



Installation, Operation, Maintenance and Spare Parts Manual

Pulverising Mill

Model LM2

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1 INTRODUCTION

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1.1 Preliminary Information

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Model	Item Code	Voltage	Item Code	Voltage
LM2-P Pneumatic	100300	380-415 V 50 Hz	100317	550 V 60 Hz
	100303	220 V 50 Hz	100318	380 V 50 Hz
	100304	220 V 60 Hz	100319	460 V 60 Hz
	100311	440 V 50 Hz	100320	400 V 60 Hz
	100312	480 V 50 Hz	100321	755 V 60 Hz
	100313	550 V 50 Hz	100322	575 V 60 Hz
	100314	380 V 60 Hz	100325	208 V 60 Hz
	100315	440 V 60 Hz	100326	240 V 50 Hz
	100316	480 V 60 Hz	100327	600 V 60 Hz
			100328	525 V 50 Hz
LM2-M Manual	100209	380-415 V 50 Hz		
	100204	220 V 60 Hz		
Model depicted in this manual: Item Code 100300 Other configurations available on request				

Revision History				
Revision	Date	Page/s	Description of Revision	Approved
A	November 2010	All	Issue of New Format	X.S.

This Manual Covers Serial No. Range			
Starting Serial No.:	218104	Month & Year:	November 2010

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Figure 1 The LM2-P Pulverising Mill

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1.2 Test Sheets and Declarations of Conformity

Please see the Test Sheet and Declaration of Conformity located in the plastic sleeve at the front of this document.

Use these documents for information on testing and conformance when installing, commissioning and maintaining this equipment.

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1.3 Commercial Summary

1.3.1 Warranty - Machines

Essa Australia Limited (Essa) warrants that upon payment in full for the manufactured goods it shall give good title of the goods to the Customer and that the goods shall be free from defects of material and workmanship, except such defects as are normally regarded as being commercially acceptable.

Any warranty claim must be made within the earlier of 12 months from the date of initial operation, or 18 months from the date of dispatch from Essa.

1.3.2 Warranty - Wear Parts

Essa's policy regarding warranty claims relating to wear parts is that you will receive a credit on a pro rata basis based on the amount of useful life remaining.

For example, we generally determine bowl usage life by the thickness of steel remaining in the bowl base. With respect to the LM5 bowl, the original base thickness is 21mm and any thickness less than 3mm is deemed to be beyond its useful life.

If an LM5 bowl is returned under a warranty claim due to premature failure, and the remaining base thickness is 9mm then it is determined to be 12/18 or 67% worn. A credit of 33% of the original purchase cost of the bowl would then be issued.

Each wear part returned to Essa is thoroughly inspected and evaluated by our workshop staff. If it is determined beyond reasonable doubt that a wear part failure has been exacerbated by careless work practices or incorrect installation, the warranty claim will be invalid.

Any warranty claim on wear parts is dependent on the cause of the premature failure being faulty workmanship and/or materials by Essa and providing the parts have been installed and operated in accordance with Essa's guidelines stated within this manual.

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1.3.3 **Warranty – Spare Parts**

Essa warrants that upon payment in full for any spare parts, it shall give good title of the goods to the Customer and that the goods shall be free from defects of material and workmanship.

1.3.4 **Limitation of Liability**

Essa does not give any other warranty. Any warranty that is implied by law that can be excluded is excluded. If it cannot be excluded, any liability that Essa might incur from such warranty, in the case of the goods, is limited to any one or more of the following:

- The replacement of the goods or the supply of equivalent goods.
- The repair of the goods.
- The payment of the costs of replacing the goods or acquiring equivalent goods.
- The payment of the costs of having the goods repaired.

Essa shall not be liable for the cost of removal or reinstallation of materials or any unauthorised warranty work, nor shall Essa be responsible for any transportation cost, unless expressly authorised in writing by Essa.

Except where required by mandatory operation of law, Essa will not be liable for any personal injury, indirect, special or consequential loss or damage (including loss of profits, loss of opportunity or business interruption), suffered by the Customer or any other person arising directly or indirectly out of the goods supplied by Essa.

1.3.5 **Manufacturing Data Records**

The equipment, for which the information contained in this manual relates, is proprietary and any records of manufacture of the item are held by Essa.

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1.3.6 **Contact Information**

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1.4 About this Manual

1.4.1 Duty of Care

Duty of care is incumbent upon all employees and supersedes all regulations, OEM and company/site specific requirements.

The client/end user is responsible to ensure that:

- Operators and maintainers are provided with, and use all relevant and appropriate safety equipment and PPE (Personal Protective Equipment).
- Operators are trained and competent.
- Maintenance personnel are trained and competent.
- The equipment is maintained to a high standard.

1.4.2 Safety Information

MSDS Warning

Ensure that, prior to operation of this equipment, all operators and maintainers read the Material Safety Data Sheets in Section 10 of this Manual for any Lubricants used in this machine

Australian Standards (AS 1319-1994) safety signs are used in this manual.

The following two (2) tables (**Warning** and **Note**) will generally only be used in the Installation, Lubrication, Maintenance and Workshop parts of the manual. They will always appear as shown with the word **Warning** or **Note** followed by the nature of the **Warning** or **Note**.

	Warning: Personnel Danger/Hazard – or unspecified cautionary note
	Note: Machinery Damage/Hazard – unspecified hazard or cautionary note

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1.4.3 Personal Protective Equipment (PPE)

The following table contains all the necessary Personal Protective Equipment (PPE) which may be required to be used.

Each section - Installation, Lubrication, Maintenance and Workshop - will have an individual table showing what minimum PPE is required for that step or section.

Minimum Personal Protective Equipment (PPE) required while working on the LM2 Mill

									
A	B	C	D	E	F	G	H	I	J

A	Eye protection must be worn	F	Respirator must be worn
B	Foot protection must be worn	G	Aisle must be kept clear i.e. work area
C	Head protection must be worn	H	Hearing protection must be worn
D	Hand protection must be worn	I	No Smoking
E	Dust mask must be worn	J	

Cautionary symbols (yellow) and other symbols used in this document

	Beware of moving machinery		Pinch point
	Fork lift hazard		Switch off power before working on equipment. As per Client/Owner isolation procedures
	Sharp edges, watch your fingers		Switch off pneumatics before working on equipment. As per Client/Owner isolation procedures

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1.4.4 Definition of Symbols Used

The following table shows other symbols that may be used throughout this manual. They will always appear under the first heading, General Safety Rules.

Symbol	Definition	Action Required
	Assistance is required	The required task should be undertaken by two (2) or more people
	Look	Check for abnormalities, leaks, colour deterioration caused by heat or other conditions
	Listen	Check for air leaks, abnormal or unusual noise, vibration
	Touch (Limited)	Keep away from any moving parts, vibration, hot surfaces, etc
	Smell	Check for leaks, burning
	Measure Temperature	Using hand held Infrared or Laser equipment, or permanently installed gauges
	Measure Pressure	Using permanently installed gauges
	Measure in mm	Using appropriate measuring tool
	Record	Take notes or complete a form for addition to the MMS
	Adjust	Check adjustments and/or torque settings
	Special Tools	Special tools are required, (i.e. torque wrench)
S	Specialist Contractor	Specialist Contractor required
	Permits are required	For hot work, confined space, working at height, etc

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1.4.5 Definitions and Abbreviations

Shall / Must	the words “shall” or “must” is to be understood as mandatory
Should	The word “should” as recommended but non-mandatory
JSA	Job Safety Analysis
MMS	Maintenance Management System (paper or computer based).
kg	Kilograms
kW	Kilowatts
Nm	Newton metres
lb	Pound
kPa	Kilopascals
P.S.I	Pounds per square inch
CFM	Cubic feet per minute
mm	Millimetres
m	Metres
XX”	Inch symbol
V	Volts
Hz	Frequency
A	Amps
dBa	Decibel (usually measured at 1 metre from the source)
OEM	Original Equipment Manufacturer
Fig	Figure
I/O	Input/output, refers to the communication between information processing systems
AWST	Australian Western Standard Time
AWDT	Australian Western Daylight Time
PLC	Programmable Logic Controller
ISPM 15	The 'International Standards for Phytosanitary Measures Publication No. 15: Guidelines for Regulating Wood Packaging Material in International Trade'

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1.4.6 Special Characters

Brackets: () All sizes and pressures are metric units, i.e. mm or kPa. Where imperial units have been included they are shown in normal brackets, i.e. 15.8 mm (5/8"). It may also be a clarification of a number, i.e. two (2).

Square Brackets: [] Indicate an Item number. These are generally associated with an exploded drawing in the parts section of this manual. The Square Brackets [] will always be preceded by a Figure (Fig) number associated with that part.

1.4.7 Outline of Manual

The content of this manual contains important information for the installation, commissioning, operation and maintenance of the LM2 Pulverising Mill. Included are Spare Parts Lists and procedures to enable the user to purchase and fit items which may be required to routinely maintain and keep the machine in working order.

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2 SPECIFICATIONS

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2.1 General Identification

The following section contains general information, drawings and lists for use with the LM2 Pulverising Mill.

Views shown in this document are indicative only; always refer to the relevant General Arrangement Drawing of the appropriate machine in Section 2.4 for specific details.

Name of Machine		Pulverising Mill LM2
Type of Machine	Pulverising Mill	
Machine Item Numbers	See Preliminary Information Panel on Page 1-2	
Manufacturer	Essa Australia Limited	
Ordering Description	Machine:	Pulverising Mill
	Model No:	LM2
	Item No:	100300, or as above
Electrical Requirements	Three phase supply to suit most voltage & frequency ratings	
Decibel Rating	<70 dBA (No material throughput)	
Dimensions - Mill	650 mm x 930 mm x 1210 mm	
Dimensions – Millmate	630 mm x 970 mm x 1520 mm (Assembled)	
Working Mass – Mill	290 kg	
Working Mass – Millmate	105 kg	
Shipping Mass – Mill	335 kg	
Shipping Mass – Millmate	130 kg	
Overall Shipping Dimensions – Mill	770 mm x 1060 mm x 1480 mm	
Overall Shipping Dimensions – Millmate – Shipped separately	440 mm x 770 mm x 1400 mm	

Table 1 Details of Machine

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2.1.1 Name Plate Location

The serial number and item number for the LM2 Pulverising Mill are on the name plate, which is situated on the front of the machine on the support ring of the base frame. The serial number should be quoted when ordering parts or enquiring about the machine.

There is a separate name plate, on the back of the control box, showing the serial number and item number of the control box only, as shown in the figures below.

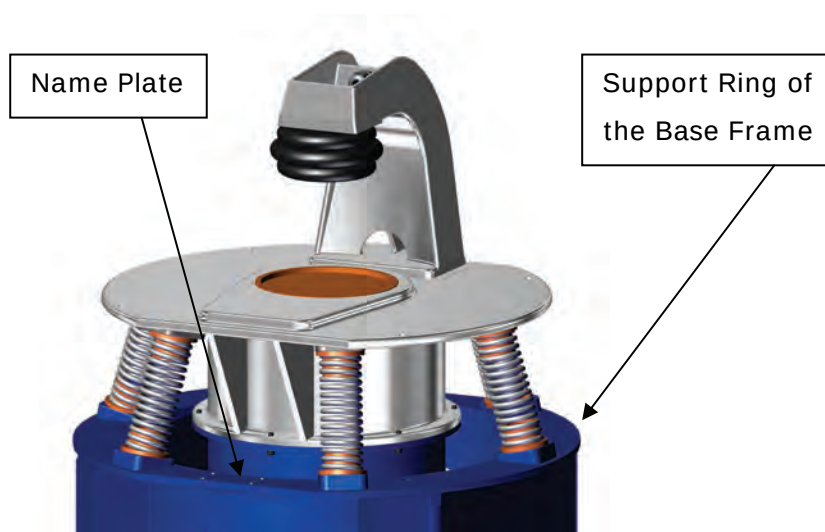


Figure 2 Location of Name Plate for the Mill

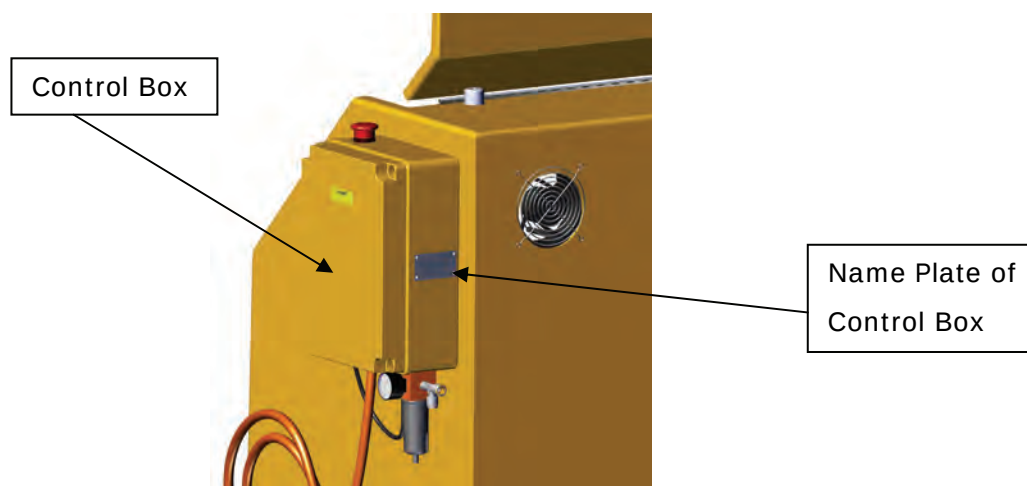


Figure 3 Location of Name Plate for Control Box

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2.2 Characteristics of the Machine

Essa manufactures a range of laboratory sized mills to suit most applications.

The basic concept of the LM2 Pulverising Mill comprises a vibratory head, driven by a universal shaft, powered by vee belts from a standard, stationary (non-vibrating) electric motor. This drive arrangement delivers more power to the grinding bowl and optimises the motor life by not exposing it to direct vibrations while operating. For an overview of the key component parts, please refer to Section 5.3 Machine Data, of this manual.

The LM2 Mill differs from traditional mills due to its ability to be fitted with unique 800 cc, 1000 cc or 2000 cc single disc type grinding bowls, in addition to the standard size ring and roller type grinding bowls.

The Mill is supplied as a complete unit pre-assembled with an electric motor and can include the optional Millmate to assist with lifting and handling the heavier bowls.

For hold down bolt locations, please refer to the General Arrangement Drawing in Section 2.4 and for required site services please refer to Section 4.2, of this manual.



Figure 4 LM2-P Pulverising Mill & Millmate

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2.3 Characteristics of the Component Parts

The following details outline general information relating to parts used on the LM2 Mill.

2.3.1 Electric Motor

2.2 kW, 380-415 V 50 Hz three phase AC, or other power configurations as required.

2.3.2 Gearbox

Not applicable to this equipment.

2.3.3 Pneumatic Equipment

The Mill requires a pneumatic supply rated at **700 kPa** with a **12 mm** line in and a minimum flow of 1 L per minute.

2.3.4 Extraction System

Not applicable to this equipment.

2.3.5 Hydrostatic

Not applicable to this equipment.

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2.3.6 Safety Devices (Lid Locking Safety Switch)

For safety purposes, the Mill features a local stop button on top of the control box on the right hand side of the machine, within easy reach for emergencies.

The Mill also features a lid locking safety switch located just inside the cabinet lid that will prevent the lid from being opened until the machine has completely stopped. In addition the machine will not start until the lid is completely closed. See the Figure below.

Note: The LM2 cabinet lid locking safety switch will not unlock, to allow the lid to be opened, unless power is supplied to the Mill. There is a seven (7) second delay for the lid to open once power is supplied to the machine. For maintenance procedures, open the lid prior to disconnecting the power supply to the machine

Important: Following initial installation of the machine and during commissioning, the lid locking safety switch must be turned to the “Lock” position using the T20 Torx Key supplied. If not turned to the lock position, the machine will not operate.

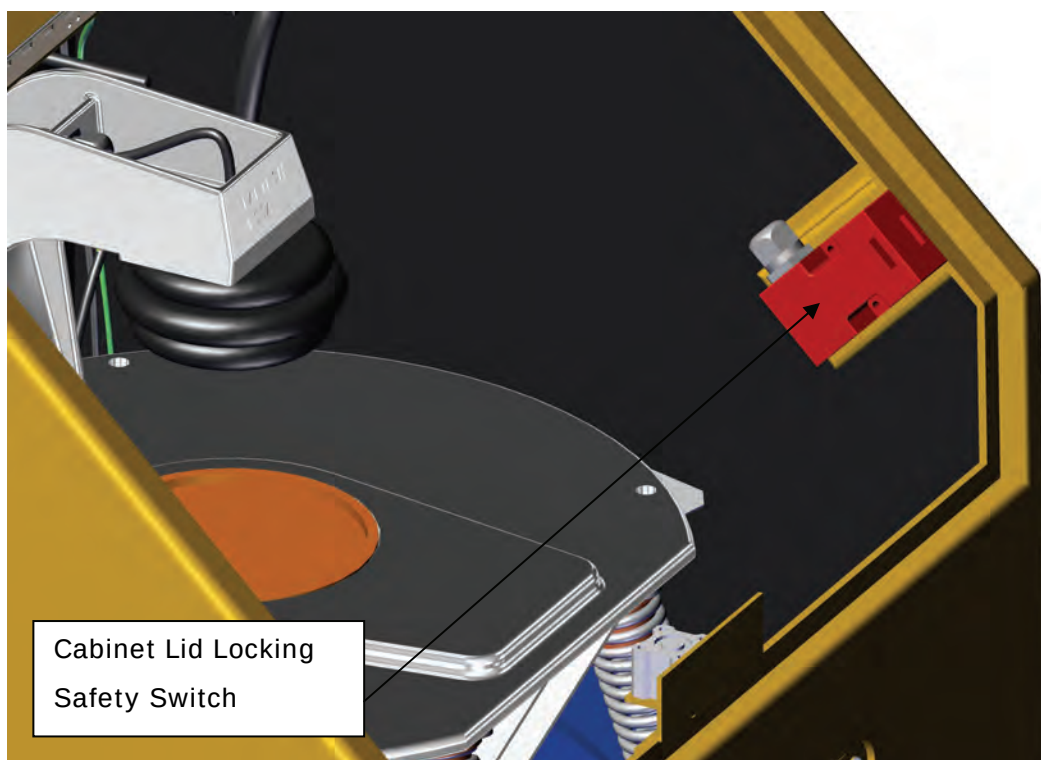


Figure 5 Cabinet Lid Locking Safety Switch

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2.3.7 Control Devices

The Mill is controlled manually using the operator controls and timer located on the control box on the side of the machine.

2.4 Diagrams and Drawings

The drawings that follow are the General Arrangement and Electrical Schematics for the LM2 Pulverising Mill.

