety are given and should prove useful to the maintenance engineer.

- Ensure that power supplies are isolated before commencing work on the unit.
- Clean down all parts and the work area prior to commencement of work.
- Block up heavy parts before commencing work beneath the unit or parts.
- Where heavy lifting is involved always seek assistance.
- Remove the primary screens before commencing work on the shaker.
- Before restarting the VSM 100 after maintenance, ensure that all tools, old parts, nuts, bolts, washers etc. are removed.
- DO NOT over lubricate the main bearings.
- The bearings are designed to run warm and can be used safely up to an operating temperature of 100°C. Normal operating temperature around 65°- 80°C.
- DO NOT weld on any part of the basket or head assembly.
- All maintenance to be carried out by suitably qualified personnel.

6.2 ROUTINE MAINTENANCE

Although the VSM 100 has been designed to minimise downtime by reducing routine maintenance, to prolong the life of the various machine parts and to maintain the smooth running of the machine, the maintenance instructions given in this section must be strictly adhered to, and be performed at the prescribed intervals.

6.2. 1 Daily

i) Visually examine the unit for signs of wear and or damage, and repair/replace as necessary.

ii) Remove any build up of solids from electric motors.

iii) Run the machine and perform audible check, investigating as necessary.

iv) Apply two (2) shots of the approved grease (Shell Retinax LX2) to each main shaft bearing every twelve (12) hours of operation. There are four (4) grease nipples - two (2) on each side of the vibratory unit.

NOTE: To attain good bearing life it is essential the specified grease is used.

v) Check air regulator is set at correct pressure (85-90 psi) and adjust if necessary.

6.2.2 Monthly

With the machine switched off and the power isolated the following procedures should be carried out:

i) Remove the drive guards.

ii) Check for belt wear. Belt wear can be caused by pulley mis-alignment or incorrect tensioning.

iii) Check tension of triple 'V' belt drive arrangements. It should be possible to move and deflect the belts at mid span between 3-4 mm/1.5kg. Adjustment is made by moving belt tensioner. Refer to Section 6.3.1.

iv) Check the tensioner pulleys and bearings for wear. Repair/replace if necessary.

v) Inspect the grease nipple assemblies and associated piping. Repair/replace if necessary. Check the main bearing seals for excessive leakage. Replace as necessary.

6.2 **ROUTINE MAINTENANCE** (Continued)

6.2.2 **Monthly** (Continued)

vi) Check the torque settings on the drive head securing bolts (8 x M20). Refer to Section 2.5 for Torque Setting.

vii) Check the torque settings on the top frame securing bolts (22 x M12). Refer to Section 2.5 for Torque Setting.

viii) Check the condition of the top frame rubber extrusion. Replace as necessary.

ix) Inspect the pneumoseal clamping systems and associated fittings for leaks and wear. Replace as necessary.

x) Visually examine electric drive motors for wear and/or damage. Remove any build up of dried solids.

xi) Check condition and pressure setting on air regulator (85-90psi). Adjust/repair as necessary.

6.3 **PART REPLACEMENT PROCEDURES**

WARNING: **Before commencing any part replacement procedures the unit must be isolated from all electric power**

6.3.1 **Drive Belts** Drawing No: 100-101

Tools Required

13mm Spanner/Socket

17mm Spanner/Socket

l9mm Spanner/Socket

8mm Allen Key

Small Bearing Pullers (3-leg)

6.3 **PART REPLACEMENT PROCEDURES** (Continued)

Removal

i) Remove the drive guards - ten (10) M8 set screws per guard.

ii) Remove the cooling fan - one (1) M10 socket cap bolt.

iii) Slacken off the belt tensioner assembly nuts - two (2) M12.

iv) Unscrew the four (4) M10 set screws from outrigger bearing housing.

v) Using bearing pullers remove the outrigger bearing housing, leaving the bearing on the motor shaft.

vi) With the outrigger bearing housing removed, work the three belts off the pulleys manually lifting from groove to groove.

NOTE: **To ensure equal loading on the belts, replacements should always be fitted in sets of three.**

Replacement

i) Manually work the three (3) new belts over the pulleys.

ii) Carefully refit the outrigger bearing housing onto the outrigger assembly, ensuring that the bearing seals remain in location.

iii) Refit the four (4) M10 set screws and apply the specified torque. (Refer to Section 2.5).

iv) Ensure that the belt tensioner pulley is located between the motor and main shaft pulleys and take up the slack on the belts.

v) Check the belts/pulleys for mix-alignment.

Method of Belt Tensioning

i) Lever the tensioner pulley down until the required tension is applied.

ii) Secure the two (2) M12 nuts to the specified torque (Ref. section 2.5).

iii) After the shaker has been running for a few hours, the tension should be checked and re-adjusted as required.

6.3 PART REPLACEMENT PROCEDURES

6.3.2 Outrigger Bearing Replacement

Drawing No. 100-103

Tools Required

13mm Spanner/Socket
17mm Spanner/Socket
l9mm Spanner/Socket
8mm Allen Key
Small Bearing Pullers (3-leg)
External Circlip Pliers

Removal

i) Remove the drive belts as set out in Section 6.3.1.

ii) Remove the outer external circlip from the motor shaft.

iii) Using bearing pullers remove the outrigger bearing from the motor shaft.

iv) Discard the bearing.

Replacement

i) Check that the new bearing runs freely and that the seals are in place.

ii) For the procedure for fitting outrigger bearings refer to Drawing No: 107-108 Sections IV & V.

iii) Refit the belts and re-tension as set out in Section 6.3.1.

6.3 **PART REPLACEMENT PROCEDURES** (Continued)

6.3.3 **Electric Motor** Drawing No. 100-103

Tools Required

13mm Spanner/Socket
17mm Spanner/Socket
l9mm Spanner/Socket
Small Bearing Pullers (3-leg)
8mm Allen Key
5mm Allen Key
External Circlip Pliers

Removal

i) Remove the drive belts and outrigger bearing as set out in Sections 6.3.1 & 6.3.2.

ii) Unscrew the two (2) grub screws from the taperlock bush in the motor pulley.

iii) Screw one grub set screw into the jacking hole in the taperlock to spring the mating tapers. The pulley can now be freely removed from shaft.

iv) Unscrew the four (4) M10 socket head electric motor securing set screws. Support the electric motor while withdrawing the spigot from the sideplate.

NOTE: **The motor weighs 52kg**

Replacement

i) Before replacing the electric motor, check that the mounting flange plate and spigot are clean and free from dirt.

ii) Lift the motor into position against the sideplate ensuring that the terminal box is positioned at the top and that the spigot is aligned correctly.

iii) Refit the four (4) M10 socket head set screws and secure to the specified torque. (Refer to Section 2.5)

v) Unscrew the eight (8) M10 set screws from the main bearing housing end cap. Using two (2) of the set screws, jack the end cap from the main bearing housing and carefully slide it from the shaft.

vi) The shaft has a circlip on one end only. If present, remove it carefully from the bearing journal using a circlip pliers.

vii) Insert the two (2) M10 jacking screws into the two (2) jacking holes in the main bearing housing. Jack the housing out of the head sideplate, taking care that housing comes out evenly.

6.3 **PART REPLACEMENT PROCEDURES** (Continued)

6.3.4 **Main Shaft Bearings** Drawing No: 100-103

Tools Required

13mm Spanner/Socket	Bearing Press
17mm Spanner/Socket	8mm Allen Key
19mm Spanner/Socket	5mm Allen Key
Soft Mallet	External Circlip Pliers

Removal

i) Remove drive guards and drive belts as detailed in Section 6.3.1.

ii) Unscrew the two (2) grub screws from the taperlock bush in the main shaft bearing.

iii) Screw one (1) grub set screw into the jacking hole in the taperlock to spring the mating tapers. The pulley can now be freely removed form shaft.

iv) Remove the grease nipple banjo coupling from the main bearing housing end cap and set it aside for refitting.

v) Unscrew the eight (8) M10 set screws from the main bearing housing end cap. Using two (2) of the set screws, jack the end cap from the main bearing housing and carefully slide it from the shaft.

vi) The shaft has a circlip on one end only. If present, remove it carefully from the bearing journal, using circlip pliers.

vii) Insert two (2) M10 jacking screws into the two (2) jacking holes in the main bearing housing. Jack the housing out of the head sideplate, taking care that the housing comes out evenly.

viii) Lower the shaft onto the bottom of the sideplate bore taking care not to damage the bearing journal or bore.

ix) Remove the labyrinth seal from the main bearing housing.

x) Using a bearing press, press the bearing out of the housing.

xi) Discard the bearing and labyrinth ring.

6.3 **PART REPLACEMENT PROCEDURES** (Continued)

6.3.4 **Main Shaft Bearings - Replacement**

i) Check that the new main bearing runs freely.

ii) Thoroughly clean the main bearing housing.

iii) Using a bearing press, press the new main bearing into the housing ensuring that it is pressed fully home against the circlip

iv) Pack the main bearing housing and bearing with 1 50g of the specified grease (Shell Retinax LX2). Press a new labyrinth ring into the housing (inside).

v) Slide the bearing housing over the end of the shaft, lining up the holes in the bearing housing with the holes in the sideplate. Check that the grease nipple slot is in the correct location.

vi) Use the four (4) M10 set screws to draw the bearing housing into the sideplate taking that it is drawn in evenly and fully locates against the sideplate. (Check with a feeler gauge.)

vii) Remove and replace the main bearing seal.

viii) Remove the four (4) M10 set screws from the bearing housing.

ix) Refit the main shaft external circlip if previously fitted.

x) Slide the main bearing housing end cap over the end of the shaft. Align holes with those in the bearing housing. Ensure the hole for the grease nipple banjo coupling is in the correct position.

xi) Insert eight (8) M10 set screws and apply the specified torque. (Refer to section 2.5). **Note: New set screws are required.**

xii) Refit the grease nipple banjo coupling and secure it in place.

xiii) Refit the main shaft pulley and taperlock bush onto the shaft and tighten the two (2) grub screws in the taperlock bush. Ensure that the pulley is correctly aligned.

xiv) Replace drive belts as detailed in Section 6.3.1

6.3 **PART REPLACEMENT PROCEDURES** (Continued)

6.3.5 **Belt Tensioner Assembly Bearing** Drawing No: 100-103

Tools Required

13mm Spanner/Socket
19mm Spanner/Socket
Soft Mallet
Bearing Press
Small Bearing Puller

Removal

i) Remove the drive guards - ten (10) M8 set screws per guard.

ii) Loosen the two (2) M12 belt tensioner assembly nuts and remove the tensioner arm from its backing plate.

iii) Remove the external circlip from the tensioner assembly shaft and discard it.

iv) Using a small bearing puller remove the pulley assembly from the shaft. (Care should be taken when removing the pulley assembly as the pulley is cast and susceptible to fracture under load.)

v) Using a suitable drift, carefully tap the two (2) bearings from the roller.

vi) Discard the bearings.

Replacement

i) Check that the new tensioner bearing runs freely and that the seals are in place.

ii) Using a bearing press, carefully press the new bearings into tensioner pulley.

iii) Heat the tensioner pulley assembly in a suitable oven to around 45°C.

iv) Using a soft mallet, tap the tensioner pulley assembly onto tensioner arm shaft.

v) Install a new external circlip onto the tensioner arm shaft.

vi) Refit tensioner arm to the backing plate and secure the two (2) M12 nuts - applying the specified torque (Refer Section 2.5).

vii) Refit the belts and drive guards as set out in Section 6.3.1.

6.3 **PART REPLACEMENT PROCEDURES** (Continued)

6.3.6 **Pneumoseal Clamping System** Drawing No. 100-102

Tools Required

2 No. Adjustable Spanners

Removal

i) Switch off the shaker.

ii) Deflate the pneumoseal system by turning the 3-way valve to the vent position.

iii) Disconnect the short stainless steel hose assembly from the pneumoseal.

iv) Remove both primary screens and the wedge piece from shaker basket.

v) Lift and pull each toggle sideways to remove it from its slot.
Carefully withdraw the pneumoseal from the screen clamping rails.

vi) Ensure that the toggle slots in the rails are clear of debris, solids, cement etc.

Replacement

i) Spray toggles on the new pneumoseal with a light oil: i.e. WD40.

ii) Slide the pneumoseal into the basket - lining up the toggles with the slots in the clamping angles.

iii) Starting at the back, lift each toggle and slide it into the slot in the clamping angle. Check that each toggle is properly located in its slot.

iv) Reconnect the pneumoseal to the short stainless steel hose assembly.

v) Re-install the primary screens and wedge piece.

SECTION 7.0 -

SCREEN INFORMATION

INDEX

SECTION 7.0 - SCREEN INFORMATION

7.1 SCREEN SPECIFICATIONS

7.1.1 VSM 100 Hook Strip Screens

Mesh Size	Aperture Micron	Open Area %
8 x 8	2465	60
10 x 10	1976	61
20 x 20	895	49
30 x 30	567	45
Special Order Only		
40 x 40	399	39
60 x 60	253	36
80 x 80	186	34
100 x 100	142	31

7.1.2 VSM 100 Pretensioned Screens - Primary

52 x 52	340	48
84 x 84	215	49
105 x 105	165	45
120 x 120	150	49
145 x 145	120	46
165 x 165	105	45
180 x 180	91	42
200 x 200	87	47
230 x 230	75	46
Special Order Only		
300 x 300	49	33
325 x 325	42	29

7.1 **SCREEN SPECIFICATIONS** (Continued)

7.1.3 **VSM 100 Secondary Screens - Oil Recovery Mode**

Mesh Size	Aperture Micron	Open Area %
100H	557 x 184	40
84 x 84	215	49
Special Order Only		
40 x 80	465 x 148	34
105 x 105	165	45
145 x 145	125	51
165 x 165	104	45

7.2 SCREEN SELECTION

7.2.1 Hooked Stripped Screen - Upper Deck

The function of the upper deck screen is to remove the large and heavy cuttings only. For this purpose, hooked stripped screens are available, ranging in sizes from 8 - 30 mesh.

The screen should be selected such that the majority of fluid passes through the first third of the screen.

7.2.2 Pretensioned Primary Screen - Lower Deck

Pretensioned primary screens range in size from 52 - 325 mesh. The mesh should be selected such that during normal operation a beach length of between 6" - 8" on WBM,
10" - 15" on OBM beach is maintained. By selecting a mesh which will allow the unit to operate with the correct beach length, a 50% overload capacity is reserved to compensate for changes in mud properties, rig motion and drilled solids.

7.2.3 Secondary Screens (Drying Module)

Secondary screens are attachments designed to reduce the fluid content on solids discharged from the primary screens. These screens are normally used with oil based muds, but are equally suitable with water based muds if desired.

Additional fluid is recovered from the solids by the screens' unique design which allows the solids to rotate on the mesh before being discharged. This results in the final discharge from the shaker being some 2 - 5% lower in fluid.

Secondary screens are available in two standard sizes : 100H and 84 x 84

***NOTE*:** **To attain the maximum benefits from the VSM100 Shale Shaker operation of the unit with too fine a mesh or with excessive volumes of fluid should be avoided.**

7.3 SCREEN REPAIR PROCEDURE

Pretensioned primary screens are of a multi panel configuration and are designed to be repaired.

At failure, screens should be removed from the shaker and washed with the appropriate medium. Allowing the screen to dry, the damaged fine cloth should be carefully removed from the panel using a knife or sharp blade.

Using the repair kit with the special cartridge and dispenser, a small quantity of compound should be applied to the surface of the backing cloth. To ensure an even finish the small plastic spreader (supplied with kit) should be drawn lightly over the surface ensuring sufficient overlap on the surrounding bonding.

Allow screen to stand for 12 - 24 hours before re-use.

This method of repair can be repeated until the use of the screen becomes impractical - approximately 25% of the screen's area..

***NOTE*:** **When repair work has been completed the mixing nozzle should be removed from the cartridge and thoroughly cleaned.**

7.4 SCREEN STORAGE

Screens are supplied in cardboard containers and should always be stored in these containers in a dry environment and out of direct sunlight. Horizontal or vertical stacking is permissible providing the containers are clear of possible protrusions which could puncture the container and damage the screen.

When transporting the screens from rig store to VSM 100 unit, the screens should be kept in their containers to minimise the risk of damage.

7.5 SCREEN WASHING

Before the VSM 100 is stopped, the screens should be washed with the appropriate medium to avoid plugging or blinding of the meshes by dried mud.

SECTION 8.0 -

PARTS LIST

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SECTION 8.0 - PARTS LIST

8.1 **BASKET ASSEMBLY** **Drawing No. 100-100 Sheet 1 of 2 Rev C**

SCREEN CLAMPING ASSEMBLY **Drawing No. 100-100 Sheet 2 of 2 Rev D**

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
1	100/100/01	Basket Fabrication	Steel BS 4360 43A	1
2	100/100/02	Top Frame Fabrication	Steel BS 4360 43A	1
3	100/100/03	Nyloc Nut - M12	316 Stainless Steel	22
4	100/100/04	Hex Head Set Screw - M12 x 35mm lg	316 Stainless Steel	22
6	100/100/06	Spring Washer - M12	316 Stainless Steel	22
7A	100/100/07A	Tension Rail - LHS	Steel BS 4360 43A	1
7B	100/100/07B	Tension Rail - RHS	Steel BS 4360 43A	1
8	100/100/08	Top Frame Rubber Extrusion	Nitrile Rubber	2 x 2m
9	100/100/09	Blind Nut - M16 x 40mm lg	316 Stainless Steel	10
10	100/100/10	Nut - M16 x 40mm lg	316 Stainless Steel	10
11	100/100/11	Washer - M16	316 Stainless Steel	10
12	100/100/12	Tension Bolt - M16 x 100mm lg	316 Stainless Steel	10
13	100/100/13	Screen Wedge Frame Fabrication	Steel BS 4360 43A	2
13A	100/100/13A	Socket Head CSK Screw - M6 x 16mm lg c/w Nyloc Nut	316 Stainless Steel	16
13B	100/100/13B	Wedge Piece Wear Strip	Steel BS 4360 43A	4
13C	100/100/13C	Socket Head Cap Screw M5 x 40mm lg c/w Washer and Nyloc Nut	316 Stainless Steel	4
14	100/100/14	Secondary Screen Carrier Fabrication	Steel BS 4360 43A	2
14A	100/100/14A	Mud Deflector Plate Fabrication	Steel BS 4360 43A	2
14B	100/100/14B	Mud Deflector Rear Clamp Screw M10 x 20 Cap Screw	316 Stainless Steel	4
15	100/100/15	Hex Head Set Screw - M10 x 20mm lg	316 Stainless Steel	12
16	100/100/16	Square Washer - M10 x 22mm	316 Stainless Steel	8
17	100/100/17	Socket Head Cap Screw - M10 x 25mm lg	316 Stainless Steel	4

8.1 **BASKET ASSEMBLY** **Drawing No. 100-100 Sheet 1 of 2 Rev C**

(ctd) **SCREEN CLAMPING ASSEMBLY** **Drawing No. 100-100 Sheet 2 of 2 Rev D**

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
17A	100/100/17A	Hex Head Set Screw M10 x 25mm lg	316 Stainless Steel	4
18	100/100/18	Disc Spring	Spring Steel	112
19A	100/100/19A	Spring Mounting Bracket - Front Right	Steel BS 4360 43A	1
19B	100/100/19B	Spring Mounting Bracket - Front Left	Steel BS 4360 43A	1
19C	100/100/19C	Spring Mounting Bracket - Back Right	Steel BS 4360 43A	1
19D	100/100/19D	Spring Mounting Bracket - Back Left	Steel BS 4360 43A	1
20	100/100/20	Machined Hex Head Set Screw - M16 x 45mm lg	316 Stainless Steel	8
21A	100/100/21A	Nyloc Nut - M16	316 Stainless Steel	16
21B	100/100/21B	Spring Washer - M16	316 Stainless Steel	16
22	100/100/22	Hex Head Set Screw - M16 x 50mm lg	316 Stainless Steel	8
24	100/100/24	Mounting Spring	Spring Steel	4
24B	100/100/24B	Mounting Spring Pads	Nitrile Rubber	8
25A	100/100/25A	LH Screen Wedge Retaining Rail	Steel BS 4360 43A	1
25B	100/100/25B	RH Centre Screen Wedge Retaining Rail	Steel BS 4360 43A	1
25C	100/100/25C	LH Centre/RH Screen Wedge Retaining Rail	Steel BS 4360 43A	2
26	100/100/26	CSK Head Set Screw - M8 x 18mm lg	316 Stainless Steel	24
27B	100/100/27B	Screen Support Rails Rear LH	Steel BS 4360 43A	1Pair
27C	100/100/27C	Screen Support Rails Rear RH	Steel BS 4360 43A	1Pair
27D	100/100/27D	Rear Screen Support Rail c/w Ext'n	Steel BS 4360 43A	2
27E	100/100/27E	Rear Screen Bar Spacer Rail	Steel BS 4360 43A	2
28A	100/100/28A	Hex Head Set Screw - M8 x 35mm lg	316 Stainless Steel	6
28B	100/100/28B	Hex Head Set Screw - M8 x 30mm lg	316 Stainless Steel	8
28C	100/100/28C	Hex Head Set Screw - M8 x 20mm lg	316 Stainless Steel	16
28D	100/100/28D	Socket Head CSK Screw - M8 x 20mm lg	316 Stainless Steel	4