2.4.1 GENERAL ARRANGEMENT

2.4.2 ELECTRICAL SCHEMATIC

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NOTES:

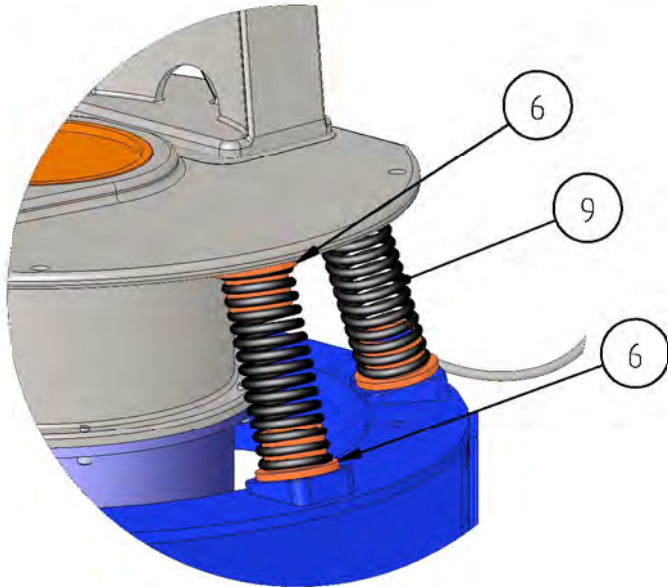
FINAL TEST REQUIREMENTS - REFER TO ASSEMBLY PROCEDURE

LUBRICATION - GREASE TYPE - EP2 / LBEP2
UNLESS OTHERWISE SPECIFIED

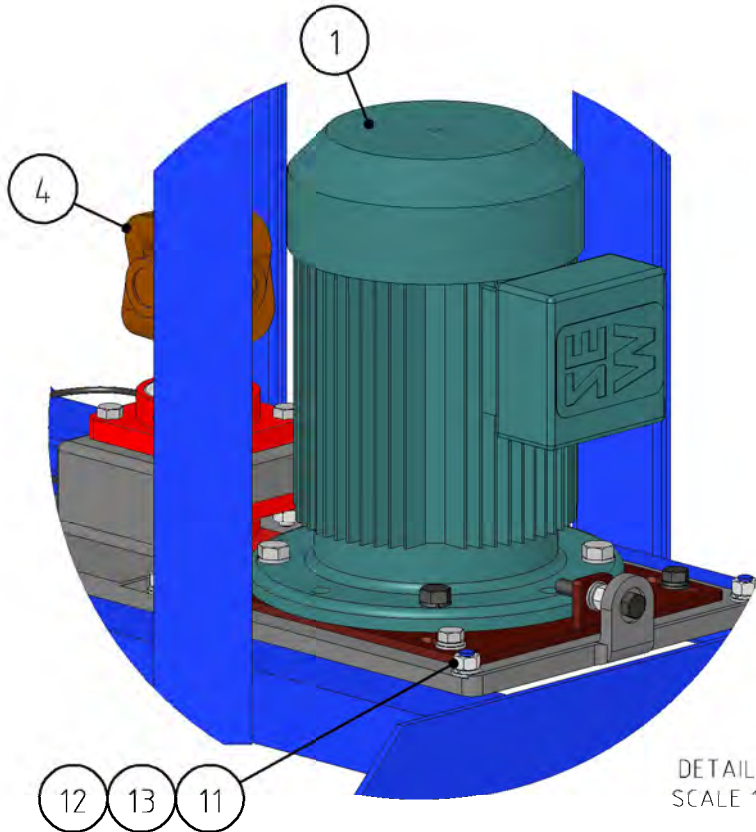
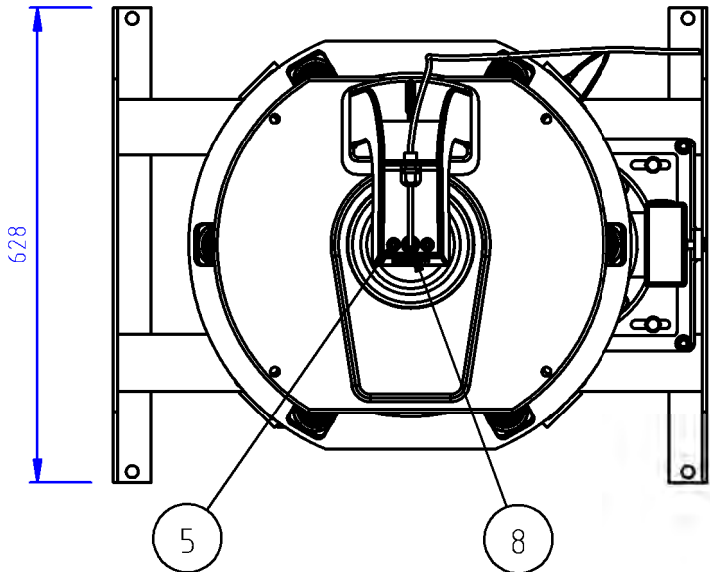
BOLT TORQUE GUIDE

BOLT GRADE 4.6 GRADE 8.8 GRADE 10.9 GRADE 12.9

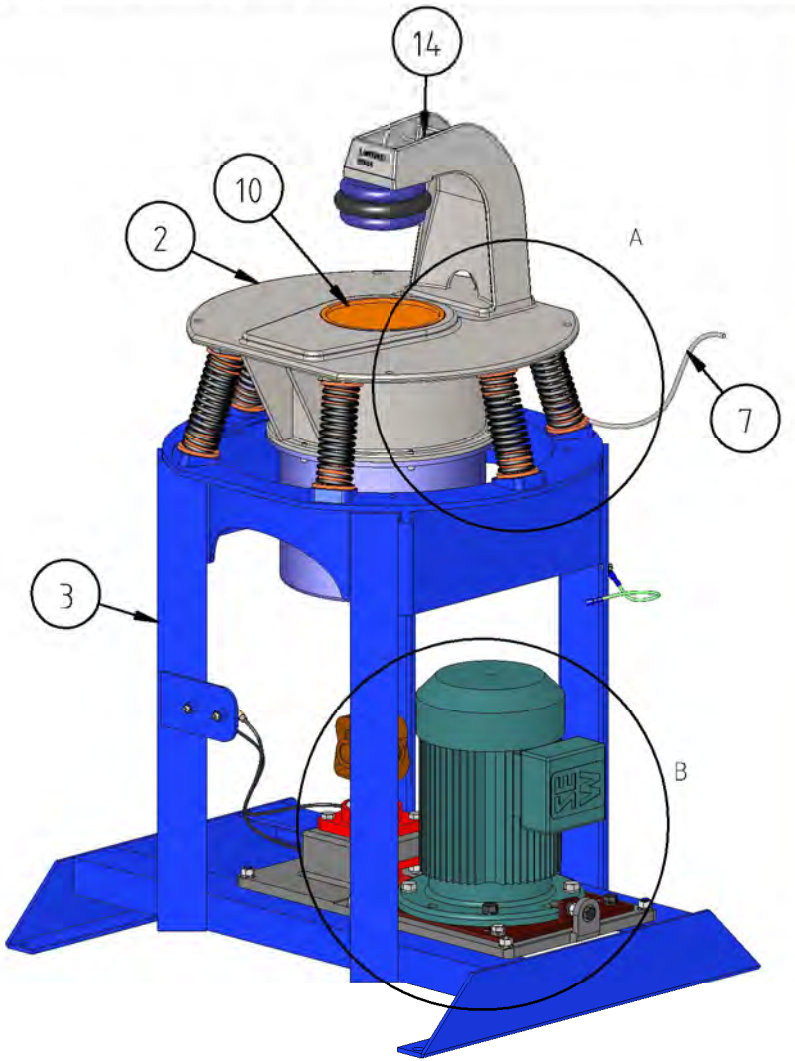
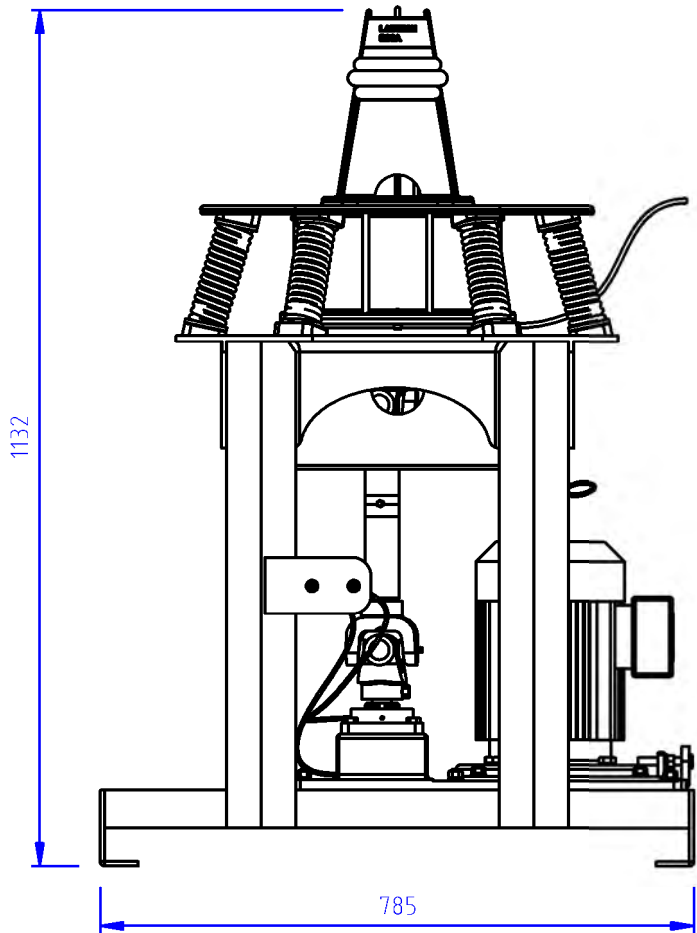
M5	2 Nm	5 Nm	8 Nm	9.5 Nm
M6	3.5 Nm	9 Nm	13 Nm	16 Nm
M8	8.5 Nm	22 Nm	32 Nm	39 Nm
M10	16.7 Nm	44 Nm	63 Nm	77 Nm
M12	29 Nm	77 Nm	109 Nm	135 Nm
M14	146.4 Nm	122 Nm	174 Nm	215 Nm
M16	71.3 Nm	180 Nm	270 Nm	330 Nm
M18		269 Nm	370 Nm	
M20	139.4 Nm	372 Nm	528 Nm	650 Nm
M22		519 Nm	722 Nm	
M24	241 Nm	640 Nm	914 Nm	1100 Nm
M30	476 Nm	1314 Nm	1817 Nm	2250 Nm
M36	2297 Nm	3173 Nm	3850 Nm	



DETAIL A
SCALE 1:5



DETAIL B
SCALE 1:5



NOTE	ITEM	QTY	BOM_Ref	DWG	DESCRIPTION	LENGTH	SIZE
S	1	1	112034	X	DRIVE UNIT		
	2	1	112035	X	MILL HEAD		
	3	1	112056	X	LM2 BASE FRAME		
S	4	1	225031	X	UNIVERSAL SHAFT		
	5	1	521015	X	AIRBAG CLAMP BOLT SET		
S	6	12	115050		MILL SPRING SPIGOT BUSH		
S	7	1	340012		AIR HOSE POLYETHYLENE 6mm	1300	
S	8	1	340029		STRAIGHT CONNECTOR		
S	9	6	350010		SPRING		
I	10	1	470029		POLYURETHANE		
S	11	6	512005		NUT ZP		M10 ZP
S	12	6	512605		WASHER FLAT ZP		M10 ZP
S	13	6	512615		WASHER SPRING ZP		M10 ZP
S	14	1	609500		CABLE GLAND 16mm		

	4	DRAWING UPDATED, VIEWS REARRANGED	S.M.B.	22/10/2010	
	3	ITEMS 10-14 ADDED, ITEM 1 MOVED, VIEW B CHANGED	A.T.	03/07/2008	
	2	SW MODEL UPDATED	B.A.	10/14/2005	
QTY/MACHINE	REV	DESCRIPTION	BY	DATE	-
QTY/WO	REVISIONS				

GENERAL TOLERANCES:

UNLESS OTHERWISE SPECIFIED

MACHINING - GENERAL - $\pm 0.1\text{mm}$

SHEET METAL WORK(<5mmTHK) - $\pm 0.5\text{mm}$

SHEET METAL WORK(>5mmTHK) - $\pm 1.0\text{mm}$

DRAWING QA CHECK BY.....

CHECK'D BOXED DIMENSIONS: ☐

BACKDRAFTING REQUIRED ☐

NAME:..... DATE:/..../..

DRAWN BY: B.A.

DATE: 22.10.10

DESIGNED BY:

DATE:

ALL DIMENSIONS IN
MILLIMETRES UNLESS
OTHERWISE NOTED
DO NOT SCALE -
IF IN DOUBT ASK



THIRD ANGLE
PROJECTION

10 AUSTRALIAN
STANDARD AS1100

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TITLE: LM2 MECHANICAL GA
GENERAL ARRANGEMENT

DESIGN REF.

DRAWING No:

112000

REVISION No:

4

SCALE: 1:10

MASS OF ITEM: kg

SHEET 1-2

A3

112000 LM2 Mechanical GA

NOTES:

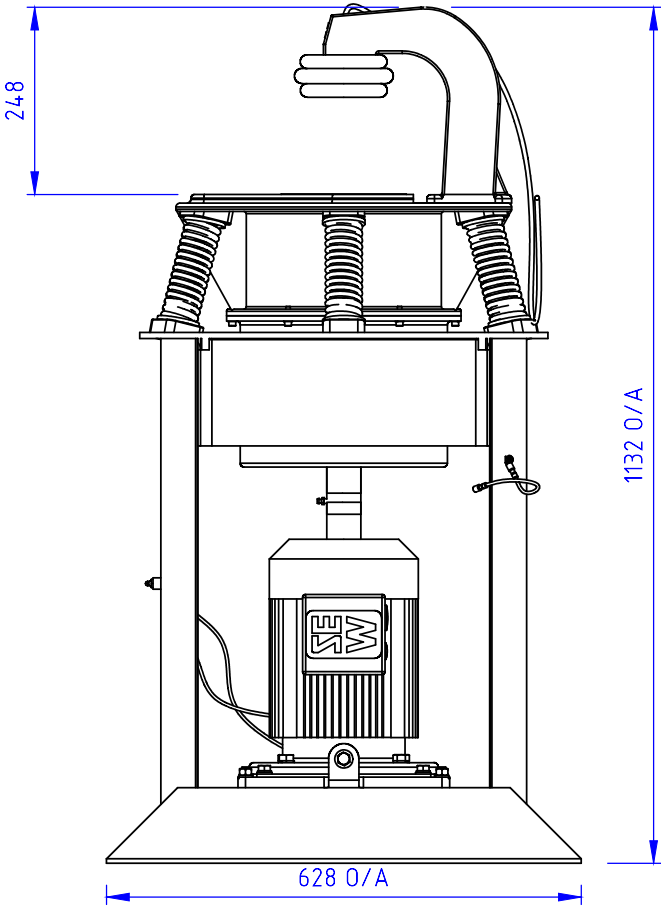
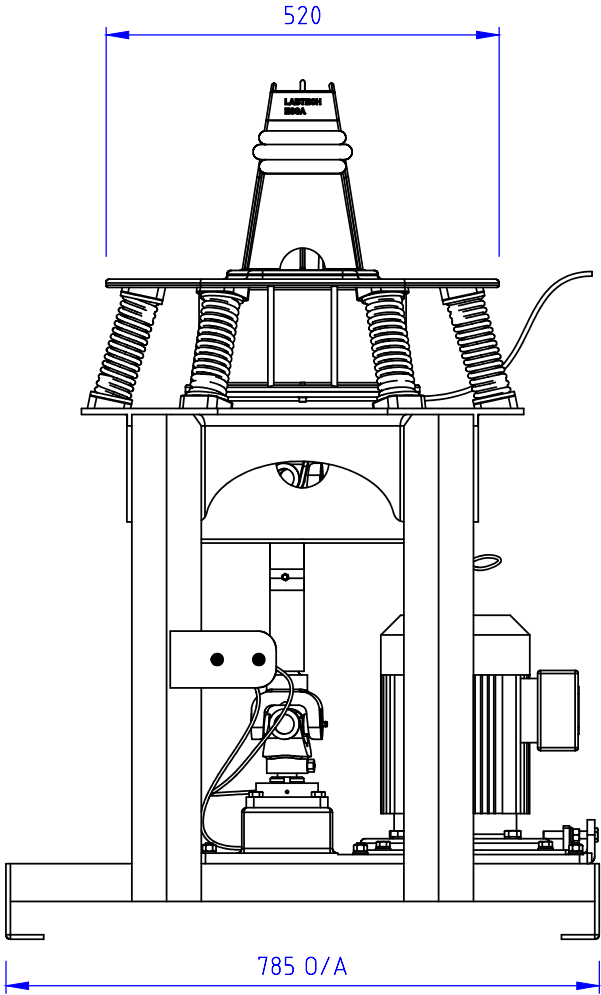
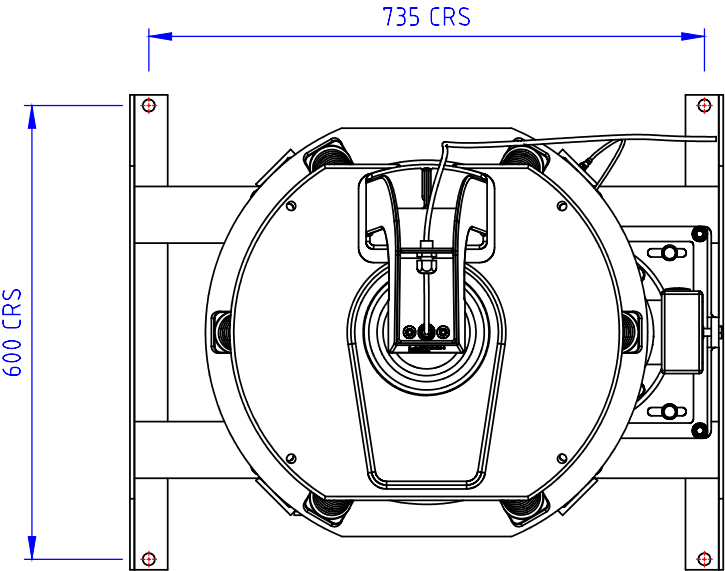
FINAL TEST REQUIREMENTS -REFER TO ASSEMBLY PROCEDURE

LUBRICATION - GREASE TYPE : EP2 / LBEP2
UNLESS OTHERWISE SPECIFIED

BOLT TORQUE GUIDE

BOLT GRADE 4.6 GRADE 8.8 GRADE 10.9 GRADE 12.9

M5	2 Nm	5 Nm	8 Nm	9.5 Nm
M6	3.5 Nm	9 Nm	13 Nm	16 Nm
M8	8.5 Nm	22 Nm	32 Nm	39 Nm
M10	16.7 Nm	44 Nm	63 Nm	77 Nm
M12	29 Nm	77 Nm	109 Nm	135 Nm
M14	146.4 Nm	122 Nm	174 Nm	215 Nm
M16	71.3 Nm	180 Nm	270 Nm	330 Nm
M18		269 Nm	370 Nm	
M20	139.4 Nm	372 Nm	528 Nm	650 Nm
M22		519 Nm	722 Nm	
M24	241 Nm	640 Nm	914 Nm	1100 Nm
M30	476 Nm	1314 Nm	1817 Nm	2250 Nm
M36	2297 Nm	3173 Nm	3850 Nm	



QTY/MACHINE	-	SEE SHEET 1	-	-	-
QTY/WO	REV	DESCRIPTION	BY	DATE	CHKD
		REVISIONS			

GENERAL TOLERANCES:
UNLESS OTHERWISE SPECIFIED
MACHINING - GENERAL - $\pm 0.1\text{mm}$
SHEET METAL WORK(<5mmTHK) - $\pm 0.5\text{mm}$
SHEET METAL WORK(>5mmTHK) - $\pm 1.0\text{mm}$

DRAWING QA CHECK BY.....
CHECK'D BOXED DIMENSIONS: ☐
BACKDRAFTING REQUIRED ☐
NAME:..... DATE: .../.../...

DRAWN BY: B.A.
DATE: 22.10.10
DESIGNED BY:
DATE:



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Web: www.essa.com.au email: mail@essa.com.au

TITLE: LM2 MECHANICAL GA
GENERAL ARRANGEMENT

DESIGN REF.