8.1 **BASKET ASSEMBLY** **Drawing No. 100-100 Sheet 1 of 2 Rev C**

(ctd) **SCREEN CLAMPING ASSEMBLY** **Drawing No. 100-100 Sheet 2 of 2 Rev D**

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
29	100/100/29	Spring & Flat Washers - M8	316 Stainless Steel	30
30A	100/100/30A	LH Side Front Clamp Angle	Steel BS 4360 43A	2
30B	100/100/30B	RH Side Front Clamp Angle	Steel BS 4360 43A	2
30C	100/100/30C	RH Side Rear Clamp Angle	Steel BS 4360 43A	2
30D	100/100/30D	LH Side Rear Clamp Angle	Steel BS 4360 43A	2
30E	100/100/30E	Rear Clamp Angle	Steel BS 4360 43A	2
31A	100/100/31A	Hex Head Set Screw - M10 x 30mm lg	316 Stainless Steel	8
31B	100/100/31B	Hex Head Set Screw - M10 x 35mm lg	316 Stainless Steel	12
31C	100/100/31C	Hex Head Set Screw - M10 x 40mm lg	316 Stainless Steel	4
31D	100/100/31D	Hex Head Set Screw - M10 x 45mm lg	316 Stainless Steel	4
32A	100/100/32A	Nut - M10	316 Stainless Steel	32
32B	100/100/32B	Spring Washer - M10	316 Stainless Steel	32
32C	100/100/32C	Flat Washer - M10	316 Stainless Steel	8
33	100/100/33	Mud Recovery Module (Secondary Screens)	Steel BS 4360 43A	2
		Consumable item to be specified/purchased separately		
34A	100/100/34A	Bottom Wear Strip (Front)	Steel BS 4360 43A	4
34B	100/100/34B	Bottom Wear Strip (Rear)	Steel BS 4360 43A	4
35	100/100/35	Spray Bar Assembly	316 Stainless Steel	1
36	100/100/36	Spray Bar Mounting Brackets	Steel BS 4360 43A	1 Pair

8.2 **VIBRATORY DRIVE UNIT** **Drawing No. 100-101 Rev F**

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
2LH	100/101/02LH	Drive Guard Left Hand	Steel BS 4360 43A	1
2RH	100/101/02RH	Drive Guard Right Hand	Steel BS 4360 43A	1
4	100/101/04	Plug	Rubber	2
7 *	100/101/07	Banjo Assembly	Brass) Grease	4
8 *	100/101/08	Tubing	Nylon) System	4
9 *	100/101/09	Grease Nipple & Bulkhead Adaptor	Brass) Kit	4
12	100/101/12B	'A' Section Belts	Rubber	6
14B	100/101/14B	Hex Head Set Screw - M20 x 70 lg	316 Stainless Steel	8
15	100/101/15	Nyloc Nut M20	316 Stainless Steel	8
16	100/101/16	Spring Washer - M20	316 Stainless Steel	8
17	100/101/17	Hex Head Set Screw - M8 x 20 lg	316 Stainless Steel	20
18	100/101/18	Spring /Flat Washers - M8	316 Stainless Steel	20

* **Note:** Part Nos. 100/101/07, 08 & 09 are supplied as a kit assembly only and cannot be purchased separately

8.3 **CLAMPING SYSTEM** **Drawing No. 100-102 Rev E**

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
1	100/102/01	1/4" BSP Pressure Regulator c/w locking facility	Steel	1
1A	100/102/01A	0 - 100 PSI Pressure Gauge	Plastic	1
2	100/102/02	1/4" x 3/8" BSP Straight Male Adaptor	Steel	2
3	100/102/03	1/4" BSP Straight Male Adaptor	Steel	2
4	100/102/04	1/4" Dowty Bonded Washer	Steel	6
5	100/102/05	1/4" BSP Shut-off Vent Valve	Steel	1
5A	100/102/05A	1/4" BSP Check Valve	Brass	1
6	100/102/06	3/8" ID Braided Hose: 0 - 30 m	Nylon/PVC	1
6A	100/102/06A	3/8" BSP Female 90º Hose End	Steel	1
6B	100/102/06B	N° 6 JIC Female Hose End c/w clips	316 Stainless Steel	1
7	100/102/07	N° 6 JIC Elbow - Male to Female	316 Stainless Steel	1
8	100/102/08	1/4" NPT Male to No. 8 JIC Male Bulkhead Adaptor	316 Stainless Steel	2
8A	100/102/08A	Tube End Reducer c/w Nut N° 8 JIC Female - No. 6 JIC Male	316 Stainless Steel	1
9	100/102/09	1/4" NPT Pipe Tee - Female	316 Stainless Steel	2
10	100/102/10	1/4" NPT Straight Adaptor - Male	316 Stainless Steel	2
11	100/102/11	1/4" NPT Quick Coupler	316 Stainless Steel	2
12	100/102/12	N° 4 JIC - 1/4" NPT Connector - Male	316 Stainless Steel	4
12A	100/10212A	N° 4 JIC - No. 6 JIC Straight Adaptor - Male	316 Stainless Steel	2
13	100/102/13	1/4" Braided Hose Assy x 9 1/2" lg	316 St St/Teflon Lined	2
14	100/102/14	Pneumoseal Clamping System - RH	Nitrile Rubber	1
15	100/102/15	1/4" Braided Hose Assy x 58" lg	316 St St/Teflon Lined	1
16	100/102/16	N° 4 JIC Blanking Nut	316 Stainless Steel	1
17	100/102/17	Pneumoseal Clamping System - LH	Nitrile Rubber	1
18	100/102/18	Pneumatic Control Mounting Plate	Stainless	1

8.4 **TENSIONER, SHAFT & DRIVE ASSEMBLY Drawing No. 100-103 Rev K**

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
1A	100/103/01A	Retaining Plate - LH	Steel BS 4360 43A	1
1B	100/103/01B	Retaining Plate - RH	Steel BS 4360 43A	1
2	100/103/02	Belt Tensioner Arm Assy	Steel BS 4360 43A	2
3	100/103/03	Bearing - Ball	Steel	4
4	100/103/04	Roller Assembly	Cast Steel	2
6	100/103/06	Circlip	Spring Steel	2
7	100/103/07	Hex Head Bolt - M12 x 50mm lg	316 Stainless Steel	4
8	100/103/08	Spring Washer - M12	316 Stainless Steel	4
9	100/103/09	Nyloc Nut - M12	316 Stainless Steel	4
10	100/103/10	Socket Head Cap Screw M10 x 20mm lg	316 Stainless Steel	6
11	100/103/11	Spring Washer - M10	316 Stainless Steel	6
16	100/103/16	Bearing Housing	Steel	4
16A	100/103/16A	Bearing Housing Circlip	Spring Steel	4
17	100/103/17	Labyrinth Sealing Ring	Rubber	4
18	100/103/18	Bearing - Spherical Roller	Steel	4
19	100/103/19	Circlip	Spring Steel	2
20	100/103/20	Bearing End Cap	Steel	4
21	100/103/21	Bearing Housing Seal	Rubber	4
22	100/103/22	Shaft Pulley (Refer to Chart - Drwg 100/103)	Cast Steel	2
23	100/103/23	Taperlock Bush	Cast Steel	2
24	100/103/24	Socket Head Grub Screw - 3/8" BSW x 5/8" lg	Steel Gr.12.9	4
25	100/103/25	Hex Head Bolt- M10 x 40 mm lg	316 Stainless Steel	32
26	100/103/26	Spring Washer - M10	316 Stainless Steel	32
28	100/103/28	Outrigger Housing	Steel	2
32	100/103/32	Drive Pulley (Refer to Chart - Drwg 100/103)	Cast Steel	2
38	100/103/38	Hex Head Set Screw - M10 x 25mm lg	316 Stainless Steel	8

8.4 **TENSIONER, SHAFT & DRIVE ASSEMBLY Drawing No. 100-103 Rev K** (ctd)

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
39	100/103/39	Spring Washer - M10	316 Stainless Steel	8
41	100/103/41	Circlip	Spring Steel	2
44	100/103/44	Main Drive Shaft Assy	Steel	2
45	100/103/45	Mainshaft Key	Key Steel	4
50*	100/103/50	Electric Motor 1.65 kW - Totally Enclosed	Steel	2
50A	100/103/50A	Motor Adaptor Flange	Steel	2
50B	100/103/50B	Hex Headed Set Screw - M8 x 20mm lg	316 Stainless Steel	8
50C	100/103/50C	M8 Shake Proof Washer	316 Stainless Steel	8
51	100/103/51	Socket Head CSK Screw - M10 x 30mm lg	316 Stainless Steel	8
52	100/103/52	Hex Head Bolt - M10 x 35mm lg	316 Stainless Steel	8
53	100/103/53	Spring Washer - M10	316 Stainless Steel	8
54	100/103/54	1610 Taperlock Assembly c/w Grub Screws	Steel	2
55	100/103/55	Electric Motor Key	Key Steel	2
60	100/103/60	Cooling Fan	Plastic	2
61	100/103/61	Washer - M10	316 Stainless Steel	2
62	100/103/62	Spring Washer - M10	316 Stainless Steel	2
63	100/103/63	Cap Screw - M10 x 80mm lg	316 Stainless Steel	2
64	100/103/64	Outrigger Bearing Housing c/w Bearing	Steel	2
65	100/103/65	Outrigger Bearing	Steel	2
66	100/103/66	Motor External Circlip	Spring Steel	4