DRAWING No:

112000

SHEET 2-2

REVISION No:

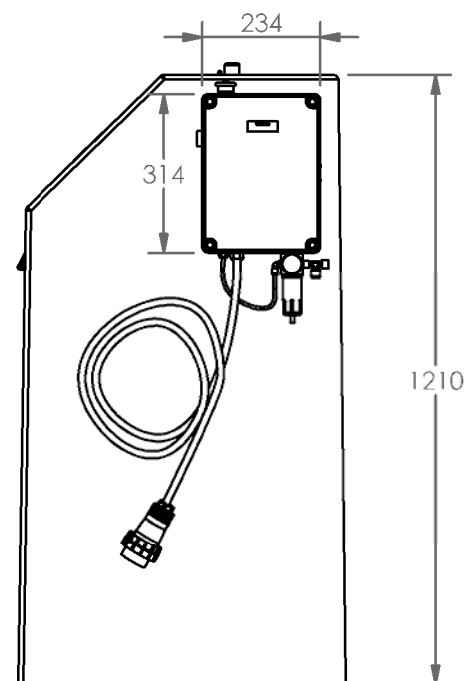
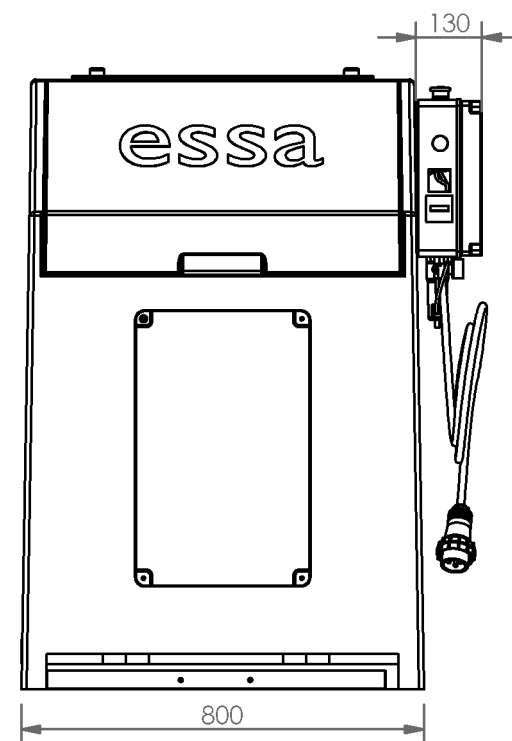
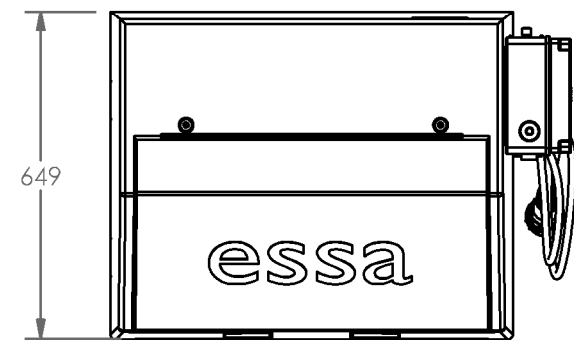
4

A3

SCALE: 1:10

MASS OF ITEM: kg

112000 LM2 Mechanical GA



	1	S/W MODEL & BOM UPDATED	17/10/2005	B.A		
CNG. No.	REV.	DESCRIPTION	DATE	CKD.		
REVISIONS						
 THIRD ANGLE PROJECTION	ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED DO NOT SCALE - IF IN DOUBT ASK		DESIGNED BY		DATE	
			DRAWN BY	B.A	DATE	28/09/2005
			CHECKED BY		DATE	

ALL DIMENSIONS IN
MILLIMETRES UNLESS
OTHERWISE NOTED
DO NOT SCALE - IF IN DOUBT ASK

DESIGNED BY		DATE	
DRAWN BY	B.A	DATE	28/09/2005
CHECKED BY		DATE	

essa

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tel: +61 8 9270 5200 fax: +61 8 9377 3420
Web: www.essa.com.au email: mail@essa.com.au

TITLE: LM2-P Pneumatic 380-415v/50Hz

DESIGN REF.
LM2

DRAWING No:
1003000

SHEET 1-2

REVISION No:

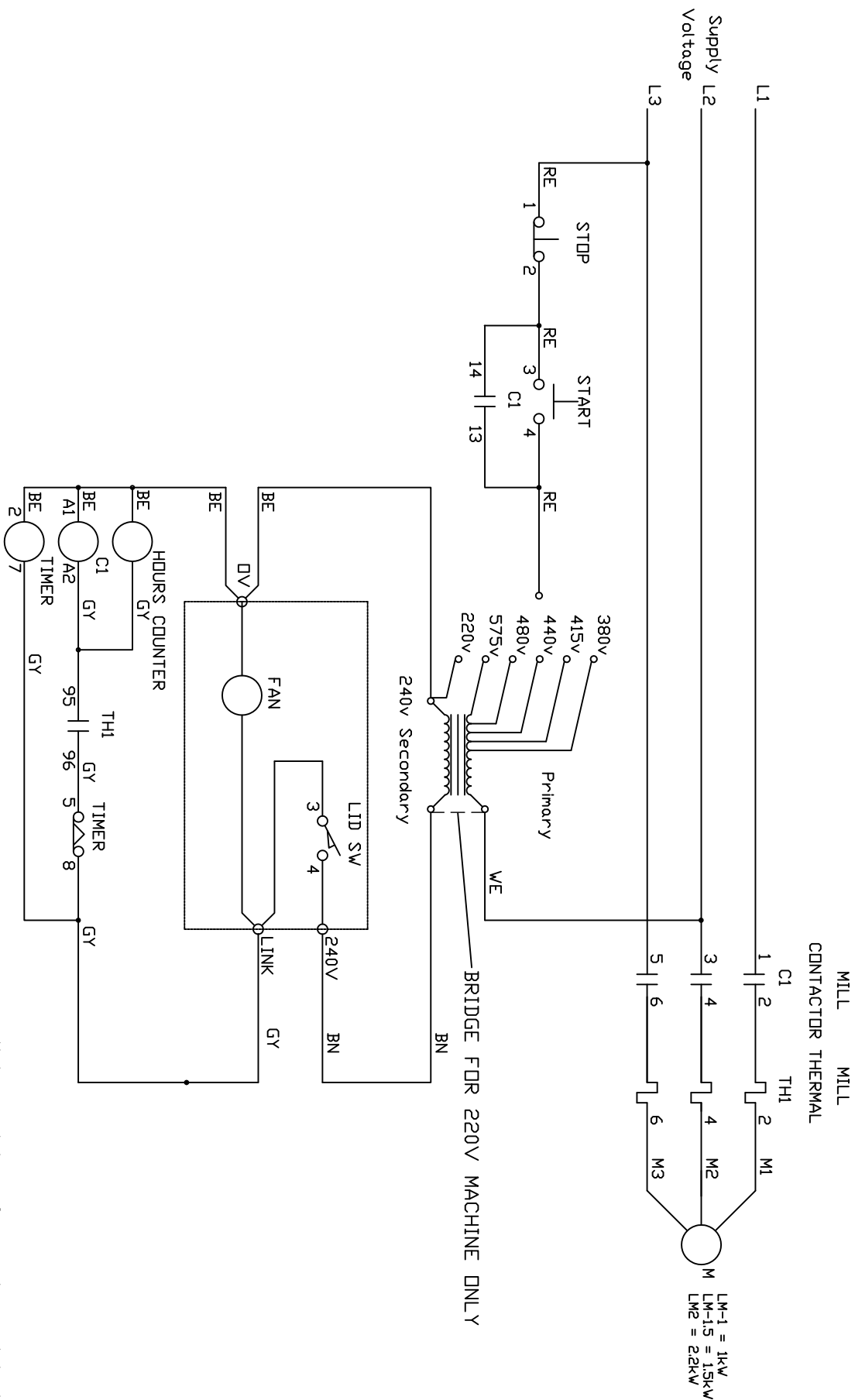
A3

SCALE: 1:15

MASS OF ITEM:

100300 LM2-P Pneumatic 380-415v 50Hz

EQUIPMENT DESIGNATION			
ESSA ITEM	TYPE	REMARKS	
CONTRACTOR	TELEMECANIQUE	TO SUIT CONTROL VOLTAGE	
604249	TELEMECANIQUE	OVERLOAD	
605008	TELEMECANIQUE	MUSHROOM HEAD OPERATOR	
605813	IDEC G13A 2AF20	TIMER	
605814	TIMER	MOUNTING BRACKET	
605911	RS	HOUR METER	
607004	3 PHASE	PLUG AND LEAD	
612000	380-550V / 240V 50Hz	TRANSFORMER	
613200	PAPST	AXIAL FAN	
613203	RS	FAN GUARD	
652004	LM	EARTH STRAP	
652007	POWER	OUTLET ASSEMBLY	
652011	MILL	CONTROL BOX ASSEMBLY	
652012	LM	SAFETY SWITCH ASSEMBLY	
652056	LM	MANUAL WIRING HARNESS	



Motor and transformer tap matched to local supply voltage and frequency

B	DRAWING UPDATED	S.M.B.		22.10.10	
A	UPDATED BORDER	B.W.	M.P.	12.09.06	
REV. No.	DESCRIPTION		BY	CHKD	DATE
REVISIONS					
DRAWING QA CHECK BY _____		ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED		DESIGNED BY _____	
CHECK'D BOXED DIMENSIONS: ☐		DO NOT SCALE - IF IN DOUBT ASK		DATE _____	
BACKDRAFTING REQUIRED ☐				DRAWN BY R.S.	
NAME: _____ DATE: ____/____/____				DATE 15.01.02	
(C) THIS DRAWING IS THE PROPERTY OF ESSA AUSTRALIA LTD. AND MUST NOT BE COPIED OR REPRODUCED WITHOUT PRIOR WRITTEN CONSENT					
THIRD ANGLE PROJECTION 					

TITLE: MILL MANUAL CONTROL CIRCUIT LM1, LM1.5 & LM2		
DESIGN REF.	DRAWING No:	REVISION No:
	880223E-01	B
SCALE: NTS		A3

essa	Essa Australia Limited	8 Yelland Way Bassendean WA 6054 Australia tel: +61 8 9270 5200 fax: +61 8 9377 3420 Web: www.essa.com.au email: mail@essa.com.au
ABN 59 007 944 569		

DWG. No:	
----------	--

2.5 Spare Parts Schedules

The sections that follow contain lists of parts recommended to, commission, operate and maintain the LM2 Mill.

2.5.1 Recommended Commissioning Spares

Not applicable, no commissioning spares are recommended for this machine.

2.5.2 Recommended Operating/Maintenance Spares – LM2 Mill

The following Spare Parts List shows the parts recommended to be held in stock for 12 months operation and general maintenance of the LM2 Mill. It does not include parts that may be required during a major overhaul. Refer to the comprehensive Parts List in Section 9 of this manual.

Item	Item No.	Quantity	Lead Time
Vee belts	225003	2	Stock
Hour counter	605911	1	Stock
Bearing	221005	2	Stock
Bearing housing	221019	2	Stock
Platform insert	470029	1	Stock
Air line 6 mm	340012	3 m	Stock
Air bag clamp	111070	2	Stock
Pneumatic regulator	340002	1	Stock
Mill spring spigot bush	115050	12	Stock
Spring	350010	6	Stock

Table 2 Recommended Operating/Maintenance Spare Parts for LM2 Mill

Section:	Specifications	Equipment Type:	Pulverising Mill
Document No.:	882118	Model Number:	LM2
Revision No.:	A	Date:	November 2010
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2.5.3 Recommended Operating/Maintenance Electrical Spares – LM2 Mill

The following Spare Parts List shows the electrical parts recommended to be held in stock for 12 months operation and general maintenance of the LM2 Mill. Please refer to the comprehensive Parts List in Section 9 of this manual for a complete electrical parts list and illustrations with figure reference numbers corresponding to those shown in the Table below.

Fig Ref #	Item No. for 220-240V	Item No. for 380-415V	Description	Qty
3	604059	604059	Contactor	1
4	604252	604250	Overload relay	1
9	340064	340064	Solenoid valve 50/60 Hz	1
10	616200	616200	Air pressure switch	1
11	340001	340001	Air clamp bleed control	1
13	340002	340002	Filter regulator	1
14	605918	605918	Start switch actuator	1
15	605919	605919	Stop switch actuator	1
34	652168	652168	Lid locking safety switch	1

Table 3 Recommended Operating/Maintenance Electrical Spares - LM2 Mill

Section:	Specifications	Equipment Type:	Pulverising Mill
Document No.:	882118	Model Number:	LM2
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2.5.4 Recommended Operating/Maintenance Spares - Millmate

The following Spare Parts List shows the parts recommended to be held in stock for 12 months operation and general maintenance of the LM2 Millmate. Refer to the comprehensive Parts List in Section 9 of this manual.

Item	Item No.	Quantity	Lead Time
Air line 4 mm	340182	3 m	Stock
Air line 6 mm	340012	3 m	Stock
Air bag	111070	2	Stock
Pneumatic regulator	340002	1	Stock

Table 4 Recommended Operating/Maintenance Spares Parts for LM2 Millmate

2.5.5 Recommended Critical Insurance Spares

Not applicable. No critical insurance spares are recommended for this machine.

Section:	Specifications	Equipment Type:	Pulverising Mill
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Revision No.:	A	Date:	November 2010
Page No.:	2-12		

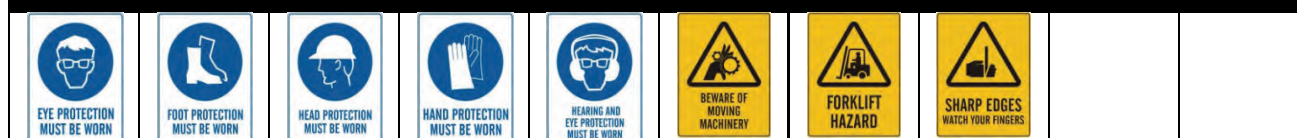
3 TRANSPORTATION & HANDLING

The following section outlines all the relevant storage, transport and handling requirements for the LM2 Mill.

Section 3 Table of Contents

3.1	General Safety Rules	3-2
3.2	Storage, Transportation and Handling.....	3-2
3.2.1	Storage	3-2
3.2.2	Transportation.....	3-2
3.2.3	Handling.....	3-2
3.3	Unpacking	3-2
3.3.1	Packaging Details.....	3-3
3.3.2	Special Devices for Transportation.....	3-4
3.3.3	Upon Delivery	3-4
3.3.4	Unpacking the machine.....	3-5
3.3.5	Movement after Unpacking	3-8
3.3.6	Checklist of Supplied Parts	3-8
3.3.7	Details for Notification	3-9

Minimum PPE used in this section



Section:	Transportation & Handling	Equipment Type:	Pulverising Mill
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3.1 General Safety Rules

Only trained operators of forklifts or cranes are to lift or move the crated or un-crated LM2 Mill.

3.2 Storage, Transportation and Handling

The sections below outline steps and procedures for the transportation, handling and unpacking of the LM2 Mill and storage of the machine if required.

3.2.1 Storage

If the machine needs to be stored for any reason, it should be indoors or undercover away from the effects of the weather.

3.2.2 Transportation

The packing crate has a pallet base for ease of access and movement with a forklift. The forklift must have a rated capacity to lift the crated machine.

Note: Under no circumstances are slings or chains to be used to lift the crated machine. Always lift the machine utilising the recesses in the pallet base with a forklift.

3.2.3 Handling

Always use the forklift to lift and move the Mill. Placing the Mill close to the installation point, prior to unpacking, will prevent unnecessary moving and therefore reduce the risk of injury.

3.3 Unpacking

Following is the procedure for unpacking the LM2 Mill. Please follow these instructions to carefully remove the machine from the transportation packaging.

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3.3.1 Packaging Details

The LM2 Mill packing crate is manufactured to ISPM15 International Standard. Depending on the destination, the crate may be an open slat type or solid sided. For dispatch from the factory the machine is strapped and bolted to the base of the crate, black poly wrapping is used to protect the machine and the body of the crate is tek screwed into position.

Note: The crate must be dismantled, a panel at a time, from the crate pallet base to unpack the machine. Do not lift the upper crate from the machine as this may cause damage to the machine cabinet. The Figure below illustrates a typical open slat type of crate.

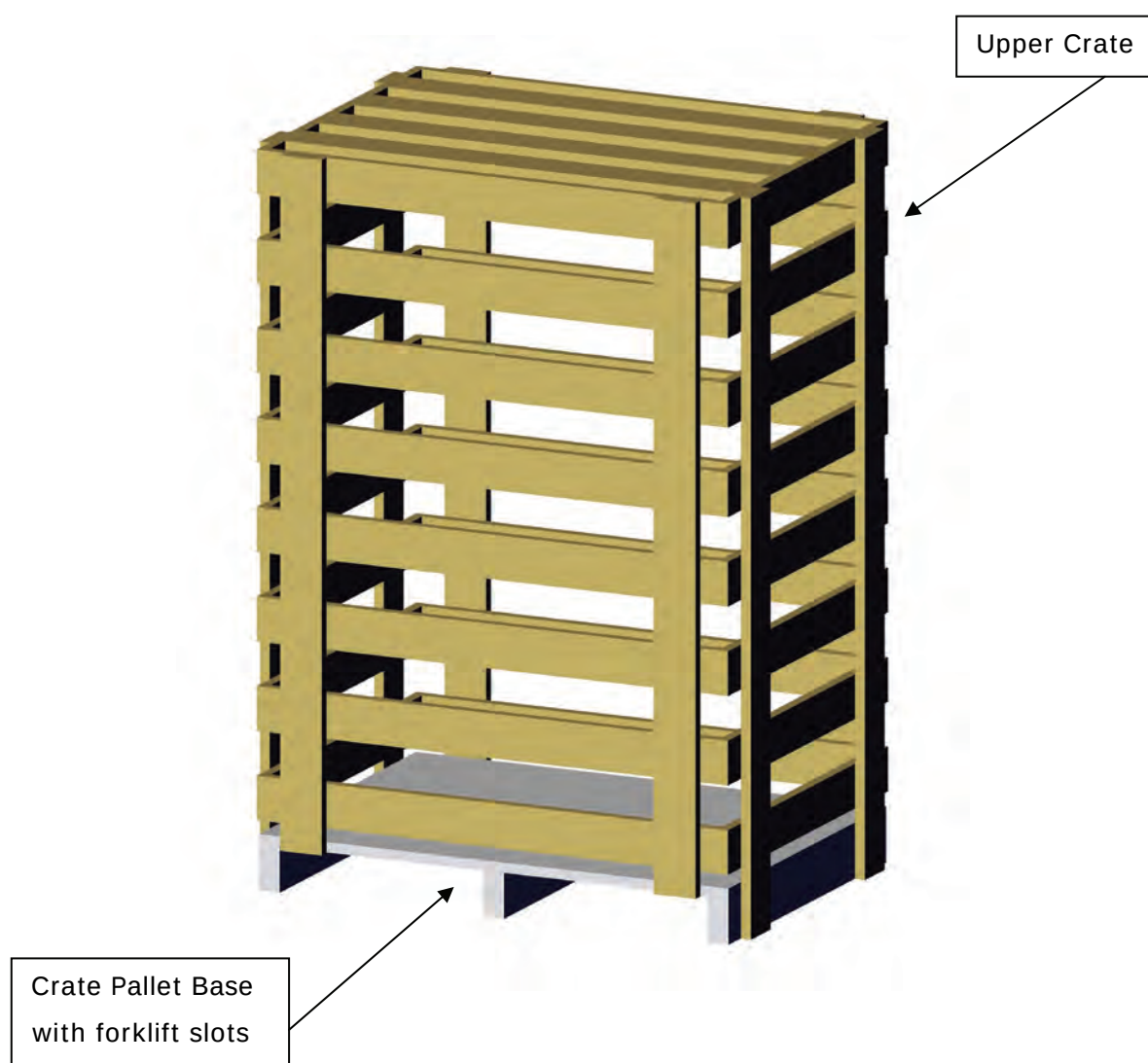


Figure 6 Typical Open Slat Type Packing Crate

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3.3.2 **Special Devices for Transportation**

Not applicable, no special fixtures, devices or connections are required. General equipment used must be capable of lifting the weight of this machine.

3.3.3 **Upon Delivery**

Prior to unpacking, make a visual inspection of the packaging for transit damage.

If any damage is evident, advise the transport company at the time of delivery or take photos and notes to forward to your supplier or Essa in case more serious damage is detected once the machine is unpacked.

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Page No.:	3-4		

3.3.4 Unpacking the machine

Follow the procedure below to unpack the LM2 Mill. Care should be taken not to break the crate in case it may be required for re-use.

- Ensure a visual inspection upon delivery and take note of any damage that may have taken place.
- Remove the tek screws that hold the front of the packing crate in place, release the front of the crate and set aside out of the way.
- Remove the top, sides and rear panels of the packing crate.
- Carefully remove the plastic protective wrapping and discard.
- Carefully cut the strapping used to secure the Mill to the crate base and discard.

Note: The next three points that allow the cabinet to be lifted from the Mill, are illustrated in the Figure that follows.

- Open the Mill cabinet lid and disconnect the air line that runs from the cabinet, behind the control box, to the air bag clamp on the Mill head. Disconnect the line at the cabinet wall end. Refer to Item 6.2.2 Air Line Fittings in the Maintenance Section of this document.
- Unplug the orange motor power cable plug from the socket inside the cabinet, to separate the cabinet from the Mill.
- Also, unplug the small yellow earth cable that runs from the Mill cabinet to the right, rear vertical leg of the Mill base frame.

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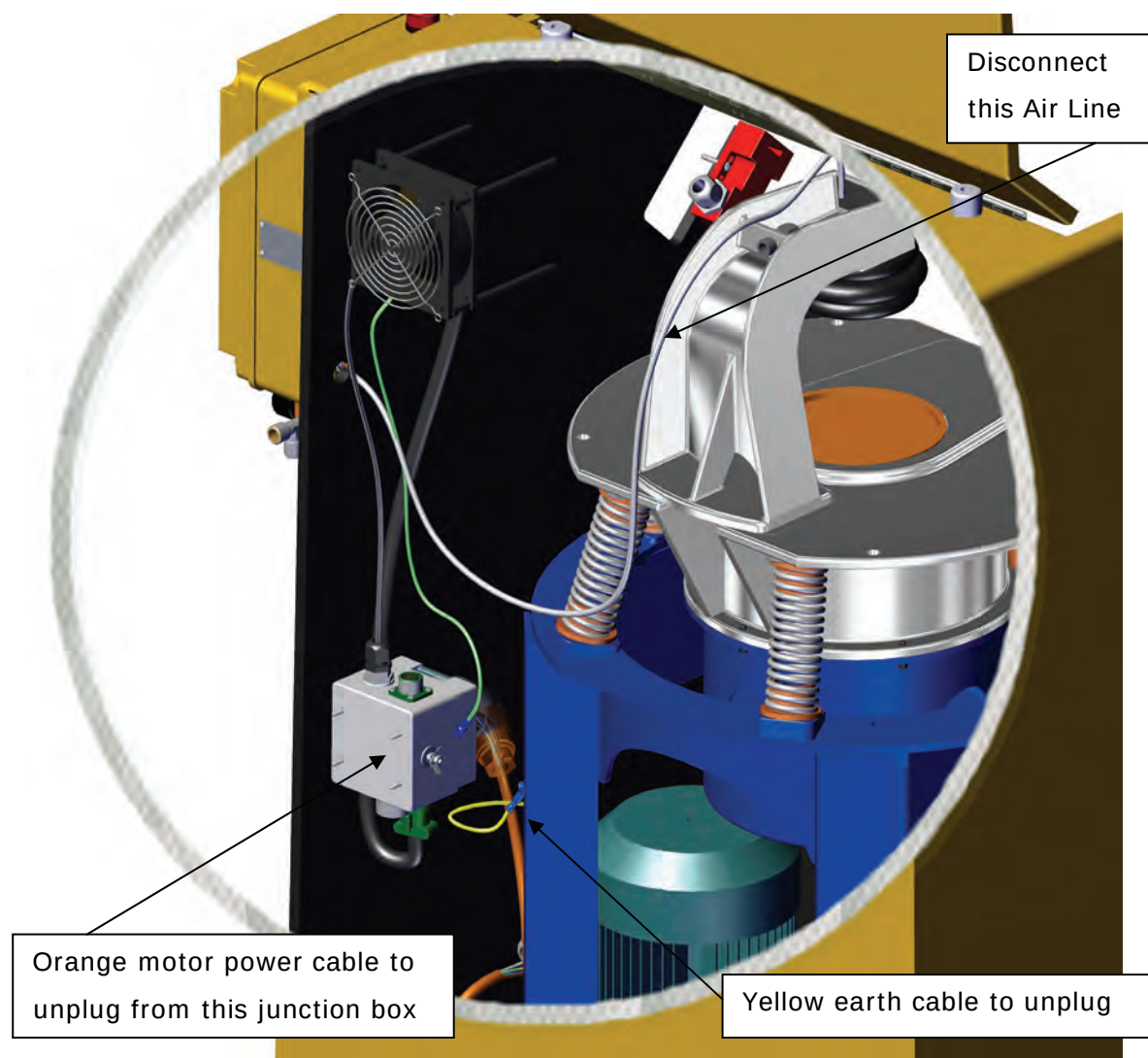


Figure 7 Disconnecting the Cabinet from the Mill (Rear panel cutaway for illustration)

- Undo the six (6) bolts holding the cabinet to the Mill base frame and lift the cabinet clear of the Mill and place aside. There are three (3) bolts at the bottom of either side of the cabinet.
- Unbolt the Mill from the crate base and retain the bolts, nuts and washers for possible re-use.
- Using a forklift under the base of the Mill, carefully lift the Mill off the crate base. See the Figures below.

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Revision No.:	A	Date:	November 2010
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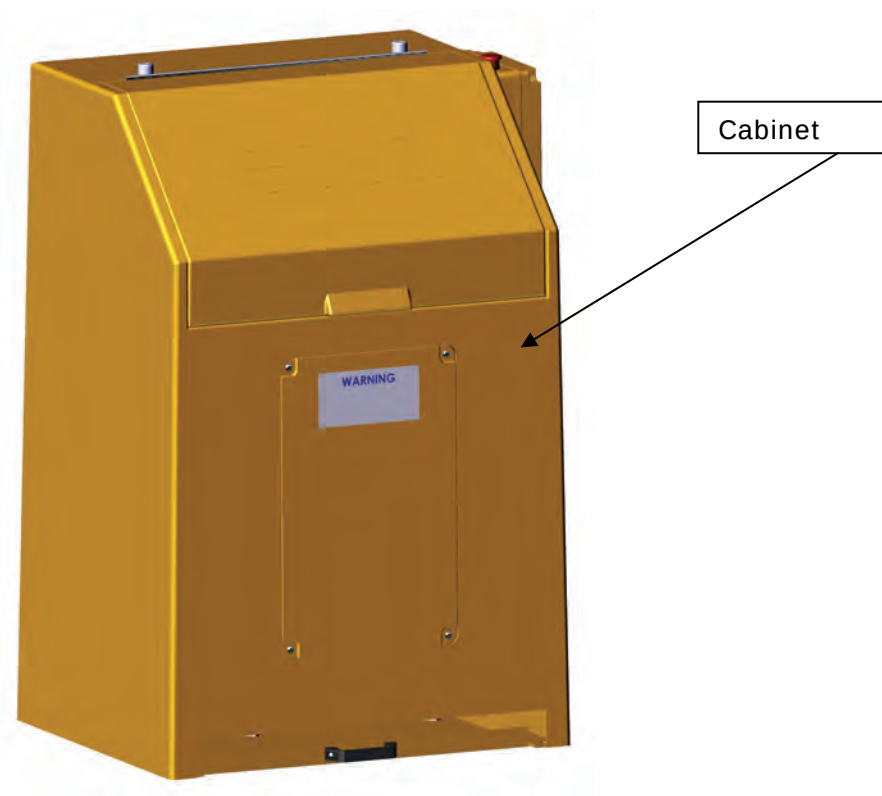


Figure 8 Unpacking the Machine

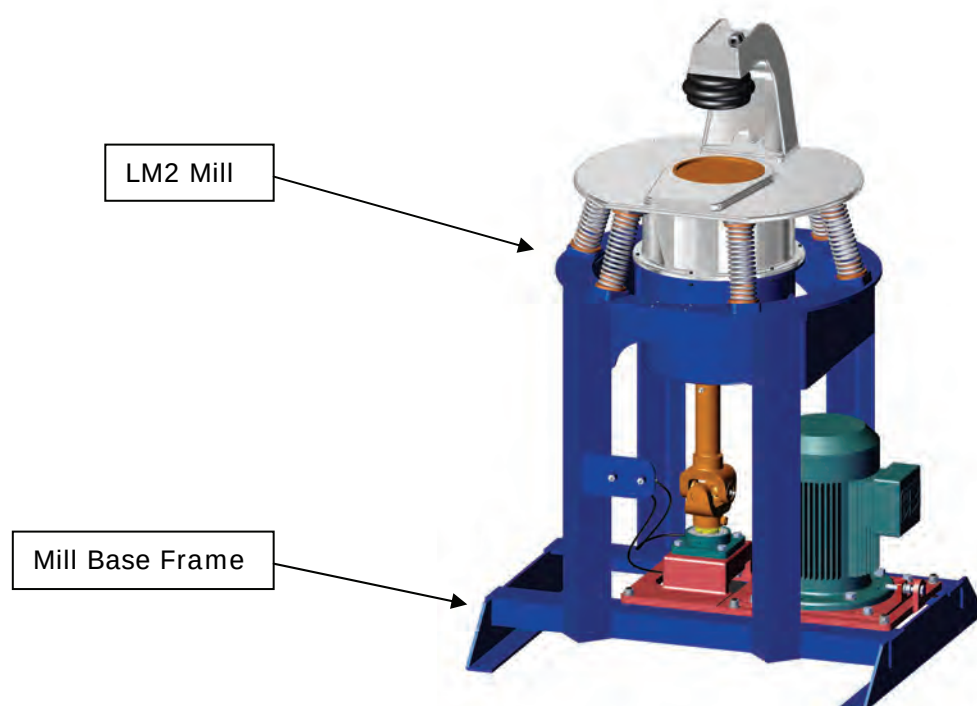


Figure 9 Unpacking the Machine

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3.3.5 Movement after Unpacking

Move the machine to the area of installation with suitable lifting equipment with a rated capacity to lift the machine.

3.3.6 Checklist of Supplied Parts

The following list describes the separate items and quantities that are/may be supplied with the LM2 Mill.

Item No.	Description	Quantity
882118	Installation, Operation, Maintenance and Spare Parts Manual	1
112016	Millmate post assembly (optional)	1
112015	Millmate base plate (optional)	1
111089	Millmate swivel/cradle assembly (optional)	1
350017	Grease tube 400 g	1
470015	Disc hook	1
512708	Dynabolts M12 X 60	4
346790	Torx key T20 for lid locking safety switch	1

Table 5 List of Separate Items Supplied

Note: Depending on installation destination and other factors, the optional Millmate components listed above, may be packed differently for transport requirements.

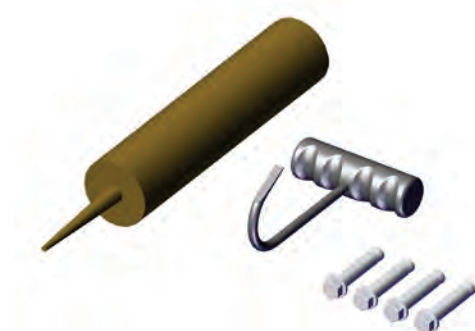


Figure 10 Grease Tube, Disc Hook & Dynabolts

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3.3.7 Details for Notification

If any items listed above are not included in the packaging please report the,

- Model number
- Description of equipment purchased
- Date purchased
- Where the equipment was dispatched from and
- A list of the missing items to your supplier, or:

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ABN 59 007 944 569

Section:	Transportation & Handling	Equipment Type:	Pulverising Mill
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4 INSTALLATION

The following section outlines procedures for the correct installation of the LM2 Mill.

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4.2.2	Pneumatics	4-3
4.2.3	Hydraulics	4-4
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4.2.6	Floor Space.....	4-4
4.2.7	Drainage	4-4
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4.2.9	Environmental Conditions.....	4-4
4.2.10	Heating, Cooling or Ventilation	4-4
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4.1 General Safety Rules.

Minimum PPE									
									
EYE PROTECTION MUST BE WORN	FOOT PROTECTION MUST BE WORN	HEAD PROTECTION MUST BE WORN	HAND PROTECTION MUST BE WORN		BEWARE OF MOVING MACHINERY	FORKLIFT HAZARD	SHARP EDGES WATCH YOUR FINGERS		

Provision of the following is the responsibility of the end user.

- Electrical supply and isolation procedures conforming to relevant company requirements.
- Control safeguards and operational procedure including start-up and shutdown protocols.
- Implementation of power loss restart.
- Setting and controlling all safety set points and limitation.
- Do not lift the machine by any point other than the lifting eyes or slots provided, unless specifically stated otherwise.
- Only lift the machine by using all of the lifting eyes or slots provided.
- Under no circumstance are cover handles to be used for any purpose other than opening covers.

4.1.1 Vents and Drains

A small fan is provided at the rear of the machine for cooling only.

4.1.2 Decibel Rating

<70 dBA (with no material through put)

4.1.3 PPE Required

The correct PPE is to be worn at all times as per company requirements

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4.2 Site Services Required

The following details outline services and other items that may be required on site for the installation of the LM2 Mill.

4.2.1 Power

The Mill operates on **three-phase AC** power connected via a three phase plug and socket.

4.2.2 Pneumatics

The Mill operates on a pneumatic supply rated at **700 kPa** with a **12 mm** line in and a minimum flow of 1 L per minute.



Figure 11 Three Phase Cable & Plug

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4.2.3 **Hydraulics**

Not applicable.

4.2.4 **Water**

Not applicable.

4.2.5 **Footings or Bench/Table/Frame/Platform detail**

It is recommended the LM2 Mill be securely fastened to a concrete floor, using the high stress fasteners provided.

4.2.6 **Floor Space**

It is recommended the LM2 Mill be installed with a minimum clearance of at least 600 mm on three sides and 1000 mm in front of the Mill, to provide safe movement areas for operators and service personnel. A work bench for handling bowls and materials may be required adjacent to the Mill and/or Millmate on the control box side.

4.2.7 **Drainage**

Not applicable.

4.2.8 **Dust Extraction**

Not applicable.

4.2.9 **Environmental Conditions**

The LM2 Mill is designed for use indoors or under cover out of the elements.

4.2.10 **Heating, Cooling or Ventilation**

There is a small fan on the rear of the Mill cabinet for cooling only.

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4.3 Installation of Equipment

The machine comes as a complete unit, so no additional parts requiring installation will be included, unless specifically requested, such as optional extras. Ensure the standard issue of items indicated in Section 3 (Checklist of Supplied Parts) have been received.

4.3.1 Special Tools

No special tools are required for the installation, maintenance or repair of this machine.

4.3.2 Installation Procedure

The correct installation procedure for the LM2 Mill, being bolted to a concrete floor, is as follows:

Note: The optional Millmate lifting device can be retrofitted to an existing machine or fitted with the installation of a new Mill. If installing the Millmate to an existing Mill, remove the cabinet and the floor mounting bolts of the Mill and, using a forklift, set the Mill aside.

- Ensure all site services are correctly measured and placed aside, ready for installation. (i.e. correct cable length).
- Ensure the floor surface where the Mill is to be placed is level, using a spirit level.
- Correct measurement and placement of the mounting holes is essential. It is advisable to place the Mill in position and use the fixing holes in the base frame as a template.
- Drill the required number of holes into the floor to secure the Mill base, suitable for appropriate size Dynabolts, (supplied).
- If installing the Millmate, first place the Millmate base plate in position where the Mill will be bolted.

Note: The Millmate base plate is placed so that the post mounting holes will be at the front, right corner of the Mill.

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- Lower the Mill into place (on to the Millmate base plate) using a forklift and take care to accurately position the machine. Secure the machine (and the Millmate base plate) to the floor using the supplied Dynabolts.



Warning: Failure to adhere to the following point may void the warranty and may create a serious personnel injury hazard.

- Before connecting the machine to power, remove the four (4) transport bolts that lock the Mill head to the base frame for security during transport. See the Figure below.

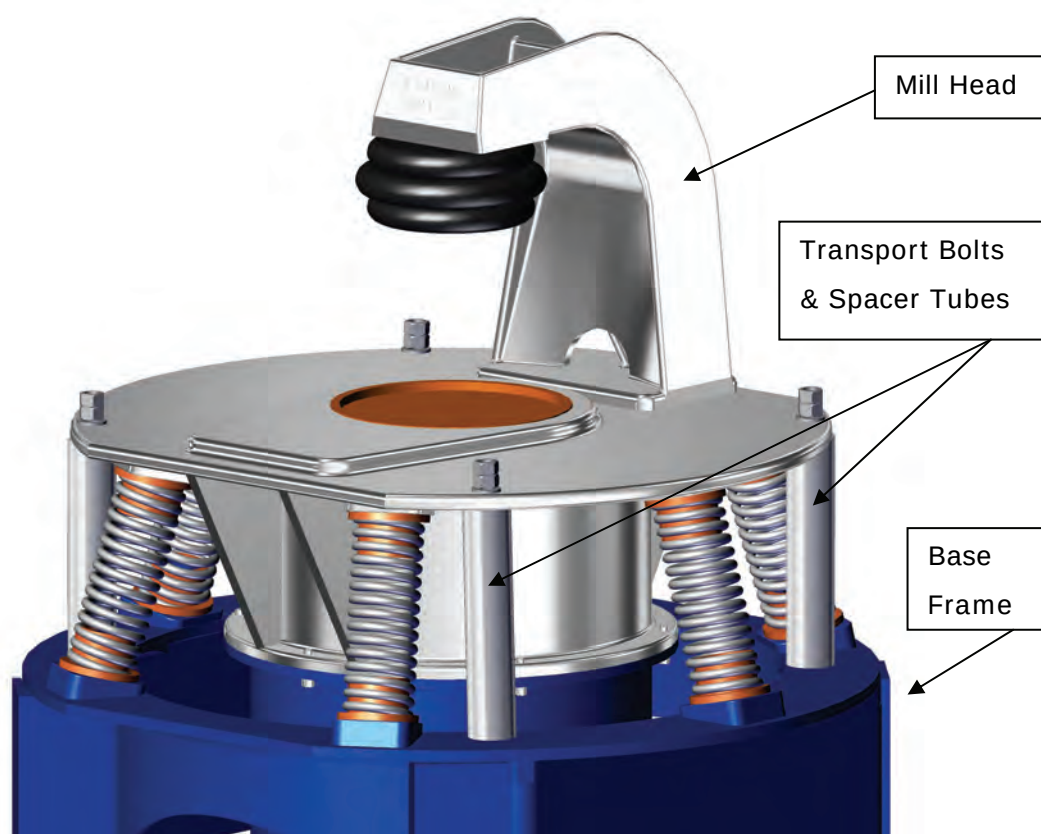


Figure 12 Transport Bolts to be removed at installation

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- When the Mill is secure and the transport bolts have been removed, lower the cabinet over the Mill and secure it to the Mill base frame using the six (6) bolts removed earlier.
- Reconnect the Mill head air line, the motor power plug and the earth cable inside the cabinet and ensure the fan grill, at the rear of the cabinet is not obstructed.

Note: Before reinstalling the Mill cabinet over the Mill, take extra precautions to ensure the motor power cable has sufficient slack inside the base frame to prevent stressing the cable during operation of the Mill, however, also be mindful of too much slack allowing the cable to be in contact with the frame or floor, that may result in friction damage to the cable insulation and potential electric shock conditions.

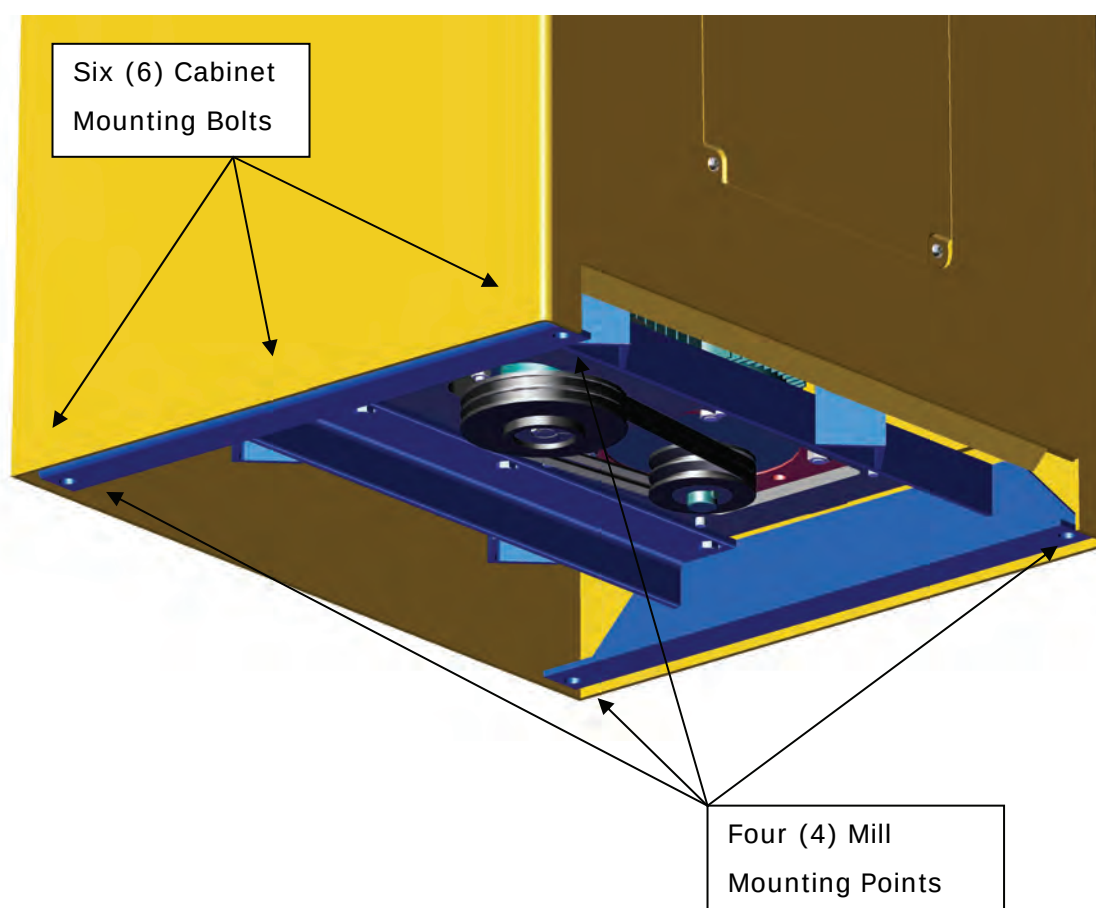


Figure 13 Mill Mounting Points

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- Assemble the Millmate post to the base plate using the four (4) bolts supplied.
- Connect the air line for the Millmate to the tee fitting situated under the Mill control box. Remove the small plug from the tee fitting and connect the air line.