* State Motor Voltage and Frequency When Ordering

8.5 **ELECTRIC STARTER BOX** **Drawing No. 107-109 Rev C**

Item N°:	Part N°:	Name of Part:	Qty:
1	100/ELECT/ZS052	Step-down Transformer	1
2	100/ELECT/RE521	Contactor (110v Coil)	2
3A	100/ELECT/RE571	Overload Relay 2.7 to 4.0 Amp (for 415 - 480 Supply Voltage)	2
		or	
3B	100/ELECT/RE664	Overload Relay 4.0 to 6.0 Amp (for 380 - 440 Supply Voltage)	2
4	100/ELECT/RE536	Auxiliary Contactor Block N/C	2
5	100/ELECT/FZ113	Mains Fuse Holder	6
6	100/ELECT/ZZ550	Mains Fuse 16 Amp	6
7	100/ELECT/FZ114	Primary Fuse Holder	2
8	100/ELECT/ZX469	Primary Fuse 1 Amp	2
9	100/ELECT/TE757	Secondary Fuse Holder & Neutral Link Holder	2
10	100/ELECT/FZ057	Secondary Fuse 2 Amp	1
11	100/ELECT/FZ050	Neutral Link	
12	100/ELECT/TE758	Terminals	

NB:	Complete Starter Part No.	100/Elect/01	
	Remote Stop/Start Part No.	100/Elect/02	(Not Shown)
	Electrical Flameproof Glands	100/Elect/09	(Not Shown)
	Shrouds	100/Elect/10	(Not Shown)
	Emergency Stop	100/Elect/24	
	Isolator	100/Elect/25	
	Earthing Strap	100/Elect/26	

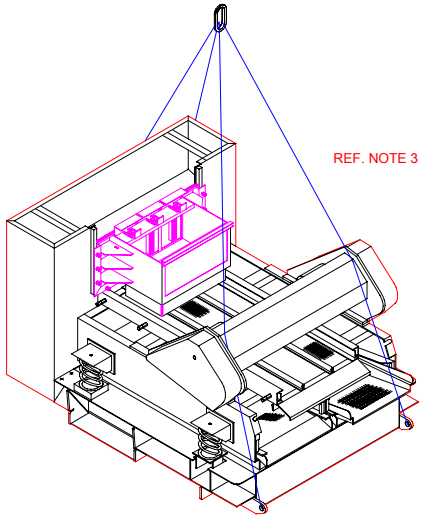
Note : When ordering electrical spares please quote voltage, amperage and frequency.

8.6 BASIC MAINTENANCE EQUIPMENT

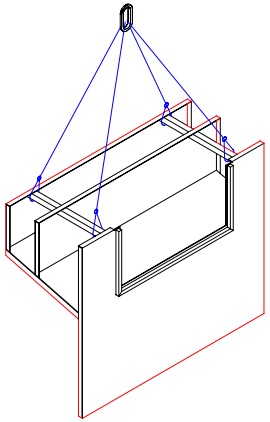
100/MAINT/01	Screen Repair Compound Applicator Gun
100/MAINT/02	Screen Repair Compound
100/MAINT/05	Assorted Stainless Steel Fasteners
100/MAINT/06	Main Shaft Bearing Housing Jacking Bolts M10 x 80 lg
100/MAINT/07	400g cartridge Retinax LX2 Grease

SECTION 9.0 - DRAWINGS

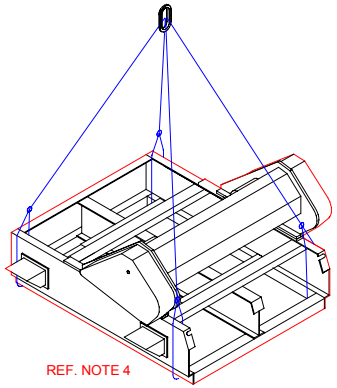
INDEX



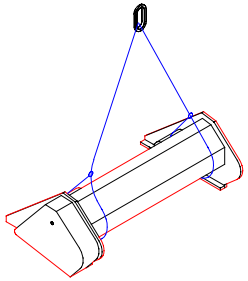
COMPLETE ASSEMBLY
MAX LIFT WEIGHT: 1685Kg



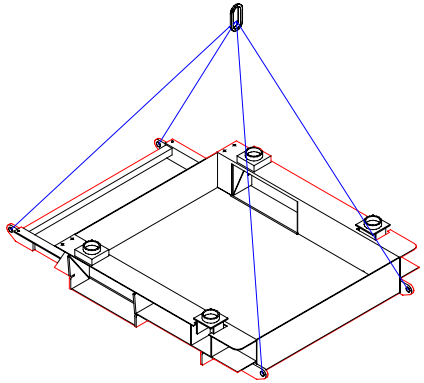
HEADER TANK SECTION
MAX LIFT WEIGHT: 328Kg



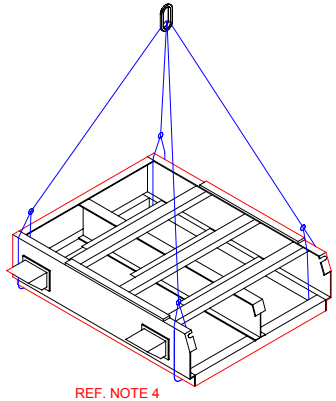
BASKET/HEAD ASSEMBLY
LIFT WEIGHT: 855Kg



VIBRATORY HEAD
LIFT WEIGHT: 449Kg



SUMP UNIT
LIFT WEIGHT: 400Kg



BASKET ASSEMBLY
LIFT WEIGHT: 406Kg

NOTES:

1. BEFORE CARRYING OUT ANY LIFTING, OPERATOR TO ENSURE ALL STROPS AND SHACKLES ARE SUITABLE AND FULLY CERTIFIED.
2. ALL LIFTING TO BE CARRIED OUT USING SOFT STROPS.
3. SOFT PACKERS TO BE FITTED BETWEEN STROPS & EQUIPMENT TO PREVENT DAMAGE.
4. STROPS TO BE LOOPED ROUND SIDE OF BASKET.

MOD LETTER	DESCRIPTION	DATE SIG	ISSUED TO/REMARKS

THULE RIGTECH
A DIVISION OF RIG TECHNOLOGY LTD.
SOUTH COLLEGE STREET
ABERDEEN
SCOTLAND
AB1 2LP
TELEPHONE : 01224 595763
FAX : 01224 574128
TELEX : 739247
A Varco Company

DRAWN		SCALE	
DATE		REPLACES	
CHECKED		SUPERSEDED BY	

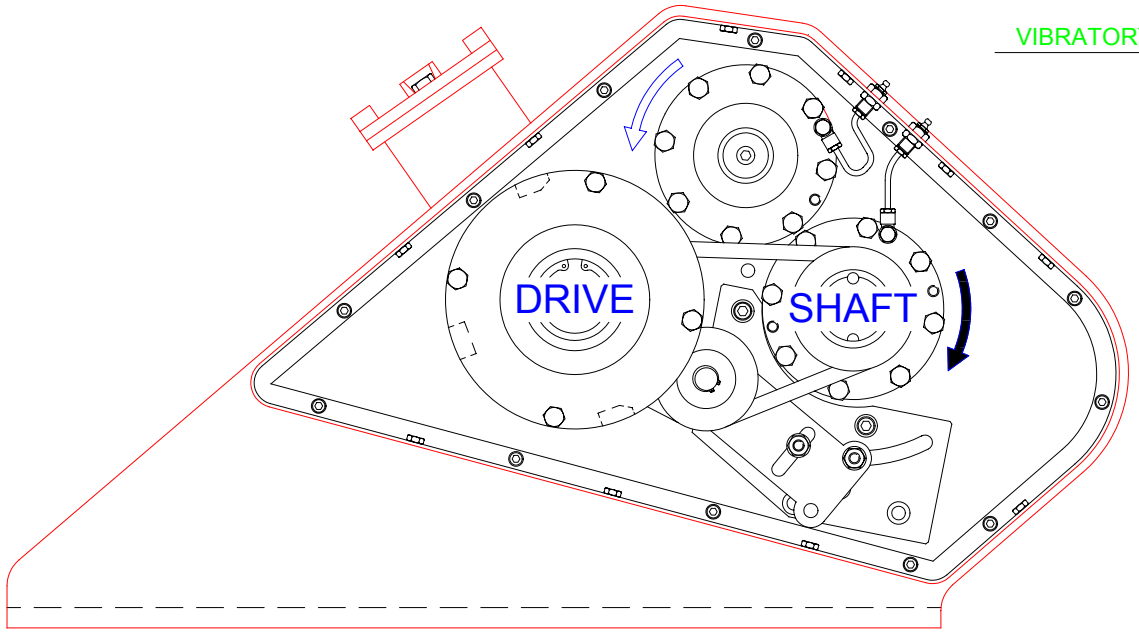
PROJECT
VSM 100

TITLE
COMPONENT LIFTING DIAGRAM

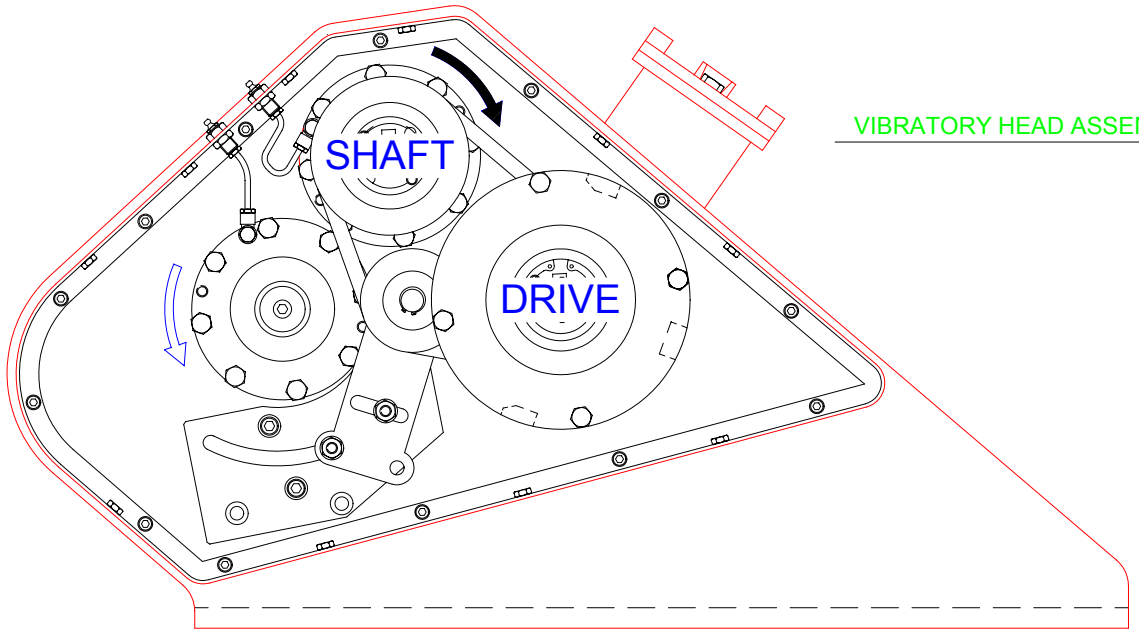
DWG No.