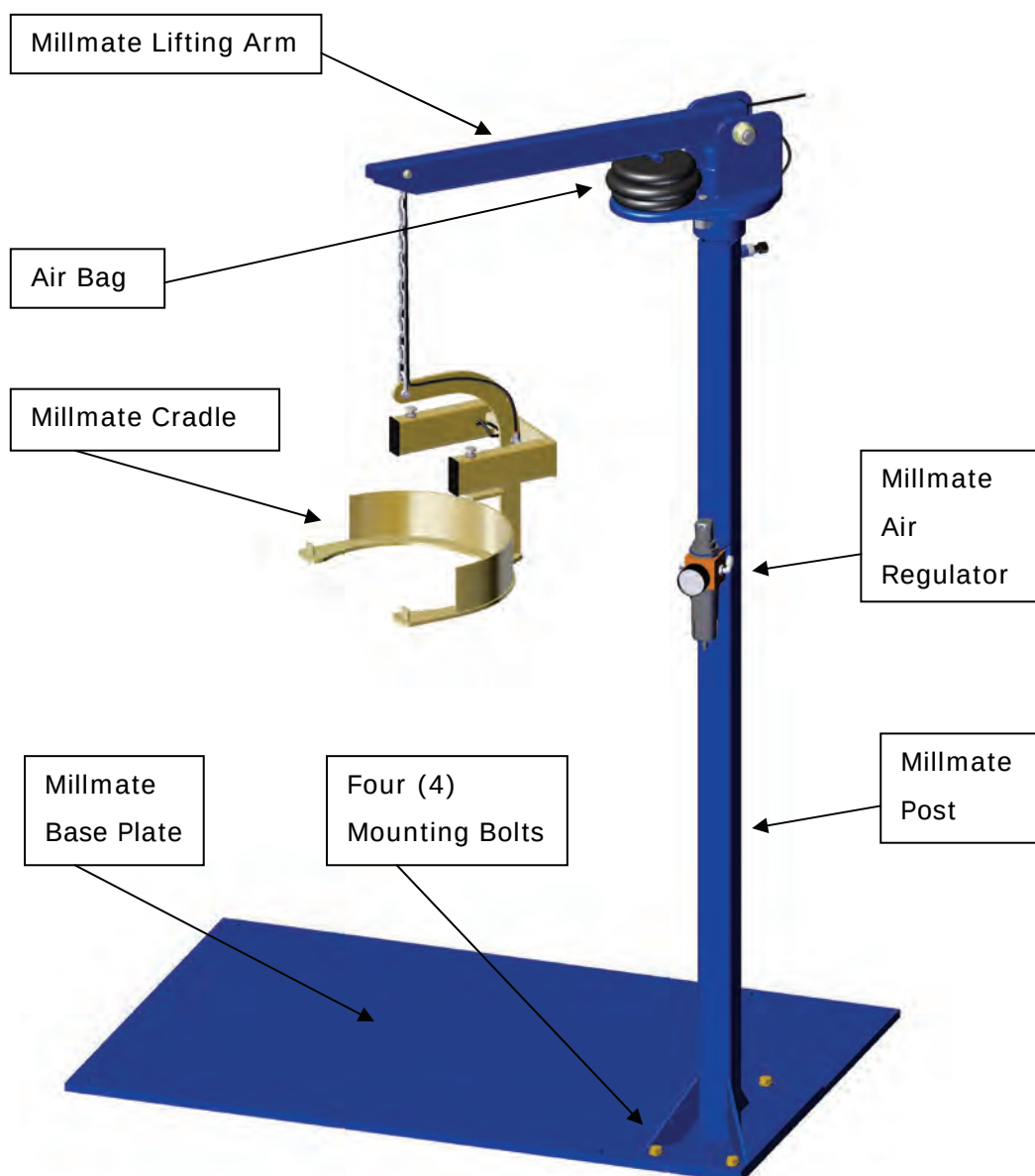


Figure 14 Installing the Millmate

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4.3.3 Assembly Instructions

The machine is supplied as a complete unit, no assembly is required, apart from the cabinet being reinstalled over the Mill on completion of installation and the optional Millmate may require assembly of some parts depending on transport arrangements.

Note: The cabinet needs to be removed from the Mill for most maintenance procedures.

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4.4 Dry Commissioning

Following is the procedure for dry commissioning the LM2 Mill and Millmate. Follow these instructions to carefully operate and to test the Mill.

4.4.1 Pre-Operation

Prior to starting the Mill, perform the following checks:

- Perform a visual check on the machine to check for any damaged or broken parts.
- Ensure the compressed air connections are secure and that air is at operational pressure.
- Check that all electrical connections have been made correctly.
- **Ensure all transport bolts have been removed.**
- Check that the Mill is seated correctly on its mounting.
- Prior to supplying power to the Mill, open the cabinet lid and, using the T20 Torx Key supplied, turn the switch to the “Lock” position. Without this setting the safety switch will not operate correctly and the machine will not operate.
- Store the T20 Torx Key in a safe place for later use if needed.

4.4.2 Operation of the Mill

	Warning: Under no circumstances should this machine be started, without a genuine Essa bowl, grinding element(s) and Lid, set with a charge, being installed in position in the Mill Head. Failure to comply with this instruction will damage the machine and will void the warranty.
---	--

To manually dry commission the Mill, follow the procedure outlined below.

- Install an Essa bowl, grinding element(s), and lid set with a cleaning charge in the Mill head.

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Note: A cleaning charge is any sample material, such as barren rock chips, to initially clean the bowl, lid and grinding element(s) of any protective coating that will have been applied to the new bowl to prevent storage corrosion.

The Table that follows illustrates the suggested charge quantity for the different bowl sizes for the LM2 Mill.

Bowl Size (Standard & Chrome)	Charge Quantity (Mass)
B2000	300 to 1600 g
B1000	150 to 800 g
B800	120 to 640 g
B400	75 to 320 g
B300	75 to 240 g
B125	25 to 100 g
B100	25 to 80 g
B50	5 to 40 g

Table 6 Charge Quantity for Bowl Models

- Close the cabinet lid and press and hold the green start button until the Mill starts. If the Mill does not start, refer to Troubleshooting in the Maintenance, Section 6 of this manual.

Note: The Mill will not start until the cabinet lid is closed due to the lid locking safety switch.

- While the Mill is running, press the red stop button. Ensure the Mill stops and the air bag clamp air bleeds off over 3 to 5 seconds.
- Set the timer for a short time and start the Mill.
- Allow the Mill to run until the timer times out. Ensure the Mill stops operating as it should when the timer stops.

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4.4.3 Operation of the Millmate

To manually dry commission the Millmate, follow the procedure outlined below.

- Operate the air bag of the Millmate using the two (2) buttons on the Millmate cradle.

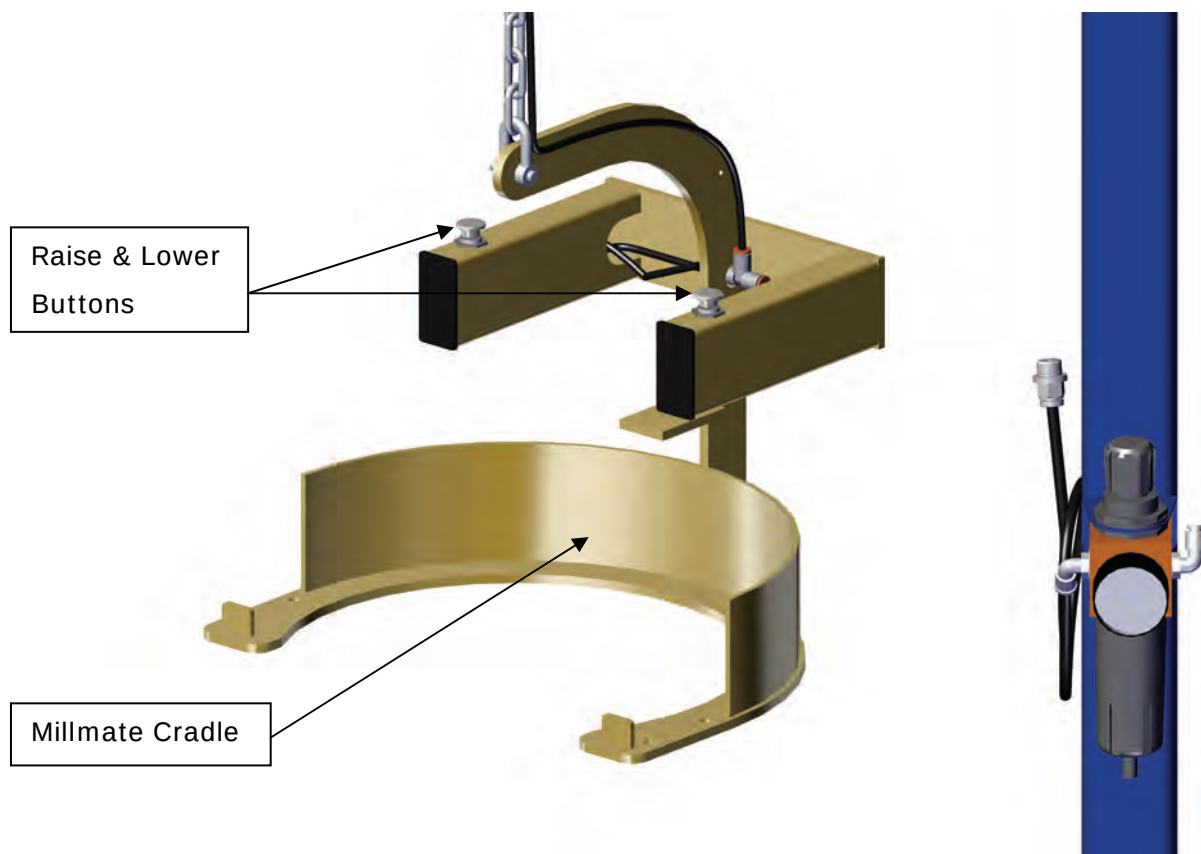


Figure 15 Raise & Lower Buttons on the Millmate

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4.4.4 **Testing the Mill**

The following steps outline proper testing to ensure correct operation of the Mill.

- Ensure the cabinet lid locking safety switch operates correctly. While the machine is running the lid should not be able to be opened and the machine will not start until the lid is fully closed.
- Ensure the air bag clamp is operating correctly.
- Ensure the stop and start buttons operate correctly, as above.
- Ensure the timer is operating correctly.
- Check that the Mill is not unusually noisy during operation. There should not be any knocking noises.

4.4.5 **Testing the Millmate**

The following step outlines proper testing to ensure correct operation of the Millmate.

- Ensure the air bag and lifting arm raises and lowers the cradle high enough to clear the Mill cabinet opening and that the lifting arm can be swung from side to side sufficient to reach the Mill head bowl position and a bench to the side of the machine.

4.5 **Maintenance Required during Dry Commissioning**

While monitoring the machine during commissioning, place yourself at a safe operating distance from all moving parts to prevent injury.

Ensure no tools or other objects are left on, or around the Mill during commissioning.

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5 OPERATION

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5.1 General Safety Rules

Minimum PPE (Personal Protective Equipment)



The following safety rules should be adhered to at all times to ensure the safety of the operator and the correct operation of the machine.

- Lubrication must *not* be carried out when the machine is running.
- All guards must be fastened in place before the machine is started.
- Prior to starting the machine, check the electrical cables for obvious defects.
- Ensure that the work area is clear of any obstruction or material that may be detrimental to a safe working environment.
- Do not climb or sit on the machine.
- Electrical safety requirements are to be followed as per user's company requirements.
- Wear the following, appropriate personal protective equipment when using the machine:



Gloves



Safety Glasses



Ear Protection



Dust Mask

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5.2 Functional Description

5.2.1 Purpose

The LM2 Mill is a pulverizing mill for grinding sample material to required particle sizes.

5.2.2 Basic Construction

The machine is fabricated using standard gauge materials and is painted with a high quality, durable finish.

5.2.3 Principles of Operation

The LM2 Mill uses electrical energy to drive the mill platform in a horizontal circular motion of about 15 cycles per second. This motion is created by an eccentric weight rotated within the mill platform. The free moving grinding element(s) inside the bowl, on the platform, crushes sample material against the internal surfaces of the bowl to produce sample of the required particle size.

Adjustment of the Mill operation time, using the timer, is a major influence on the size of particles produced. However, particle size is also dependant on the inherent properties of the sample material.

The optional Millmate lifting device, when installed, assists the operator to insert the heavier bowls into and out of, the Mill.

5.2.4 Modes of Operation

The machine is operated manually by the operator using the stop and start buttons and the timer.

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5.2.5 Controls

The Essa LM2 Mill has electrical, local stop and start buttons, a timer, an hour meter and a locking safety switch on the cabinet lid to control the operation of the Mill. The Mill and Millmate, use pneumatic air bags as part of the operation of both machines.

5.2.6 Operating Parameters

Parameters for operation of this machine are to be determined by the user's company requirements and are to be specified by others.

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5.3 Machine Data

5.3.1 Overview of the LM2 Mill

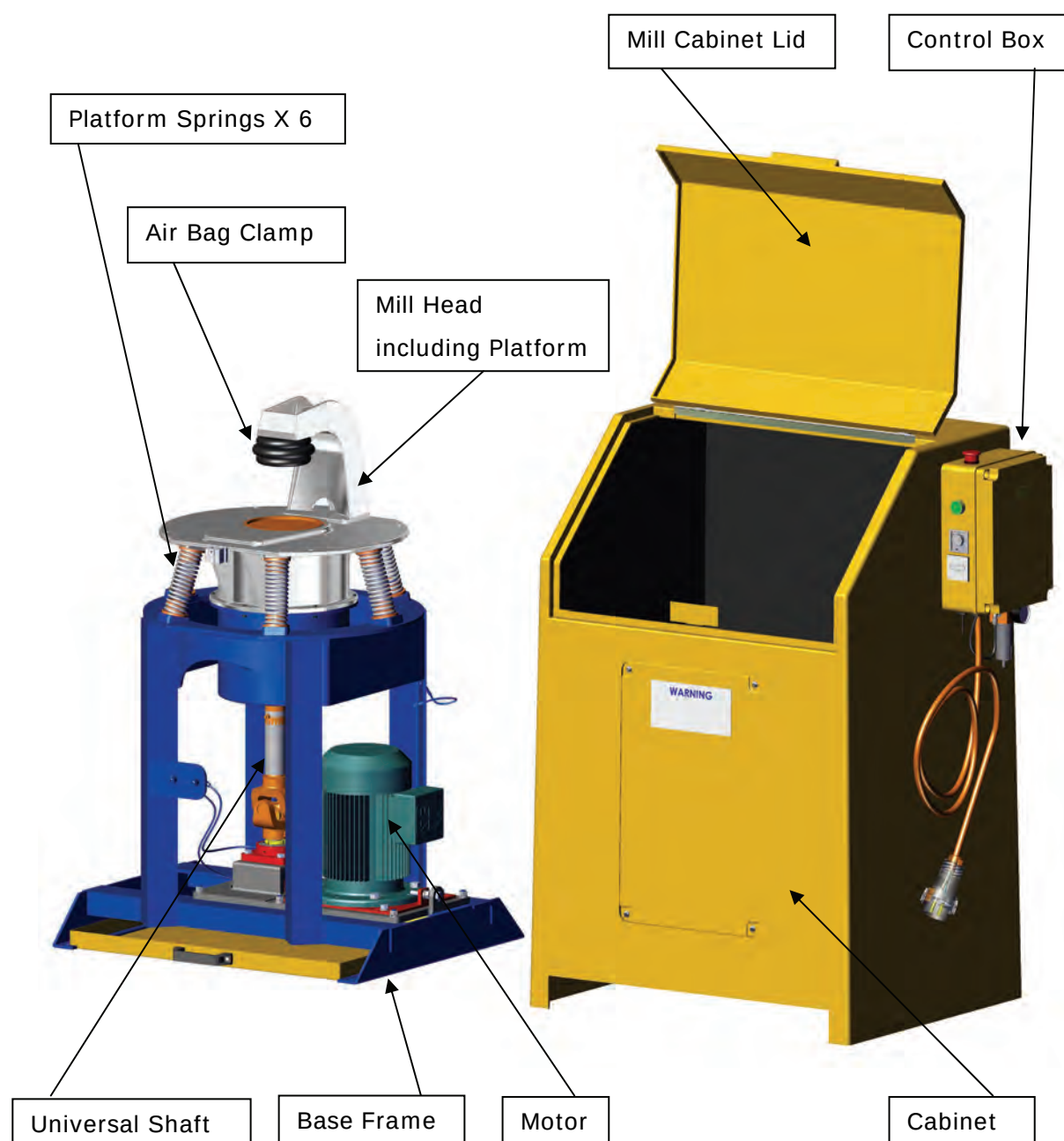


Figure 16 Overview of the LM2 Mill

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5.3.2 Overview of the LM2 Millmate

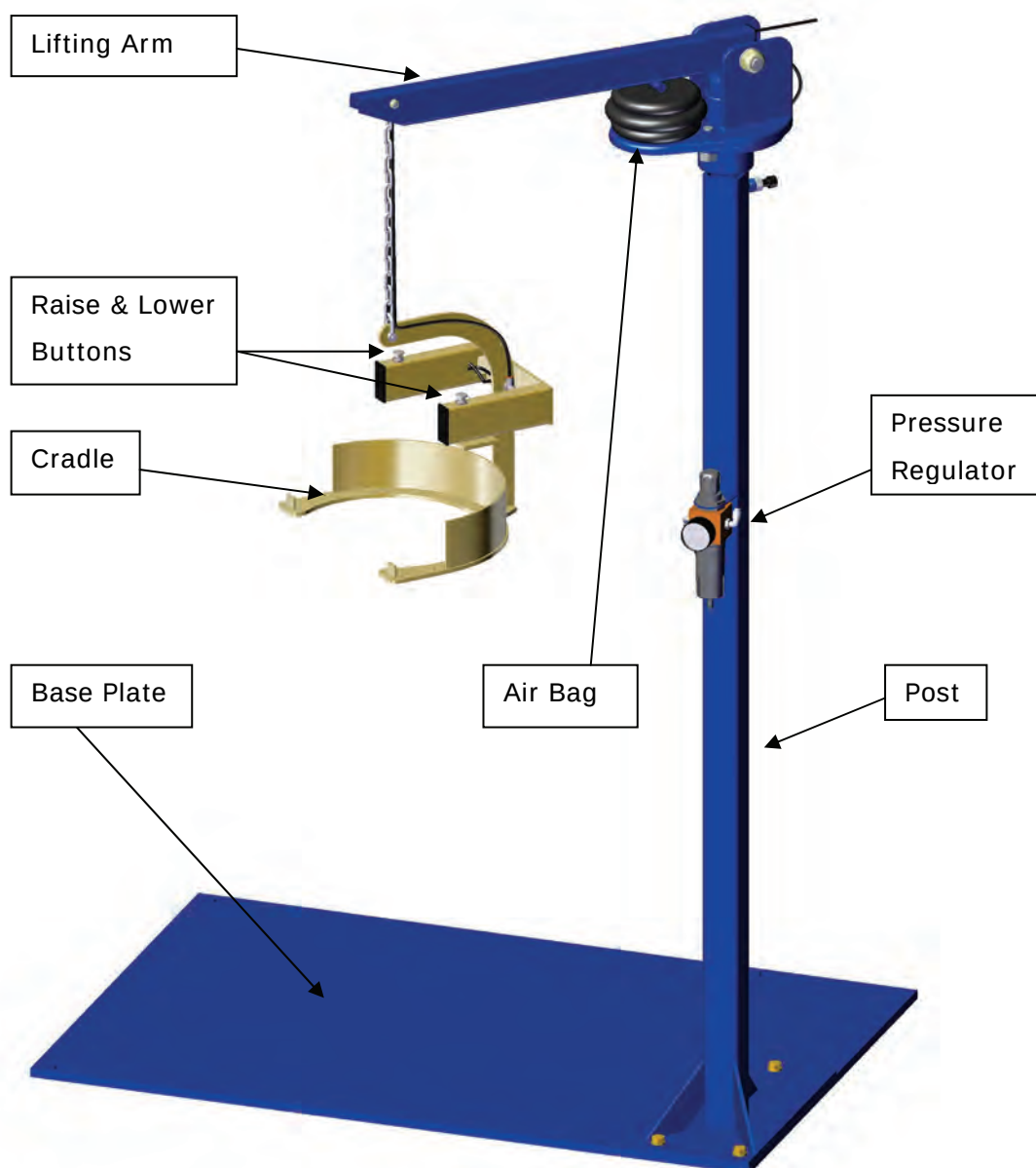


Figure 17 Overview of the LM2 Millmate

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5.3.3 Location of Controls

The operator's controls are located at the right hand side of the machine, on the control box. There are electrical start and stop buttons, a timer, an hour meter and a pressure gauge on the pneumatic regulator, as shown in the Figure below.