REV.

VIBRATORY HEAD ASSEMBLY (L.H.)



VIBRATORY HEAD ASSEMBLY (R.H.)



MOD LETTER	DESCRIPTION	DATE SIG	ISSUED TO/REMARKS

THULE RIGTECH
A DIVISION OF RIG TECHNOLOGY LTD.
SOUTH COLLEGE STREET
ABERDEEN
SCOTLAND
AB1 2LP
TELEPHONE : 0224 595763
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TELEX : 739247

DRAWN		SCALE	
DATE		REPLACES	
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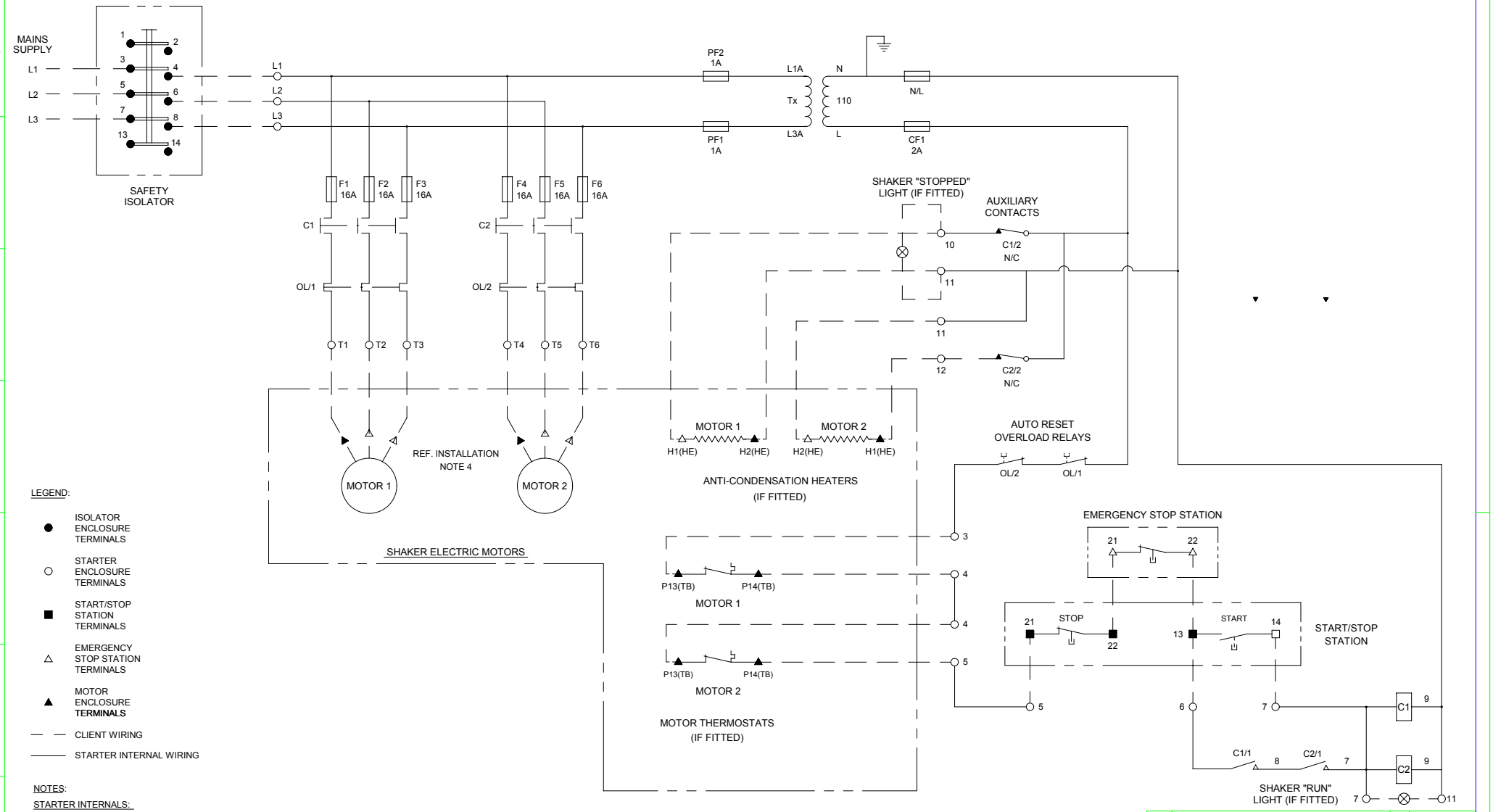
PROJECT

TITLE

VIBRATORY HEAD ROTATION DIRECTION

DWG No. | REV.



LEGEND:

- ISOLATOR ENCLOSURE TERMINALS
- STARTER ENCLOSURE TERMINALS
- START/STOP STATION TERMINALS
- EMERGENCY STOP STATION TERMINALS
- MOTOR ENCLOSURE TERMINALS
- CLIENT WIRING
- STARTER INTERNAL WIRING

NOTES:

STARTER INTERNALS:

1. POWER CALBES TO BE 2.5mm SQ. TRI-RATED PHASE COLOURED.
2. 110V CONTROL CABLES TO BE 1mm SQ. TRI-RATED COLOUR RED.
3. OTHER CONTROL CABLES TO BE 1mm SQ. TRI-RATED COLOUR BLACK.
4. ALL CABLES c/w IDENTS & TERMINATED VIA SUITABLE FERRULES.
5. IF MOTOR THERMOSTATS NOT FITTED LINK TERMINALS 3,4 & 5.
6. REFERENCE DRAWINGS:
   DRG. No. 107-109:- JL4/3 TWIN STARTER ARRANGEMENT.
   DRG. No. 107-133:- VSM 100 BONDING ARRANGEMENT.

INSTALLATION NOTES:-

1. FOR RECOMMENDED COMPONENT LOCATIONS REFER TO THE OPERATION & MAINTENANCE MANUAL.
2. RECOMMENDED INSTALLATION CABLE - 2.3mm GEXOL-125 4 CORE 600/1000v FLAME RETARDANT. BRONZE ARMOUR.
3. OVERCURRENT PROTECTION DEVICE FOR THE MAINS SUPPLY CONDUCTOR SHALL BE RATED 20 Amp.
4. TO REVERSE DIRECTION OF ROTATION CHANGES OVER ANY TWO MOTOR SUPPLY LEADS.

MOD. LETTER	DESCRIPTION	DATE SIG	ISSUED TO/REMARKS
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PROJECT

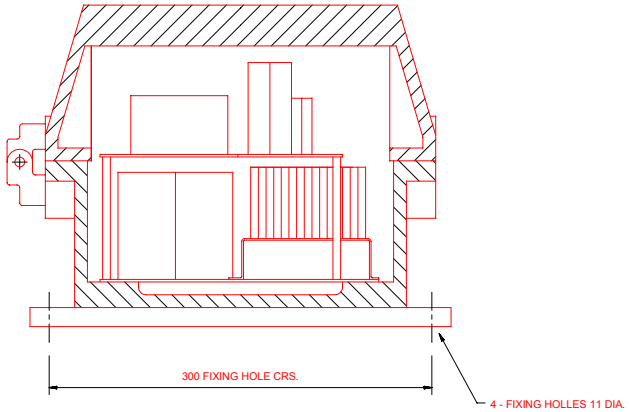
TITLE

JL4/3 TWIN STARTER WIRING DIAGRAM

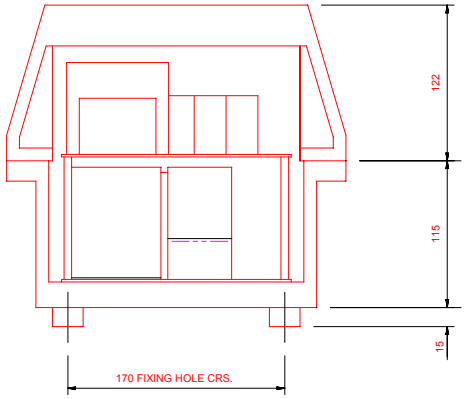
DWG No. | REV.

ITEM No.	PART No.	DESCRIPTION	QTY
1	100/ELECT/ZS052	STEPDOWN TRANSFORMER	1
2	100/ELECT/RE521	CONTACTOR (110V COIL)	2
3a	100/ELECT/RE571	OVERLOAD RELAY 2.7 TO 4 AMP	2
3b	100/ELECT/RE572	OVERLOAD RELAY 4 TO 6 AMP	2
4	100/ELECT/RE536	AUXILIARY CONTACT BLOCK N/C	2
5	100/ELECT/FZ113	MAINS FUSEHOLDER	6
6	100/ELECT/ZZ550	MAINS FUSE, 16 AMP	6
7	100/ELECT/FZ114	PRIMARY FUSEHOLDER	2
8	100/ELECT/ZX469	PRIMARY FUSES, 1 AMP	2
9	100/ELECT/TE757	SECONDARY FUSEHOLDER & NEUTRAL LINK HOLDER	2
10	100/ELECT/FZ057	SECONDARY FUSES, 2 AMP	1
11	100/ELECT/FZ050	NEUTRAL LINK	1
12	100/ELECT/TE766	TERMINALS	15
13	100/ELECT/RE537	AUXILLIARY CONTACT BLOCK N/O	2