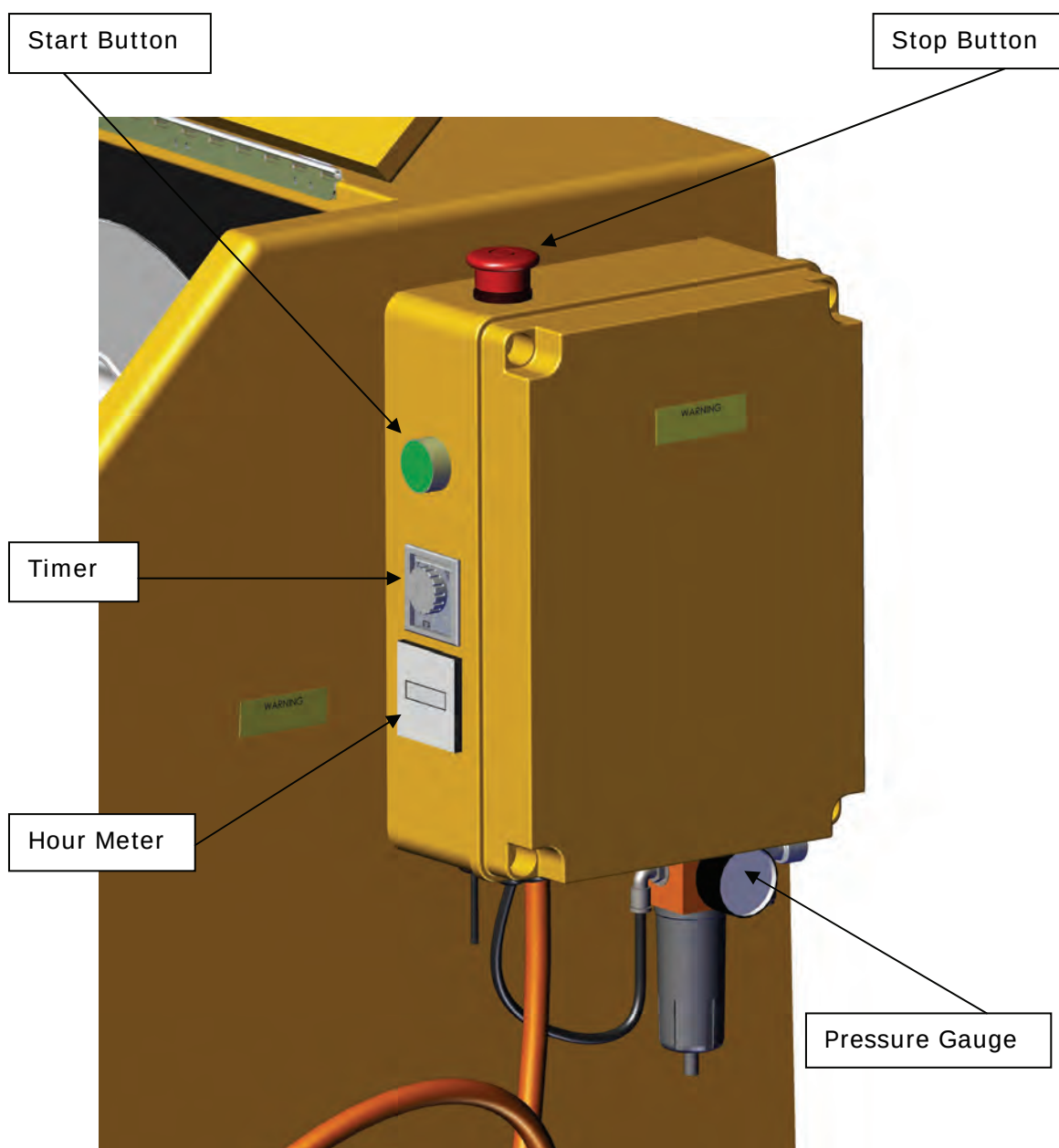


Figure 18 Location of Controls

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5.4 Operator's Controls

The Essa LM2 Mill's operation is controlled locally by the operator.

5.5 Operation and Use

The following sections contain important information on the correct procedure for day to day use of the LM2 Mill.

Please be aware of all special conditions and safety messages (displayed in **Red**).

5.5.1 General

The general rules that follow for operation will ensure safe and efficient use of the Mill.

- To efficiently grind the material there has to be free space in the bowl for the material to move around the grinding element(s), therefore, do not overload the bowl.
- Do not load the Bowl with material of particle size that is too large, preventing the bowl lid from closing properly. The material particle size should be no greater than 20 mm.
- Use the Millmate to lift the heavier bowls into and out of the machine.
- Ensure the Millmate cradle is clear and the cabinet lid is closed prior to starting the machine.
- Follow the timer instructions below to correctly operate the timer.

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5.5.2 Timer Instructions LM2 Pulverising Mill

GT3 Series [Multi-Mode Type]



Time Ranges

(2) Range \ (3) Dial	0 - 1	0 - 3	0 - 6	0 - 18
1S	0.1 sec to 1 sec	0.1 sec to 3 sec	0.1 sec to 6 sec	0.2 sec to 18 sec
10S	0.1 sec to 10 sec	0.3 sec to 30 sec	0.6 sec to 60 sec	1.8 sec to 180 sec
10M	6 sec to 10 min	18 sec to 30 min	36 sec to 60 min	108 sec to 180 min
10H	6 min to 10 hours	18 min to 30 hours	36 min to 60 hours	108 min to 180 hours

1. Timer Mode (1) must be set to "A"
2. Time range selector (2) must be set to "10M"
3. The dial selector (3) must be set to "0-1" to enable best range of time selection.

The timer configured to these three settings will ensure that the machine will be able to operate between 6 seconds and 10 minutes before automatically switching off. Using the setting knob will enable adjustment of the time required for pulverising between these parameters.

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5.6 Wet Commissioning, Starting and Stopping

The following steps outline the procedure for correct wet commissioning of the Mill.

- Perform a visual check on the machine to ensure there are no damaged or broken parts.
- Add a quantity of dry material to a bowl with the grinding element(s) in place and place the lid onto the bowl.
- Install the bowl into the Mill head using the Millmate where applicable and ensure the bowl is correctly seated on the insert of the platform. See Fig Ref 8, Figure 45, page 9-6, Parts Section of this manual.

Note: In the case of the smaller bowls, a spacer ring will need to be used on the platform so that the air bag clamp, with its limited extension, can reach the bowl lid. Ensure the correct spacer ring is selected for the bowl being used. See Item 9.3.8 in the Parts Section of this manual.

- Move the Millmate cradle well clear of the machine and close the cabinet lid securely.
- Set the desired time on the timer.
- Start operation.
- Wait for the timer to stop the machine completely and the seven (7) second delay of the cabinet lid locking safety switch.
- Open the cabinet lid and remove the bowl with sample from the machine using the Millmate where applicable.
- Inspect the resultant material for the desired fineness.

Note: It is advisable to wear gloves when unloading the bowl. Operation of the LM2 Mill imparts heat to the bowl and its contents.

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5.7 Daily Operation

5.7.1 Verification

The various procedures that follow provide information on checking and starting the LM2 Mill, as well as adjusting & stopping the machine.

Prior to starting the machine, perform the following checks and verifications:

- Check the Lubrication Schedule to determine if lubrication is required. If required, perform the relevant lubrication procedure – as outlined in the Lubrication Section of this Manual.
- Carefully check for any loose, worn, missing or broken parts on the machine.
- Check the electrical cables for any damage. Do not use the machine if any electrical cable is damaged. Notify the relevant authority to have the machine tagged and the damage repaired.
- Check the pneumatic lines to the Mill and the Millmate for cracking, damage or leaks.
- Check the platform insert for correct seating in the platform recess.
- Check the platform springs and spigot bushes for correct seating.

5.7.2 Start Procedure

Isolation and start up of this machine are as per the user's company procedures and control systems supplied by others.

Start the machine and while operating the Mill, perform a general visual check to ensure there are no damaged or broken parts.



**SAFETY NOTE: ISOLATE THE MACHINE BEFORE MAKING ANY
ADJUSTMENTS. FAILURE TO DO THIS MAY CAUSE SERIOUS
INJURY TO THE OPERATOR OR DAMAGE TO THE MACHINE**

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5.7.3 **Daily Operation**

Prior to operating the LM2 Mill, ensure the verification procedure above has been performed. Checklists for the operation of this machine are as per the user's company requirements.

5.7.4 **Instrumentation Checks.**

The air pressure gauges on the Mill and Millmate should be checked periodically. They should be set at about 600 kPa (90 P.S.I.).

5.7.5 **Warm Up.**

Not applicable.

5.7.6 **Checks During Operation**

Visually and audibly check the machine during operation for excessive noise or vibrations.

5.7.7 **Stop Procedure**

Stop procedures for this machine are as per the user's company procedures.

5.7.8 **Special Conditions of Use**

The Mill must be kept undercover, in a dry area, away from the effects of weather, particularly moisture, at all times.

5.7.9 **Preservation and Storage**

If the Mill will not be used for any extended period of time, it should be kept in its original packaging where possible, or wrapped in plastic and stored undercover in a dry area.

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5.8 How to get the best life from the Pulverising Bowls.

Following are some useful tips regarding optimum bowl and grinding element usage in order for you to obtain the longest possible life from your pulverising bowls.

- Use two (2) discs concurrently per bowl, changing over on a daily or shift basis. Never break up matched sets.
- Replace bowls when they crack or pop a hole. Discs should also be at the end of their useful life at that stage.
- A B2000 disc loses effectiveness (on average) at around 9 kg, B1000 disc at about 6 kg, B800 about 3 kg. Put another way, when a disc has lost about 30% of its mass, grind time will have increased to the point where discarding it may have to be considered.
- Putting a new disc into a worn bowl will dramatically increase wear rates on both items until the disc "beds in". Sample quality during this time may also be degraded.

Other factors effecting increased bowl wear or premature failure include:

- The condition of the mill - worn springs and/or spigot bushes, faulty universal drive shaft, loose vee belts and/or poor motor assembly mounts may all contribute to excessive and/or irregular bowl wear.
- The condition of the bowl and discs.
- The metallurgy and physical properties of the particular bowl and discs.
- Grind time - excessive milling time will obviously increase wear on a per sample basis (including greater levels of bowl contaminants entering the sample).
- Mineralogy of the sample - probably the most significant parameter affecting bowl and disc wear.
- Workplace practices - whether a Millmate is used or not, rough handling, whether any variations are noticed from shift to shift.

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- Bowl to disc ratio - whether two discs are used per bowl, how often they are alternated and at what weight they are discarded. Are discs being used for too long and becoming ineffective due to low mass or becoming mis-shaped and increasing bowl wall wear?
- Sample particle size - a large distribution of particle sizes may in fact, decrease grind time.
- Sample moisture content - excessive moisture can lead to sample re-agglomeration and erratic disc movement.

5.8.1 How much sample will the Pulverising Bowls handle.

The Table that follows illustrates the suggested charge quantity for the different bowl sizes for the LM2 Mill.

Bowl Size (Standard & Chrome)	Charge Quantity (Mass)
B2000	300 to 1600 g
B1000	150 to 800 g
B800	120 to 640 g
B400	75 to 320 g
B300	75 to 240 g
B125	25 to 100 g
B100	25 to 80 g
B50	5 to 40 g

Table 7 Charge Quantity for Bowl Models

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5.8.2 How to stop samples sticking to Pulverising Bowls & Grinding Elements.

During pulverising, some samples have a tendency to adhere to the bowl and disc (or ring and rollers) and prove to be a problem from both a cleaning and a potential cross-contamination viewpoint. There are several methods currently in common use to deal with this problem, these are detailed below.

Drying:

This is the single most critical process in the preparation procedure. If samples are not dried properly, they will adhere to the crushing/grinding surfaces and/or re-agglomerate to a greater or lesser extent. Large samples with a high clay content tend to be amongst the worst offenders as it is very difficult to completely dry these samples in a reasonable period, particularly when delivered to the sample preparation laboratory in a very wet condition.

Following are some tips in dealing with these samples at an assumed oven temperature of 100 degrees C.

- Samples should not be dried in one solid mass but placed in as large a drying tray as practical, then broken down to as small a particle size as possible using a spatula, paint scraper or similar and spread evenly across the tray. The idea here is to present as much surface area of the sample to the atmosphere as possible, thus allowing easier escape of water vapour as heat is applied, thereby reducing drying time. Trays should not be stacked on top of each other as this also restricts escape of water vapour and may overload the oven.
- Sealed ovens (even if provided with an internal fan) will simply recirculate water vapour, which will drastically slow down drying time. Airflow within the oven should be balanced via the use of inlet and outlet flues equipped with butterfly valves (such as in use with the Essa range of drying ovens). Properly adjusted, the effect here is to allow the maximum flow of "flushing" air without affecting the oven's ability to maintain set temperature. This will reduce drying time considerably.
- Some samples will take longer than others to dry, in fact it is not unknown for large clay samples to take up to 36 hours to dry effectively. This fact should be recognised and procedures put in place to accommodate this reality if necessary.

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For example, it may be permissible to increase oven temperature, or extra ovens may be required, or turnaround time may need to be re-negotiated to accommodate a particular size and type of sample.

Methylated Spirits (or Methyl Alcohol):

- The most common pulverising aid for sticky or re-agglomerating samples is methylated spirits or a similar alcohol, such as methyl alcohol. This is added to the sample during pulverising. Its use appears to reduce the quantity of sample adhering to the grinding surfaces and also has some effect in reducing re-agglomeration. A quantity of 20 to 40 ml per kg of sample seems to be the average required for the best effect, though this will vary from sample to sample and generally remains an operator judgement issue.
- Methylated spirits can be added immediately prior to pulverising, however the most effective time appears to be approx 1/3 through the grinding cycle when larger particles have been broken down, this allows more effective mixing throughout the sample and therefore a better result.
- Methylated spirits is most commonly applied via a fine nozzle "squeeze" bottle of around 250 to 500 mL capacity. As with all flammable liquids, care should be exercised in its use and the proper training given to all operators in safety procedures.

"Flush" Grinding:

- Flush grinding may be necessary when all other methods fail. This has the effect of scouring grinding surfaces clean and is a more effective solution than wire brushing or washing in water. It does, unfortunately, add an extra cycle to every sample and therefore its use should be considered carefully in regard to its impact on both production and extra bowl wear.
- The most common flush materials are silica sand, basalt, quartz and feldspar. Of these materials, feldspar is perhaps the best solution due to its low percentage of free silica (~4%) compared to most other materials. A particle size of anywhere from 0.5mm to 8mm can be used, grinding time should be no more than is required to scour grinding surfaces clean, this will be an operator judgement.

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6 MAINTENANCE

This document outlines important information on the maintenance of the LM2 Mill in a working environment. Procedures and diagrams are provided to help ensure proper maintenance of the machine.

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6.1 Safety during Maintenance Operations

Minimum PPE

 EYE PROTECTION MUST BE WORN	 FOOT PROTECTION MUST BE WORN	 HEAD PROTECTION MUST BE WORN	 HAND PROTECTION MUST BE WORN		 BEWARE OF MOVING MACHINERY	 FORKLIFT HAZARD	 SHARP EDGES WATCH YOUR FINGERS		
---	--	--	--	--	---	--	--	--	--



SAFETY NOTE: The machine can start without warning. Isolate power before accessing any electrical or moving components.

Before carrying out any other work on the machine, ensure that the power supply is disconnected and that any relevant isolator is locked out and labelled with a suitable warning notice.

Should it be necessary for maintenance purposes to put the machine into operation, it must be fitted with notices to the effect that it may start without warning; and that under no circumstances are tools, equipment or personnel to be allowed in the vicinity of the moving parts of the machine.

Should access to the moving parts be required for any reason, the motor shall be isolated as described and not reconnected to the power supply until all equipment and tools have been removed and personnel are clear of the internals of the machine.



SAFETY NOTE: Note that the mechanical advantage and efficiency of the machines mechanism is very high. Serious damage or injury will result from this being ignored.

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6.2 Preventative/Corrective Maintenance Schedule

The following table indicates checks and adjustments which should be carried out to ensure trouble free use of the LM2 Mill.

Operation and Location	Every 10 Hours or Every Shift	Every one (1) Month	Every twelve (12) Months
Overall machine including Millmate	Visual inspection for obvious defects		
Vee belts		Check for correct tension	
Air bag clamp - Mill		Check for leaks or damage	
Air bag – Millmate		Check for leaks or damage	
Drive shaft universal joints			Check for wear
Drive shaft bearings			Check for wear
Mill spring spigot bushes		Check for wear	
Mill springs		Check for wear or breaks	
Platform insert	Check for wear		
Lubrication		See Lubrication Schedule	
Air filters on Mill & Millmate	Press drain buttons to expel water	Check filters for replacement need	
Bowls, lids & seals	Check for wear		
Dust tray under cabinet	Empty tray		
Floor mountings		Check that the Mill is still secure	

Table 8 Preventative/Corrective Maintenance Schedule

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6.2.1 Pneumatic Pressure Regulator

Routine maintenance of the pressure regulator comprises of periodic replacement of the filter in the pressure regulator, regularly, i.e. every shift, draining any excess water from the filter container and inspection of the pneumatic components for possible damage.

Note: As the amount of water present in any pneumatic system is related to atmospheric conditions and the configuration of the supply compressor and drier, the time interval for filter replacement is a matter for user judgement. See the Figure below.

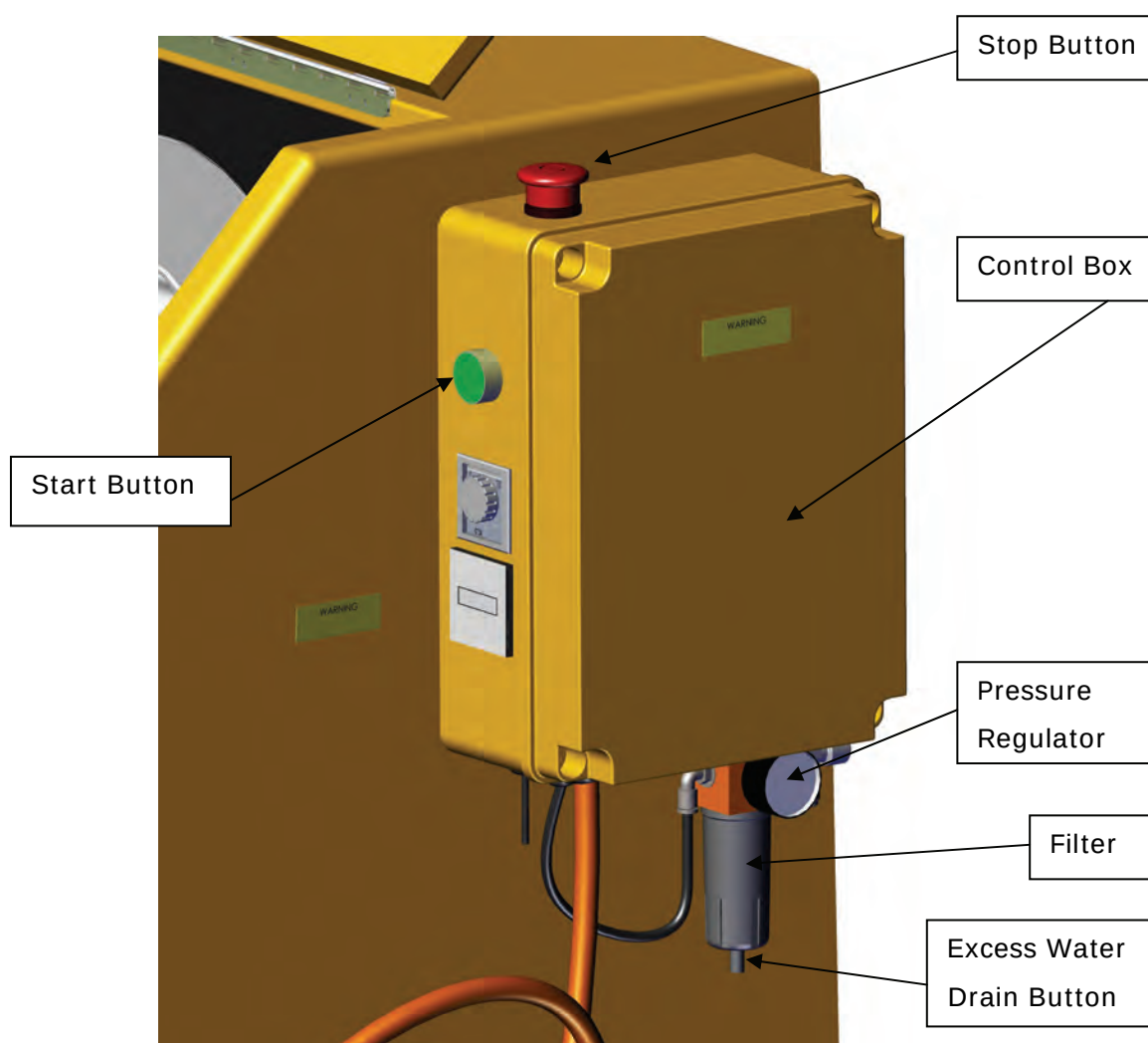


Figure 19 Pneumatic Pressure Regulator

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6.2.2 Air Line Fittings

The air line fittings used on the LM2-P Mill enable quick and easy maintenance due to the quick attach and release mechanism built into the fittings. Simply push the air line into the fitting for a secure fit. To release the air line, simply push in the orange collar and withdraw the air line from the fitting. See the Figure below.