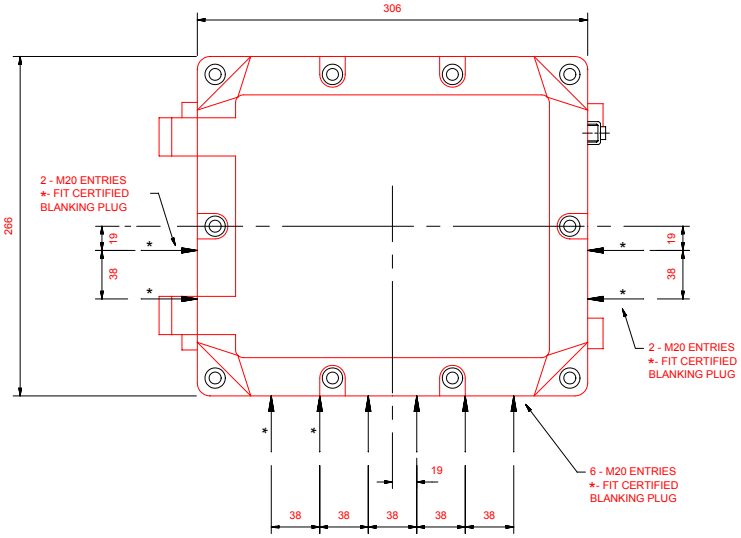
OR



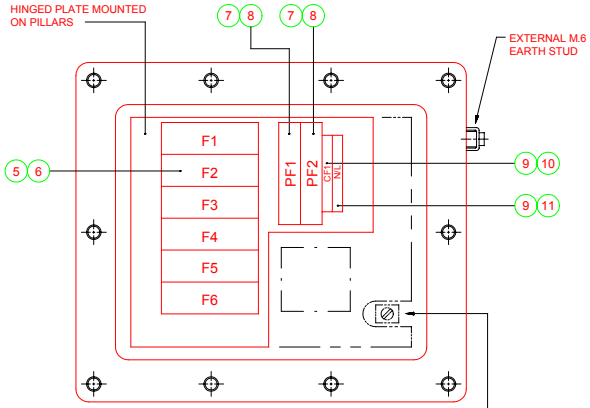
SECTIONAL ELEVATION



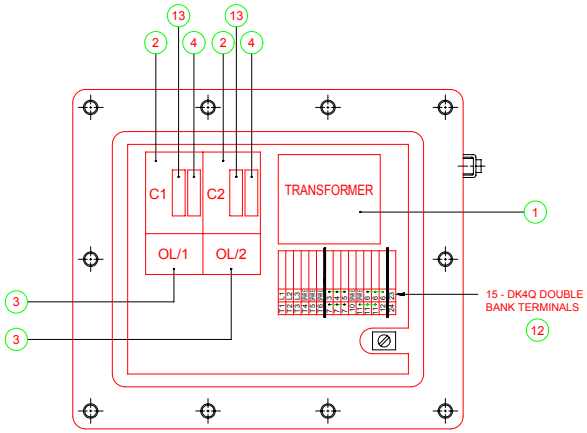
SECTIONAL END ELEVATION



PLAN VIEW



INTERNAL LAYOUT OF UPPER PLATE



INTERNAL LAYOUT OF LOWER PLATE

NOTES :
1. REFERENCE DRAWING :
DRG. No.107-110 :- JL4/3 TWIN STARTER WIRING DIAGRAM

MOD LETTER	DESCRIPTION	DATE INI	ISSUED TO/REMARKS

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DATE		REPLACES	
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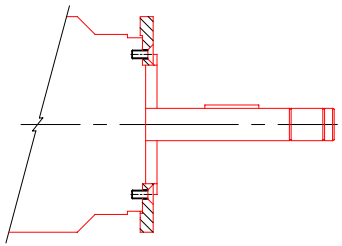
PROJECT

TITLE
JL4/3 TWIN STARTER ARRANGEMENT

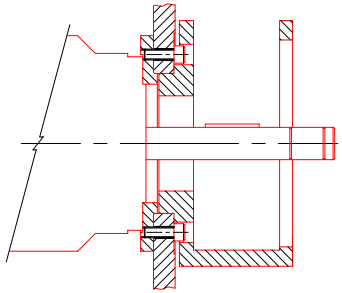
DWG No. | REV.

STAGE I



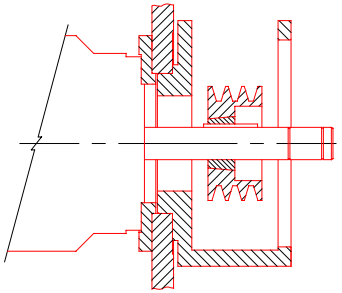
1a. SECURE MOUNTING FLANGE ONTO MOTOR.

STAGE II



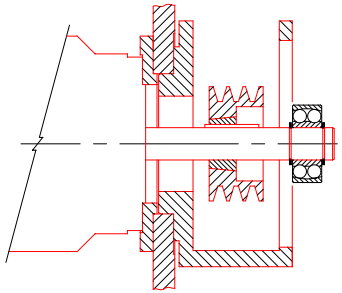
2a. SECURE MOTOR ONTO VIBRATORY HEAD SIDE PLATE.
2b. POSITION & SECURE OUTRIGGER ONTO SIDE PLATE.

STAGE III



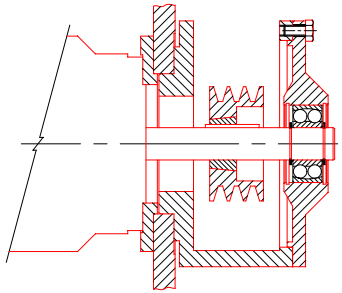
3a. POSITION & INSTALL PULLEY C/W TAPER LOCK BUSH ONTO MOTOR SHAFT.

STAGE IV



4a. INSTALL REAR CIRCLIP ONTO MOTOR SHAFT.
4b. USE HOT PLATE OR SIMILAR TO WARM BALL BEARING PRIOR TO INSTALLATION. (MAX. TEMP. 40°C)
4c. SLIP BALL BEARING ONTO MOTOR SHAFT UNTIL IT SEATS AGAINST REAR CIRCLIP.
4d. INSTALL FRONT CIRCLIP ONTO MOTOR SHAFT.

STAGE V



5a. SLIP BEARING HOUSING OVER BALL BEARING.
5b. SECURE BEARING HOUSING TO OUTRIGGER, (SCREWS HAND TIGHT ONLY)
5c. RUN MOTOR BRIEFLY.
5d. TIGHTEN SCREWS.

MOD LETTER	DESCRIPTION	DATE SIG	ISSUED TO/REMARKS

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DATE		REPLACES	
CHECKED		SUPERSEDED BY	

PROJECT

OUTRIGGER BEARING INSTALLATION PROCEDURE

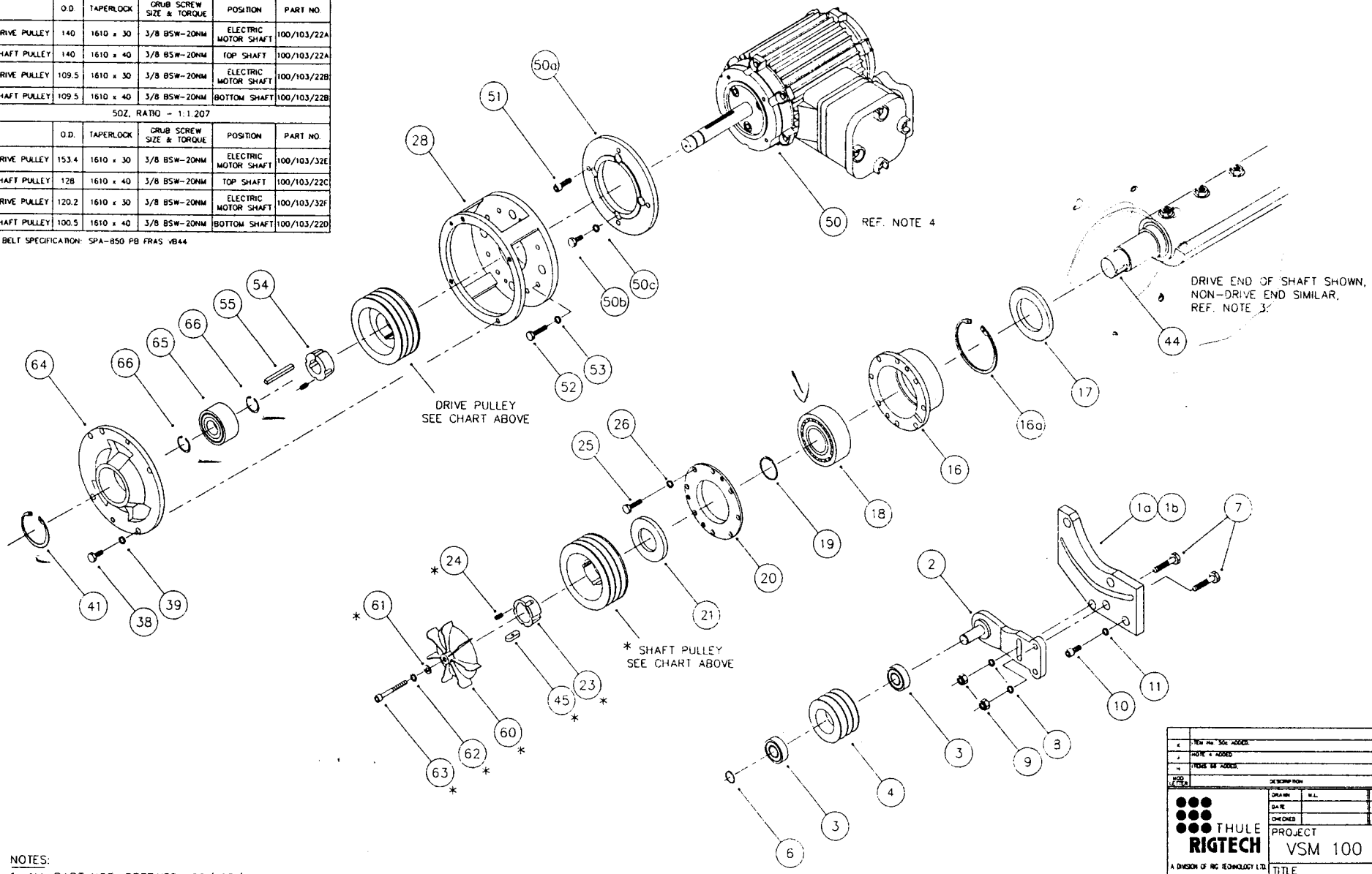
DWG No. | REV.