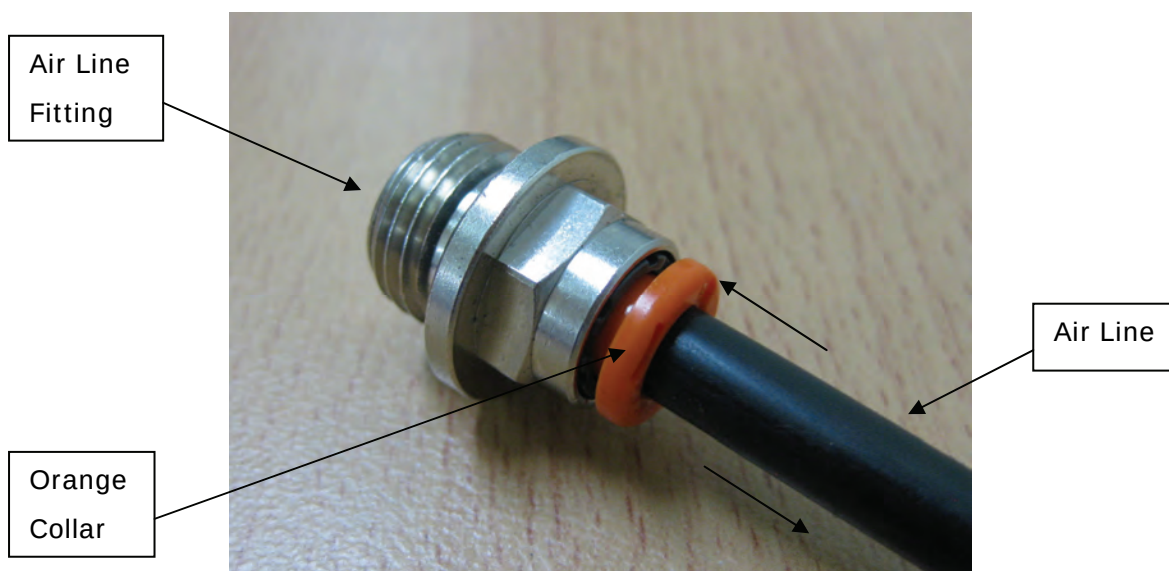


Figure 20 Air Line Fittings

6.3 Wear Limit and Alignment Tolerances

The grinding bowl and its internal components used with the LM2-P are all subject to abrasive action through normal use. The materials and finishes used are selected to attain the longest possible useful life of these items consistent with efficient operation of the mill and minimum contamination of sample. However, they do wear out.

Because different applications result in different wear characteristics, it is not possible to state a definitive guide to replacement requirements. Visual inspection and/or decreased milling efficiency will indicate the requirement to replace the grinding element(s) or rings and rollers used and the condition of the bowl and bowl lid and seal.

Change lid seals as soon as damage or permanent deformation is evident. Unusually rapid wear of any head component should be referred to ESSA for advice.

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6.4 Corrective Maintenance Troubleshooting Guide

The Troubleshooting Guide following outlines possible causes to any problems which may occur with the LM2 Mill. Refer to the Preventative / Corrective Maintenance Work Instructions for details.

Problem	Possible Cause	Remedy
Operating noise level higher than normal	Check for any loose parts i.e. broken springs etc	Replace or readjust any loose or broken parts
	Sound proofing has fallen off panels of cabinet	Replace sound proofing
Air bag clamp not working	Faulty air supply	Check air supply to Mill
	Air bag is damaged	Replace air bag clamp
	Airlines or fittings are damaged or broken	Replace lines or fittings as necessary
Excessive dust present in cabinet	Bowl lid seal is worn	Replace bowl lid seal
Platform not oscillating when motor is started	Vee belts are loose or broken	Replace or re-tension vee belts
	Faulty universal shaft	Replace universal shaft
Millmate lifting arm not operating	Faulty air supply	Check air supply to Millmate
	Air bag is damaged	Replace air bag
	Airlines or fittings are damaged or broken	Replace lines or fittings as necessary
Mill will not start	Cabinet lid not completely closed	Ensure cabinet lid is completely closed
	Faulty power supply or control box component	Check power source &/or repair fault as necessary
	Drive motor faulty	Replace drive motor

Table 9 Corrective Maintenance Troubleshooting Guide

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Note: The Cabinet of the LM2 Mill will need to be removed for most routine maintenance activities. Always remember to first unplug the electrical cables, earth lead and air lines that connect the Mill to the cabinet and therefore the control box, prior to lifting the cabinet clear of the Mill. The inspection panel at the front of the cabinet provides access for inspection and lubrication.

6.5 Preventative/Corrective Maintenance Work Instructions

This section details the steps needed to be taken to rectify the problems outlined in the troubleshooting table above.

6.5.1 Operating noise level higher than normal

Follow the steps and refer to the Figure below, if the operating noise level is higher than normal, from the machine.

Step 1

Stop the machine and check for any loose parts of the Mill, such as broken or loose springs.

Step 2

To replace the sound proofing inside the cabinet, remove the sticky backed sections of insulation by peeling off the cabinet walls.

Step 3

Replace the old insulation with new sections, taking care to ensure certain small bolts poke through the insulation and large washers are used with the nuts on those bolts. See the Figure below.

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Figure 21 Replacement of Sound Proofing

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6.5.2 Air Bag Clamp not working

Follow the steps outlined below and refer to the Figure below, if the air bag clamp is not working.

Step 1

Check the air supply, lines and fittings for any faults, breaks, leaking or other damage.

Step 2

Repair the air supply or replace any leaking or damaged lines or fittings as necessary.

Step 3

To replace a faulty air bag clamp, undo the air line fitting on top of the clamp and undo the two (2) bolts holding the air bag clamp to the Mill platform top arm. Replace with a new air bag clamp. **Note:** Always use thread tape when installing any threaded air fittings.

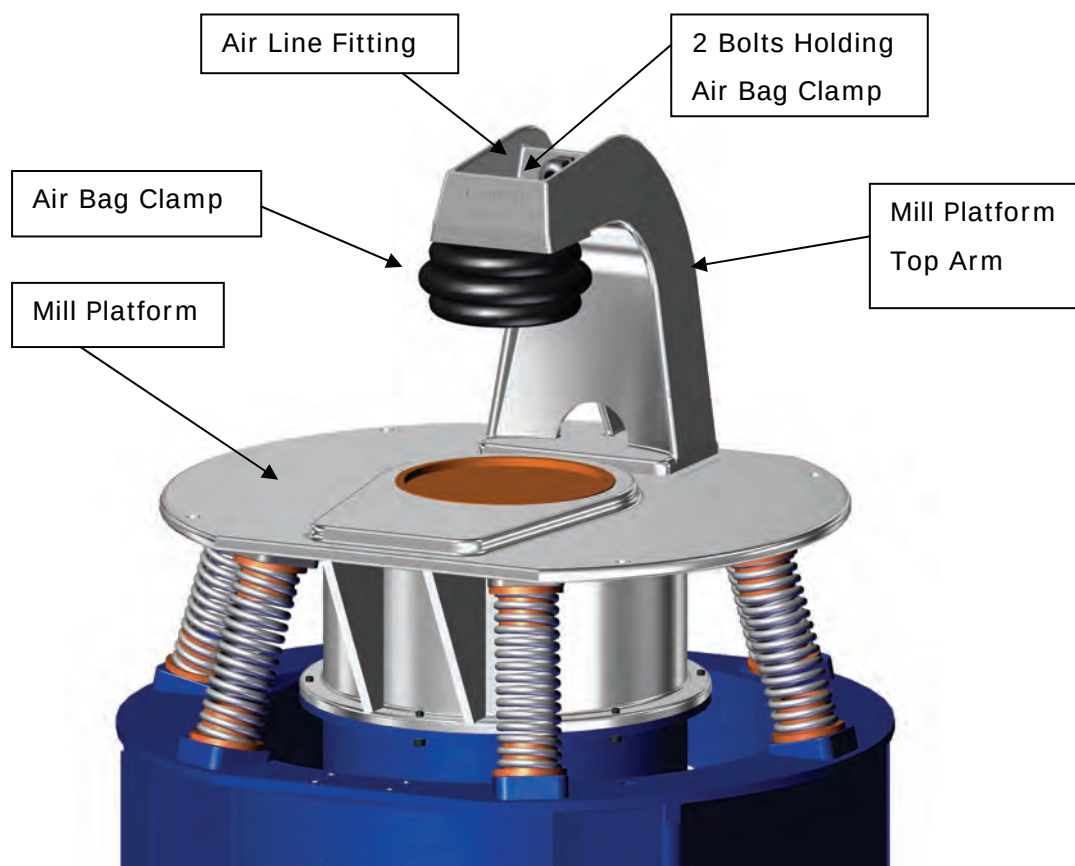


Figure 22 Replacing the Air Bag Clamp

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6.5.3 Excessive Dust Present in Cabinet

Follow the steps below and refer to the Figure below, if there is excessive dust present in the cabinet.

Step 1

Check the bowl lid seal of the bowl and lid being used and if worn, replace with a new one.



Figure 23 Excessive Dust in the Cabinet

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6.5.4 Platform not oscillating when motor is started – vee belts

Follow the steps below and refer to the Figure below, if the platform is not oscillating when the motor is started.

Step 1

To re-tension or replace the motor vee belts, loosen the four (4) belt tensioning bolts at the base of the motor and use the jacking bolt to adjust the vee belt tension.

Step 2

To replace broken vee belts, move the motor closer to the drive shaft to install the new belts.

Step 3

Once the new belts are in place, pull the motor back from the drive shaft and re-tension the belts using the jacking bolt. Once the belts are correctly tensioned, secure the motor in place by tightening the four (4) belt tensioning bolts. Correct tension should allow 5 mm deflection midway between the pulleys.

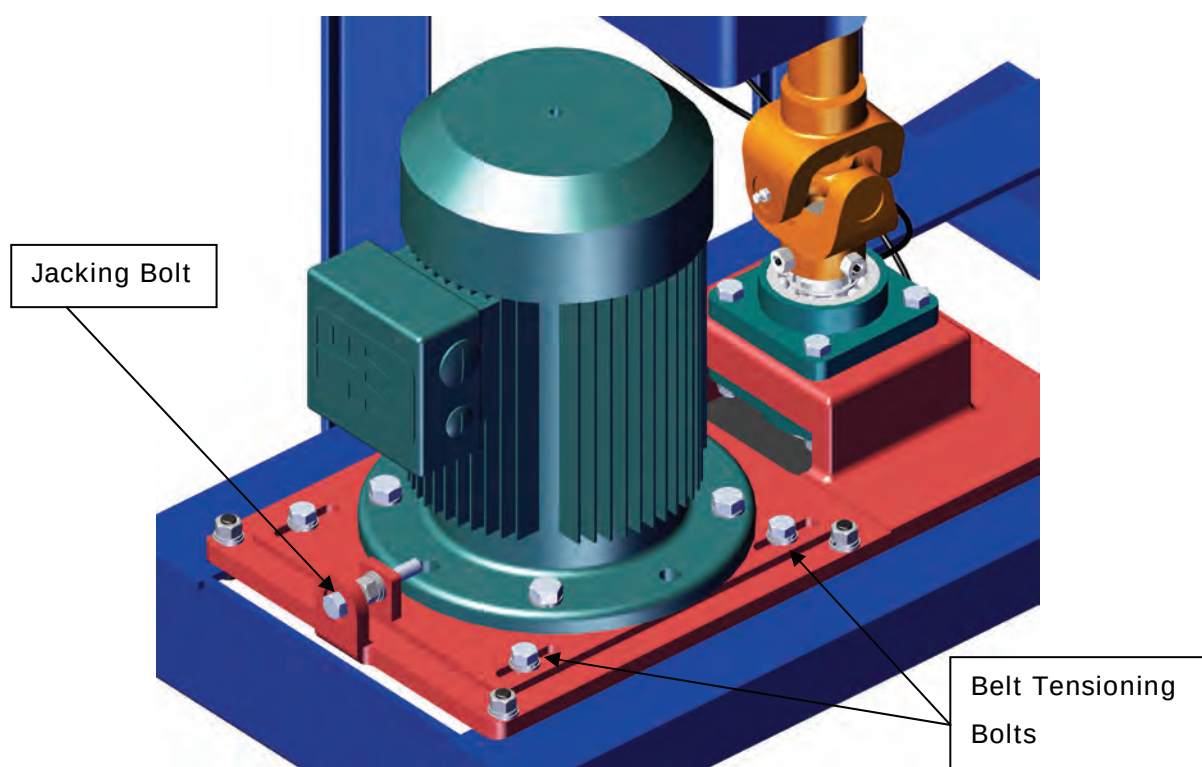


Figure 24 Motor Vee Belt Replacement or Re-tensioning

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6.5.5 Platform not oscillating when motor is started – faulty universal shaft

Follow the steps below and refer to the Figures below, if the platform is not oscillating when the motor is started and the cause is found to be a faulty universal shaft.

Step 1

Refer to 8.2.6 Removal of the Mass Assembly, Page 8-6, Workshop Section of this manual, Steps 1 and 2.

Step 2

Using a socket set with extension and perhaps a flexible socket joint, undo the two locknuts and grub screws on the top universal joint, working through the holes in the bottom housing of the mass assembly.

Note: If access to the locknuts and grub screws is too restricted, use a suitable lifting device to raise the mass assembly so the holes in the bottom housing are above the Mill top frame plate, as per Step 3 of Section 8.2.6 Removal of the Mass Assembly, Page 8-6, Workshop Section of this manual.

Step 3

Replace the universal shaft with a new one and reassemble all parts in reverse order.

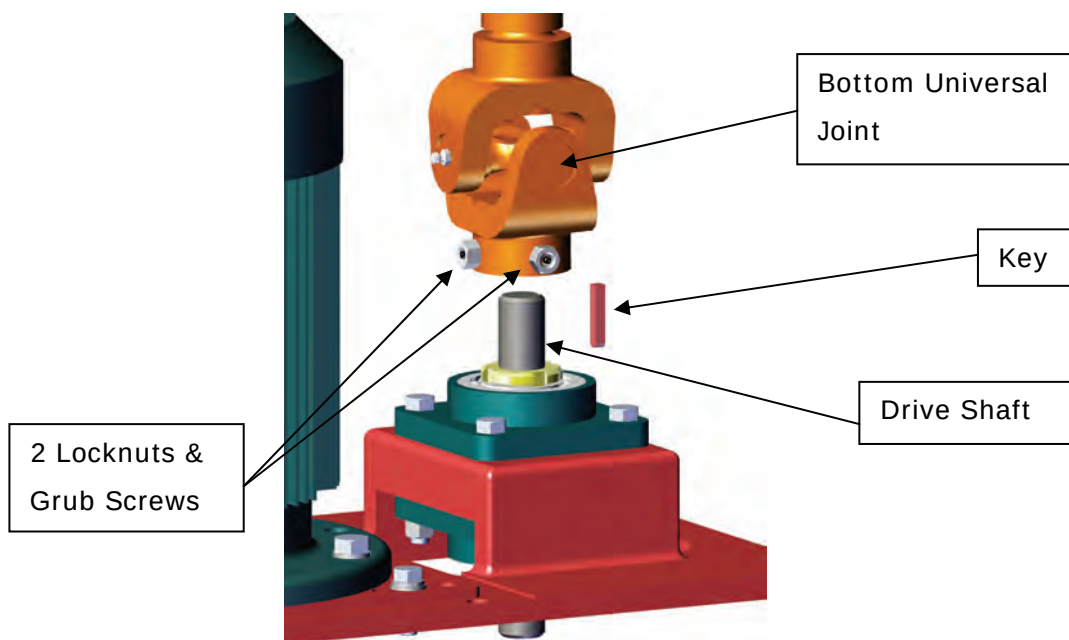


Figure 25 Lower Universal Joint

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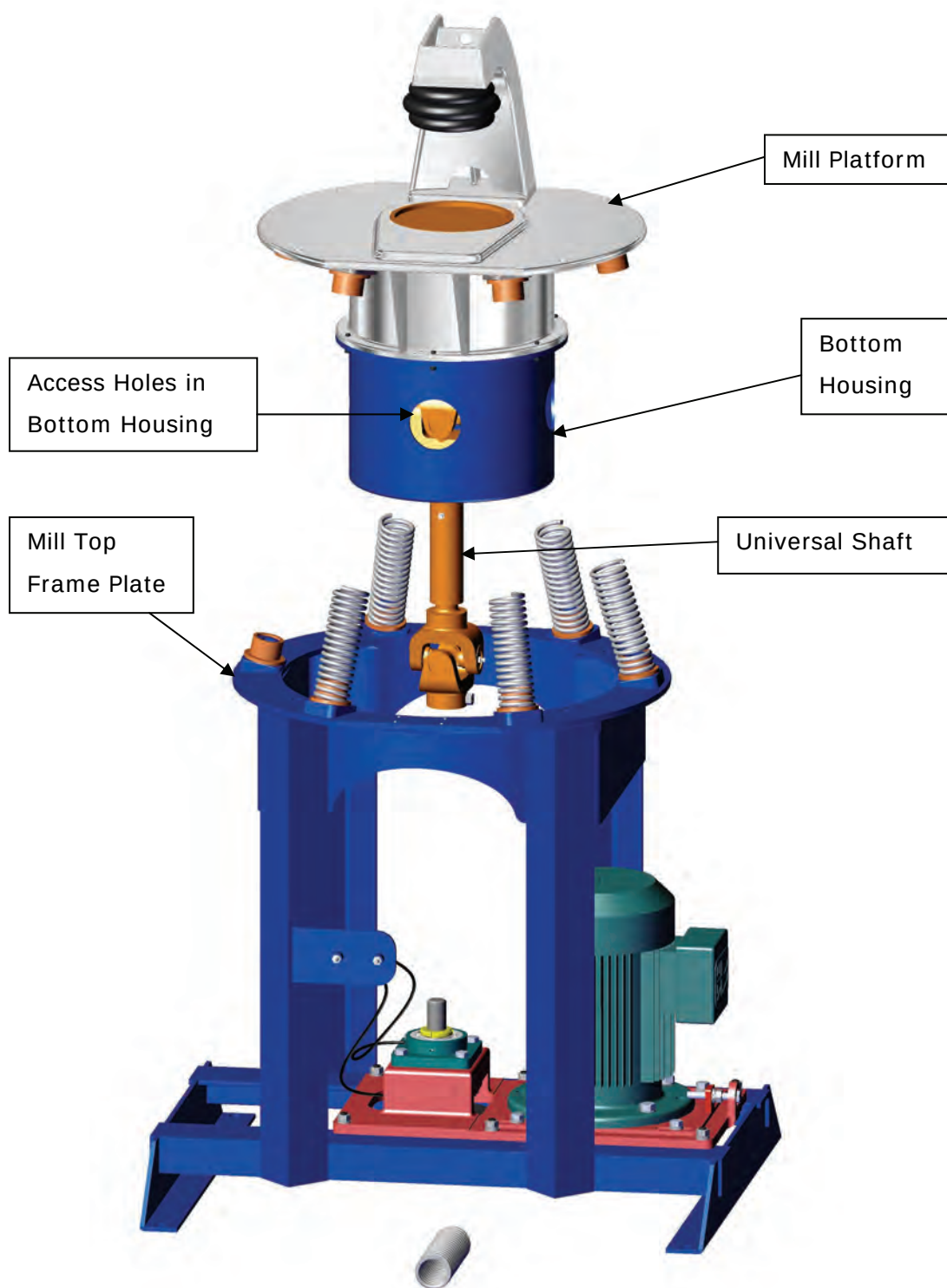


Figure 26 Removing the Universal Shaft

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6.5.6 Millmate Lifting Arm not operating

Follow the steps below and refer to the Figure below, if the Millmate Lifting Arm is not operating.

Step 1

Check the air supply and all the air lines and fittings supplying the air bag and control buttons for leaks or breaks. Repair the air supply or replace any fittings or lines as necessary.

Step 2

To replace a faulty air bag, remove the two (2) bolts securing the air bag, undo the air line fitting and replace the air bag with a new one. **Note:** Always use thread tape on any threaded air line fittings.