DRIVE PULLEYS

60Z, RATIO – 1:1	O.D.	TAPERLOCK	GRUB SCREW SIZE & TORQUE	POSITION	PART NO.
DRIVE PULLEY	140	1610 x 30	3/8 BSW–20NM	ELECTRIC MOTOR SHAFT	100/103/22A
SHAFT PULLEY	140	1610 x 40	3/8 BSW–20NM	TOP SHAFT	100/103/22A
DRIVE PULLEY	109.5	1610 x 30	3/8 BSW–20NM	ELECTRIC MOTOR SHAFT	100/103/22B
SHAFT PULLEY	109.5	1610 x 40	3/8 BSW–20NM	BOTTOM SHAFT	100/103/22B

50Z, RATIO – 1:1.207	O.D.	TAPERLOCK	GRUB SCREW SIZE & TORQUE	POSITION	PART NO.
DRIVE PULLEY	153.4	1610 x 30	3/8 BSW–20NM	ELECTRIC MOTOR SHAFT	100/103/32E
SHAFT PULLEY	128	1610 x 40	3/8 BSW–20NM	TOP SHAFT	100/103/22C
DRIVE PULLEY	120.2	1610 x 30	3/8 BSW–20NM	ELECTRIC MOTOR SHAFT	100/103/32F
SHAFT PULLEY	100.5	1610 x 40	3/8 BSW–20NM	BOTTOM SHAFT	100/103/22D

BELT SPECIFICATION: SPA–850 PB FRAS vB44



NOTES:

1. ALL PART NOS. PREFIXED 100/103/
2. MOTOR, ITEM 50, SUPPLIED C/W ITEMS 50a, 50b & 50c.
3. PART Nos. MARKED THUS * ONLY REQD. ON DRIVE END OF SHAFT.
4. STATE VOLTAGE & FREQUENCY WHEN ORDERING SPARE.

MOD LETTER	DESCRIPTION	DATE & INIT.	ISSUED TO/REMARKS
4	ITEM No. 50c ADDED.		
3	NOTE 4 ADDED		
2	ITEMS 50 ADDED.		

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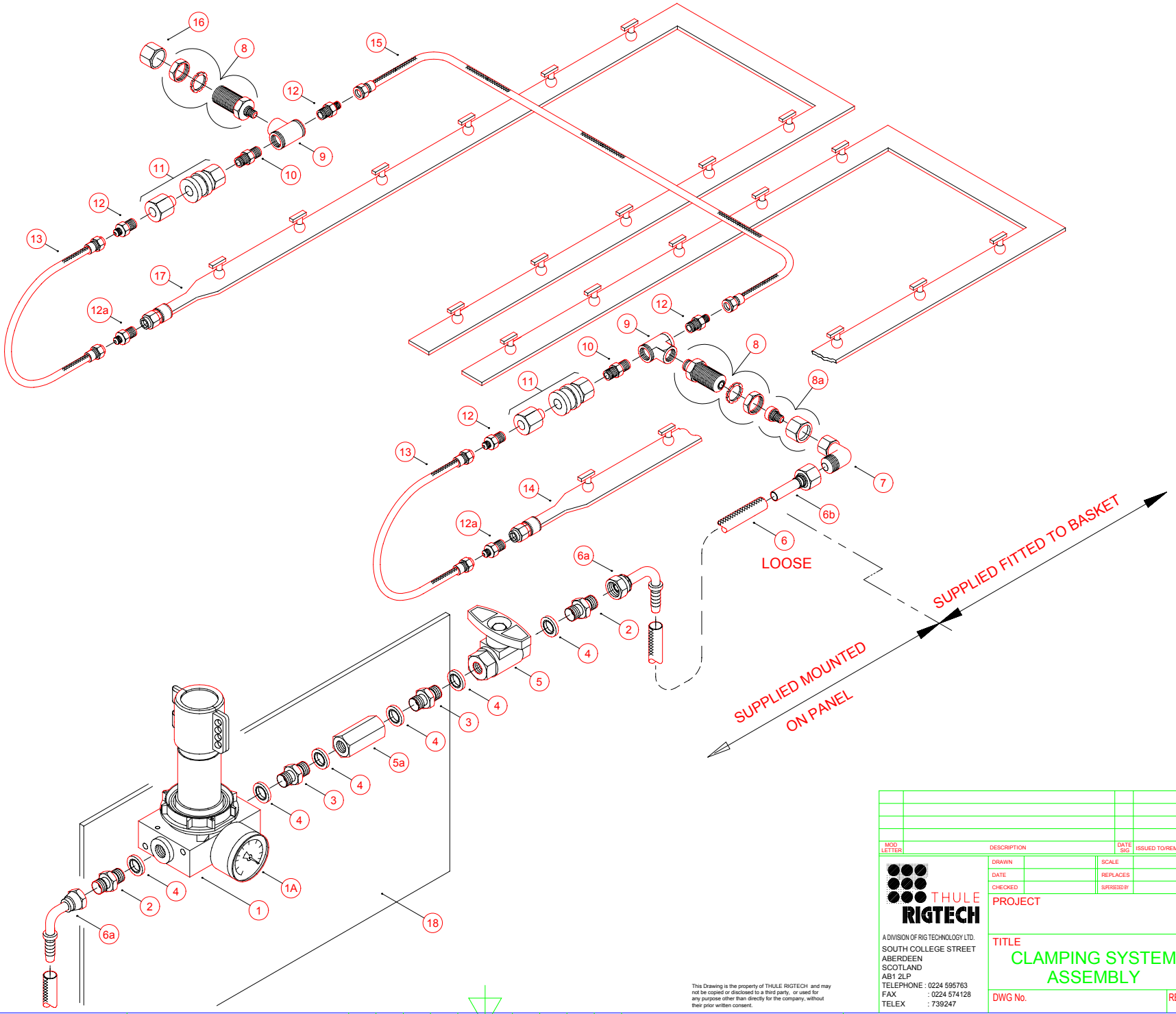
FAX 0224 574128
TELEX 739247

DRAWN M.L. SCALE 1:1.5
DATE REPLACES
CHECKED SUPERSEDED BY

PROJECT
VSM 100

TITLE
DRIVE ASSEMBLY

DWG No. 100–103 REV K



MOD LETTER	DESCRIPTION	DATE SIG	ISSUED TO/REMARKS

THULE RIGTECH

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DRAWN		SCALE	
DATE		REPLACES	
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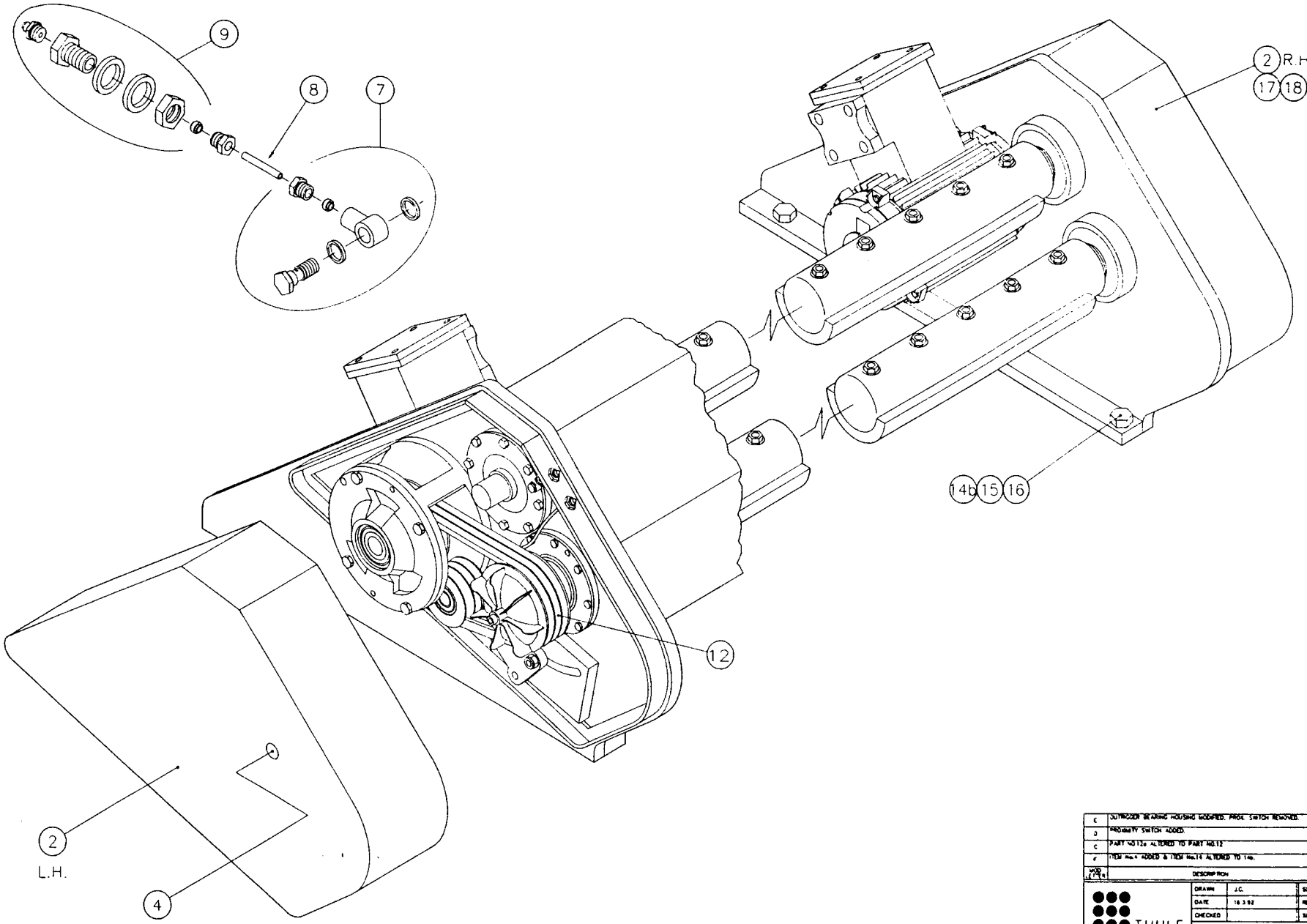
PROJECT

TITLE
CLAMPING SYSTEM ASSEMBLY

DWG No. | REV.



REV LETTER	DESCRIPTION		ISSUED TO/REMARKS
C	OUTRIGGER BEARING HOUSING MODIFIED. PROX. SWITCH REMOVED.	26.8.94	
D	PROXIMITY SWITCH ADDED.	2.4.93	
E	PART NO.12a ALTERED TO PART NO.12	8.2.93	
F	ITEM No.4 ADDED & ITEM No.14 ALTERED TO 14b.	3.1.93	

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DRAWN	J.C.	SCALE	N/A
DATE	16.3.92	REPLACES	
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PROJECT
THULE RIGTECH

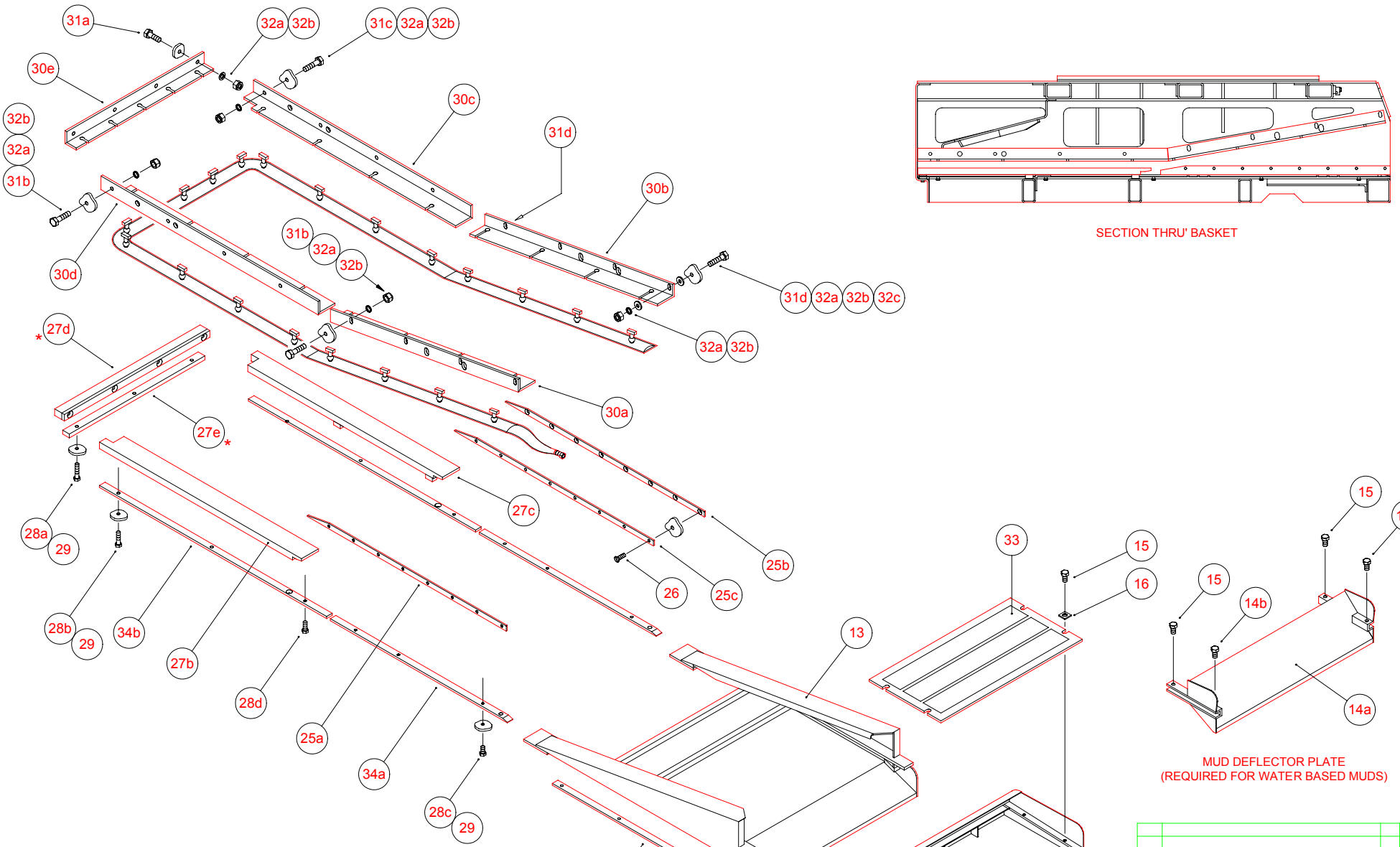
TITLE
VSM 100 – VIBRATORY DRIVE UNIT Mk.IV

DWG No. 100–101 REV F

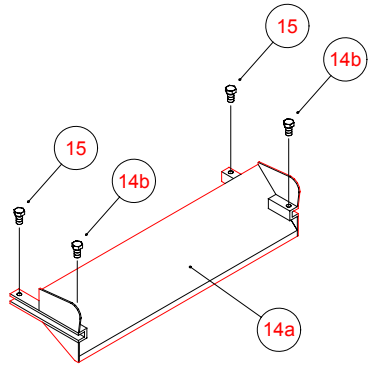
8.2 **VIBRATORY DRIVE UNIT** **Drawing No. 100-101 Rev F**

Item N°:	Part N°:	Name of Part:	Material:	N° Parts per Unit:
2LH	100/101/02LH	Drive Guard Left Hand	Steel BS 4360 43A	1
2RH	100/101/02RH	Drive Guard Right Hand	Steel BS 4360 43A	1
4	100/101/04	Plug	Rubber	2
7 *	100/101/07	Banjo Assembly	Brass) Grease	4
8 *	100/101/08	Tubing	Nylon) System	4
9 *	100/101/09	Grease Nipple & Bulkhead Adaptor	Brass) Kit	4
12	100/101/12B	'A' Section Belts	Rubber	6
14B	100/101/14B	Hex Head Set Screw - M20 x 70 lg	316 Stainless Steel	8
15	100/101/15	Nyloc Nut M20	316 Stainless Steel	8
16	100/101/16	Spring Washer - M20	316 Stainless Steel	8
17	100/101/17	Hex Head Set Screw - M8 x 20 lg	316 Stainless Steel	20
18	100/101/18	Spring /Flat Washers - M8	316 Stainless Steel	20

* **Note:** Part Nos. 100/101/07, 08 & 09 are supplied as a kit assembly only and cannot be purchased separately



SECTION THRU' BASKET



MUD DEFLECTOR PLATE
(REQUIRED FOR WATER BASED MUDS)

SECONDARY SCREEN CARRIER
(REQUIRED FOR OIL BASED MUDS)

NOTES :
1. TWO SCREEN CLAMPING ASSEMBLIES REQD. PER SHAKER
   i.e. ONE OFF AS SHOWN (L.H.)
   ONE OFF OPP. HAND (R.H.)
2. * 27d & 27e SUPPLIED AS ONE PIECE

MOD LETTER	DESCRIPTION	DATE SIG	ISSUED TO/REMARKS

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TELEX : 739247

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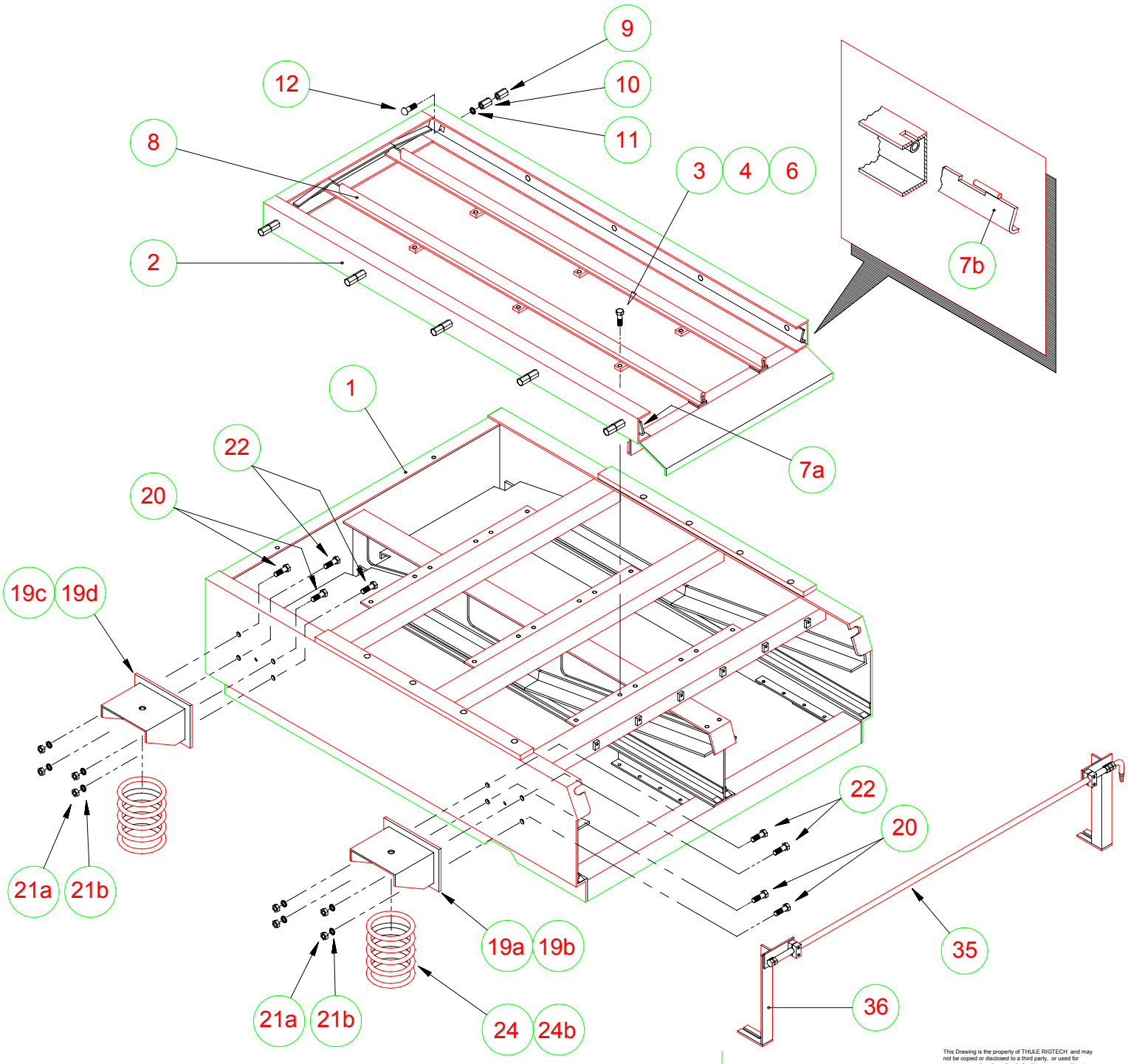
PROJECT

TITLE VSM 100
BASKET ASSEMBLY
SCREEN CLAMPING

DWG No. 100-100 SHT.2 OF 2 REV.



MOD. LETTER	DESCRIPTION	DATE SIG	ISSUED TO/REMARKS

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DATE		REPLACES	
CHECKED		SUPERSEDED BY	

PROJECT

TITLE
VSM 100
BASKET ASSEMBLY
MAIN STRUCTURE

DWG No. 100-100 SHT.1 OF 2 REV.