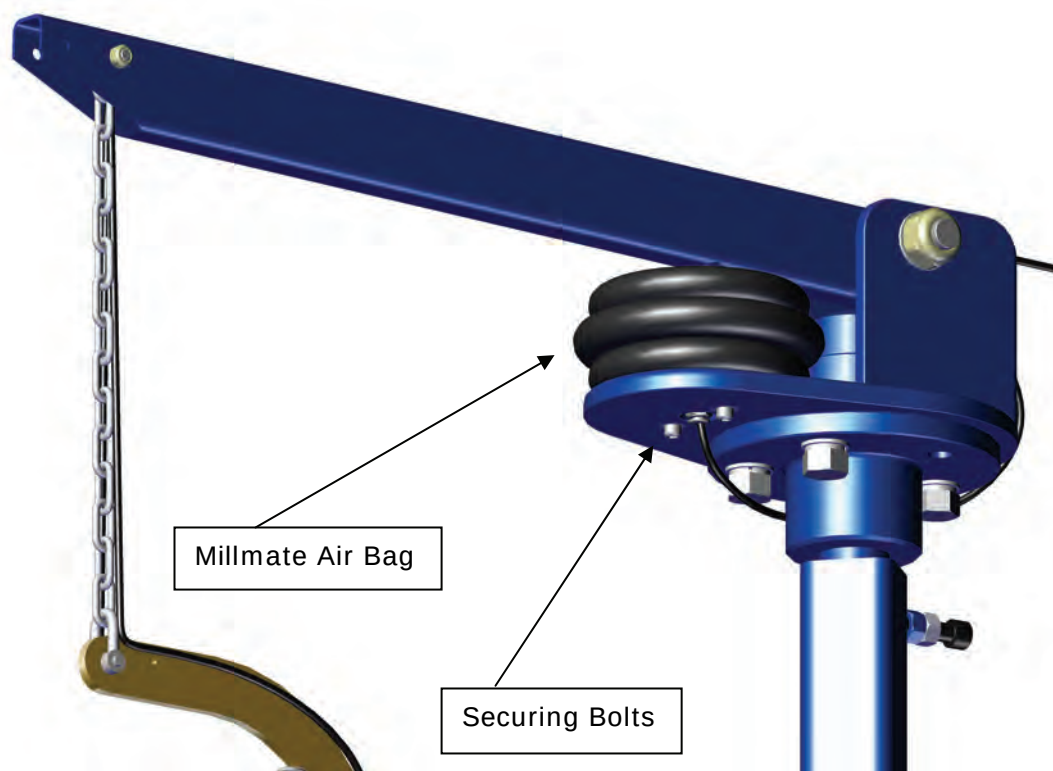


Figure 27 Replacing the Millmate Air Bag

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6.5.7 Mill will not start

Follow the steps below and refer to the Figure below, if the Mill will not start.

Step 1

Ensure the cabinet lid is completely closed for the lid locking safety switch to allow the machine to operate.

Step 2

Check the electrical supply to the Mill and have an electrician check all the electrical connections to the Mill and control buttons and switches and specifically the motor. Repair any electrical failure found between the supply and the machine.

Step 3

To replace a faulty motor, loosen the four (4) belt tensioning bolts and move the motor towards the drive shaft to slacken the vee belts, so they can be removed.

Step 4

Undo and remove the four (4) motor mounting bolts and nuts holding the motor to the mounting plate. Replace the motor with a new one. Re-install all parts in reverse order and re-tension the vee belts as per Item 6.5.4 above.

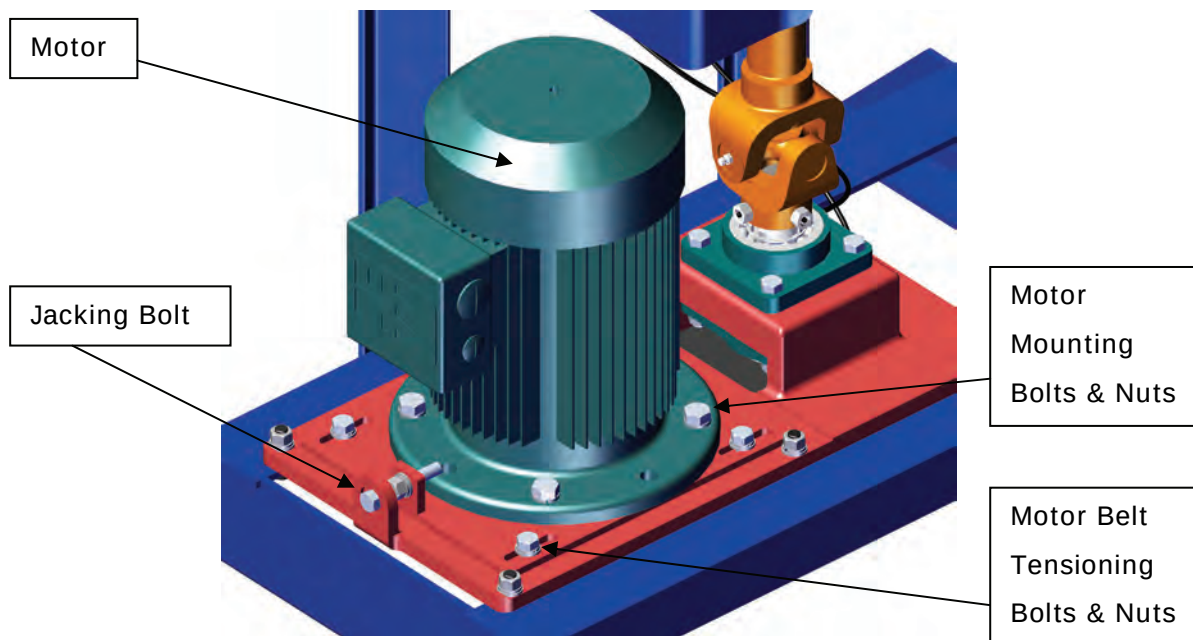


Figure 28 Replacing the Motor

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6.6 Other Maintenance Procedures

For other maintenance procedures such as changing platform springs and bushes and removing the mass assembly, please refer to the Workshop Section 8, of this manual. Please contact Essa for any additional technical documentation covering detailed overhaul procedures.

6.6.1 Replacing the Platform Insert

To replace the platform insert, lever the old one out with a fine screwdriver, install the new insert and tap firmly in place using a soft faced hammer.

6.6.2 Adjusting the Air Bag Clamp Hold Time

To adjust the air bag clamp bleed control regulator, Fig Ref' No. 11, Figures 51 & 52, Item 9.3.6, Parts Section, pull the knob out to engage the adjustment and turn clockwise to increase the air bag clamp hold time, or anticlockwise to reduce the air bag clamp hold time.

If there is no improvement in the hold time, the regulator may be faulty, or it may have scale or dirt blocking the bleed valve and may need to be replaced.

6.7 Operator's Tool kit

Listed below are a number of tools that are recommended for use with the LM2 Mill.

- Set of metric Allen keys
- Socket set
- Set of open-ended spanners
- Set of screw drivers

6.8 Cleaning.

Routine cleaning should be performed on the Mill to remove excess dust. To do so, vacuum inside the Mill cabinet and use a clean, dry rag to wipe all components down.

Do not use compressed air or high pressure water hoses to clean the Mill, as damage may result and will void the warranty.

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6.9 Bolt Torque Settings

The list that follows indicates recommended torque ratings for bolts used on the LM2 Mill.

Description	Torque Setting Grade 4.6	Torque Setting Grade 8.8	Torque Setting Grade 10.9	Torque Setting Grade 12.9
M5	2 Nm	5 Nm	8 Nm	9.5 Nm
M6	3.5 Nm	9 Nm	13 Nm	16 Nm
M8	8.5 Nm	22 Nm	32 Nm	39 Nm
M10	16.7 Nm	44 Nm	63 Nm	77 Nm
M12	29 Nm	77 Nm	109 Nm	135 Nm
M14	46.4 Nm	122 Nm	174 Nm	215 Nm
M16	71.3 Nm	180 Nm	270 Nm	330 Nm
M18		269 Nm	370 Nm	
M20	139.4 Nm	372 Nm	528 Nm	650 Nm
M22		519 Nm	722 Nm	
M24	241 Nm	640 Nm	914 Nm	1100 Nm
M30	476 Nm	1314 Nm	1817 Nm	2250 Nm
M36		2297 Nm	3173 Nm	3850 Nm
M10 Shoulder Bolt	29 Nm			

Table 10 Bolt Torque Settings

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7 LUBRICATION

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7.1 Lubrication Safety and other precautions

The procedure that follows outlines the proper method for routinely and safely lubricating the Mill.

- Lubrication must not be carried out when the Mill is running.
- Ensure that the work area is clear of any material that may cause, or fuel, a fire.
- Follow the manufacturer's safety instructions when handling the lubricant, to prevent any injury to personnel.
- Wipe the Mill grease points down with a clean rag prior to lubrication.
- Avoid over lubricating the Mill. Refer to 7.4 Lubrication Schedule, below.
- Always wipe off any excess grease.

Note: Access to the grease nipples is gained by removing the inspection panel on the front of the cabinet. To remove the panel, undo the four (4) Phillips head screws securing the panel to the cabinet.

7.2 Data for Lubricants, Hydraulic Fluids, Coolants etc.

Note: Refer to Section 10 of this manual for any Lubrication Material Safety Data Sheets.

7.3 Lubrication Points

The Mill has six (6) lubrication points, four (4) on the universal shaft and two (2) mounted on a frame bracket with grease lines for the lower bearings, below the universal shaft.

Note: The Mill head main bearings are sealed and only require greasing when the Mill head (mass assembly) is overhauled.

Refer to the Figure below for the location of grease points.

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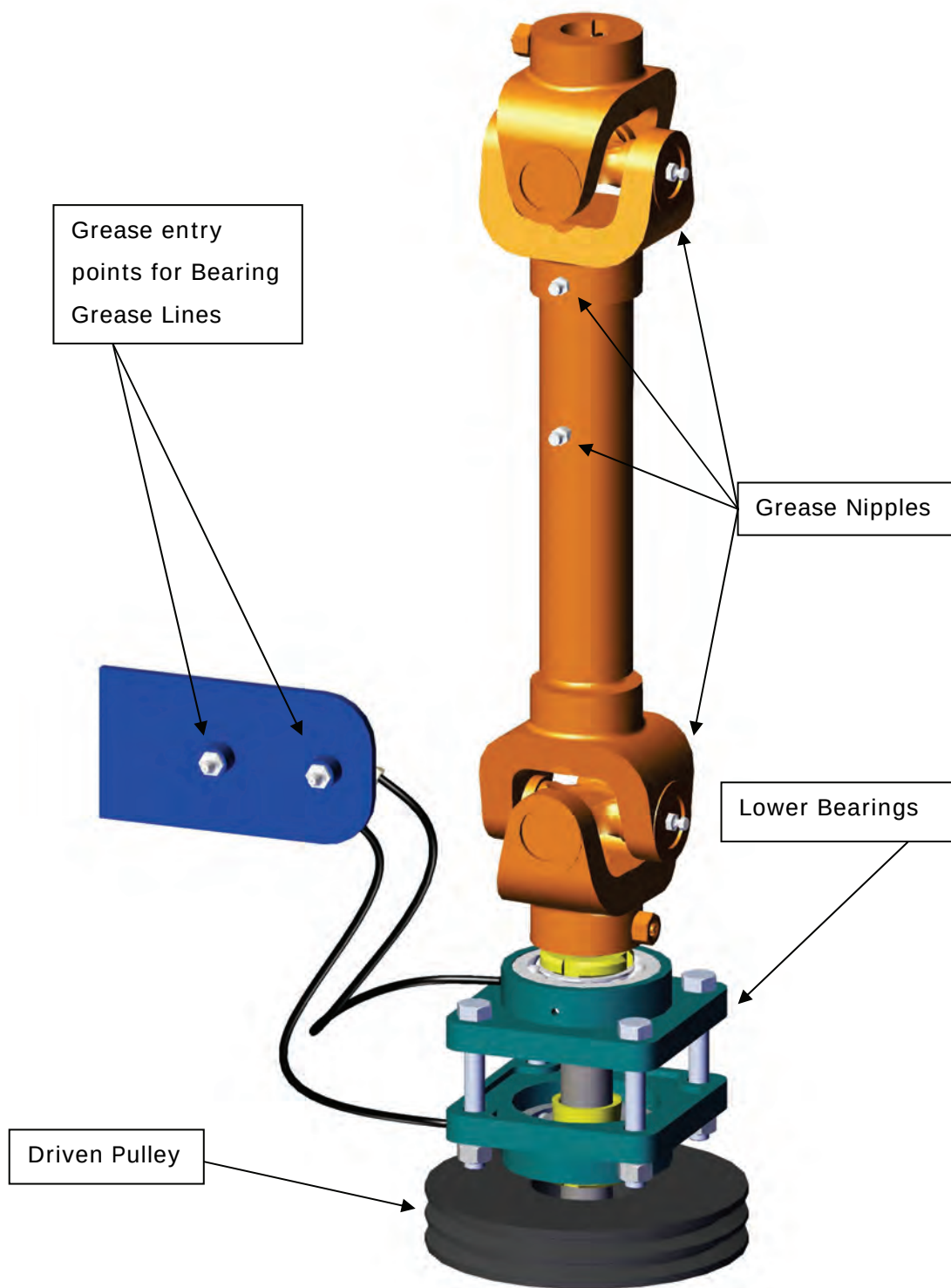


Figure 29 Grease Points for the Mill Universal Shaft & Bearings

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7.4 Lubrication Schedules

The following Table illustrates a suggested lubrication schedule to be administered to the LM2 Mill.

Note: Over lubricating can be equally as detrimental as under lubricating. It is therefore recommended the lubrication applied be supervised, documented and monitored as part of the overall routine maintenance schedule for this machine.

Location	Grease or Oil Type	Frequency	Number of Pumps	Note
Lower motor plate bearings	Castrol EPL 2 or equivalent	150 Hours of operation	4 – 5 pumps	Leave a layer of grease on the nipple to protect from dirt
Universal drive shaft grease points	Castrol EPL 2 or equivalent	500 Hours of operation	1 pump	Leave a layer of grease on the nipple to protect from dirt

Table 11 Lubrication Schedule

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8 WORKSHOP

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8.1 General Safety Rules

Minimum PPE required for jobs contained in the workshop section of this manual.

 EYE PROTECTION MUST BE WORN	 FOOT PROTECTION MUST BE WORN	 HEAD PROTECTION MUST BE WORN	 HAND PROTECTION MUST BE WORN	 DUST MASK MUST BE WORN	 HALF FACE MASK RESPIRATOR MUST BE WORN	 AISLE MUST BE KEPT CLEAR	 HEARING AND EYE PROTECTION MUST BE WORN		
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8.2 Test and Inspection Procedures

Procedures for testing and inspection of the LM2 Mill are as per the user's company requirements.

8.2.1 Special Test Equipment

Not applicable. No special test equipment is required for use on the LM2 Mill.

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8.2.2 **Test and Inspection Programme**

The following procedure outlines suggested steps for testing and inspecting the Mill:

- Perform a visual inspection on parts that are likely to wear, such as the mill springs and spring spigot bushes, lower bearings, universal joints and the mass assembly bearings.
- Ensure there is no excessive wear play in the various drive components from the motor to the mass assembly.
- Ensure the lubrication points have been adequately lubricated.
- Check that the drive train turns freely by hand. Feel for any sign of bearing breakdown.

8.2.3 **Testing Standards**

Not applicable.

8.2.4 **Adjustments for Test or Inspection**

No adjustments for test or inspection are required on the LM2 Mill.

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8.2.5 Replacing Platform Springs & Spring Spigot Bushes

Follow the steps below and refer to the Figure below, for replacement of the platform springs and/or spring spigot bushes.

Note: If any springs need replacement, always replace all six (6) springs with new ones. And if any spring spigot bushes need replacement, always replace all twelve (12) bushes with new ones.

Step 1

The springs and bushes can be replaced with the cabinet left in place and the lid opened to gain access. Alternatively the Mill cabinet can be completely removed from the Mill to gain easier access to the springs at the rear of the Mill.

Using either the assistance of another person, or a leverage device, such as a large adjustable spanner, lift (tilt) the Mill platform on one side enough to enable the removal of one or two springs at a time. Change the spigot bushes at this time if required.

Note: Please exercise caution during this procedure to avoid injury by clamping fingers between the springs and the bushes.

Alternatively, undo the locknuts and grub screws of the bottom universal joint to release the universal shaft from the drive shaft and using appropriate lifting equipment, lift the entire Mill head high enough to enable the removal of the springs and the spigot bushes.

Step 2

The polyurethane spigot bushes have a slight interference fit and need to be prised off with the aid of a screwdriver or similar tool to remove them.

Step 3

Replace the bushes by tapping the new bushes into place with a soft mallet or similar tool.

Step 4

Install the new spring onto the new bushes as per Step 1 above.

Step 5

Repeat Steps 1, 2, 3 and 4, for replacement of the other springs and bushes, one set at a time.

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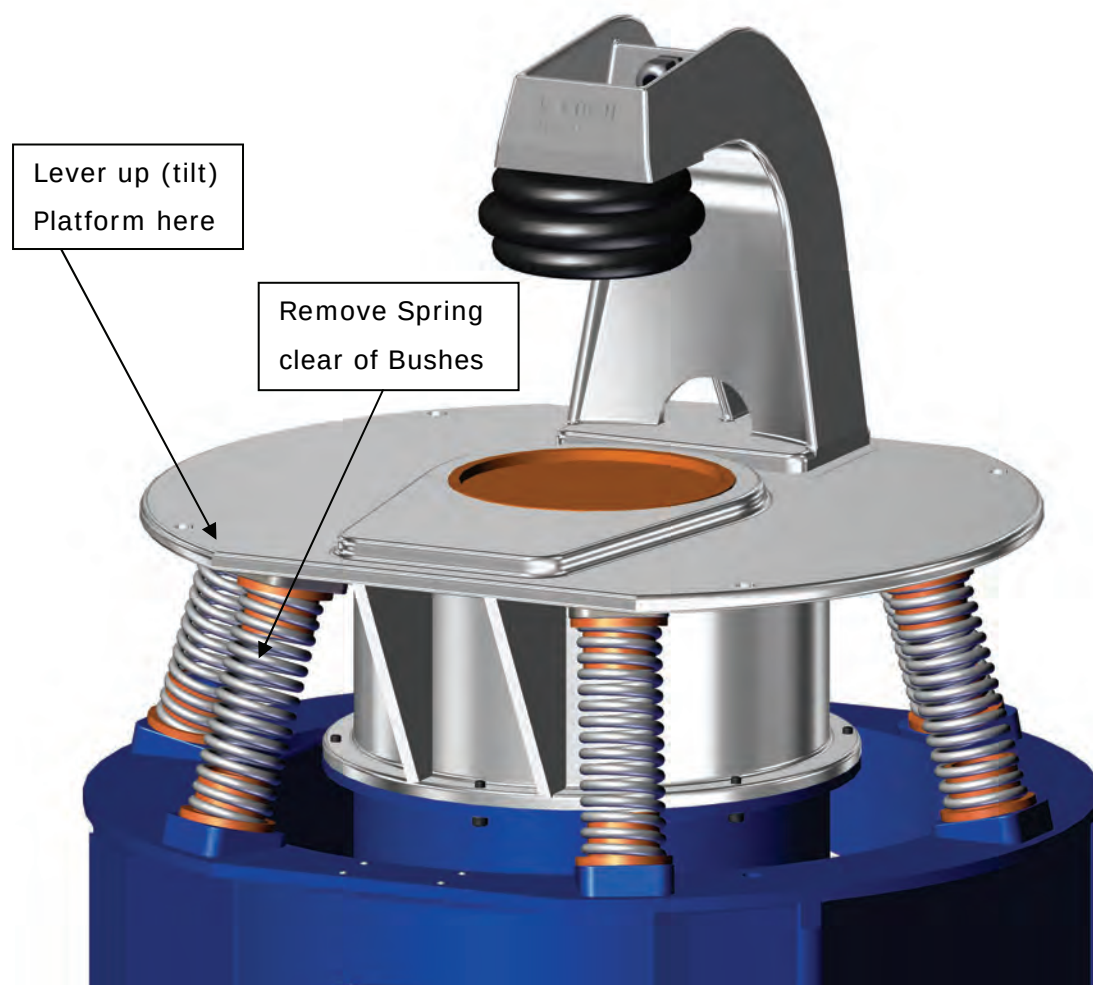


Figure 30 Replacing Platform Springs & Spigot Bushes

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8.2.6 Removal of the Mass Assembly

Follow the steps below and refer to the Figures below, for the removal of the mass assembly.

Note: The mass assembly would normally only be removed in the event of bearing failure and the need for a rebuild of the mass assembly and bearings.

Step 1

Remove the LM2 cabinet from the Mill to gain access to the mass assembly. See Transportation and Handling, Section 3.3.4, of this manual.

Step 2

Undo the two (2) locknuts and grub screws to separate the bottom universal joint from the drive shaft, so that the whole universal shaft will be lifted out with the mass assembly, from the Mill frame.

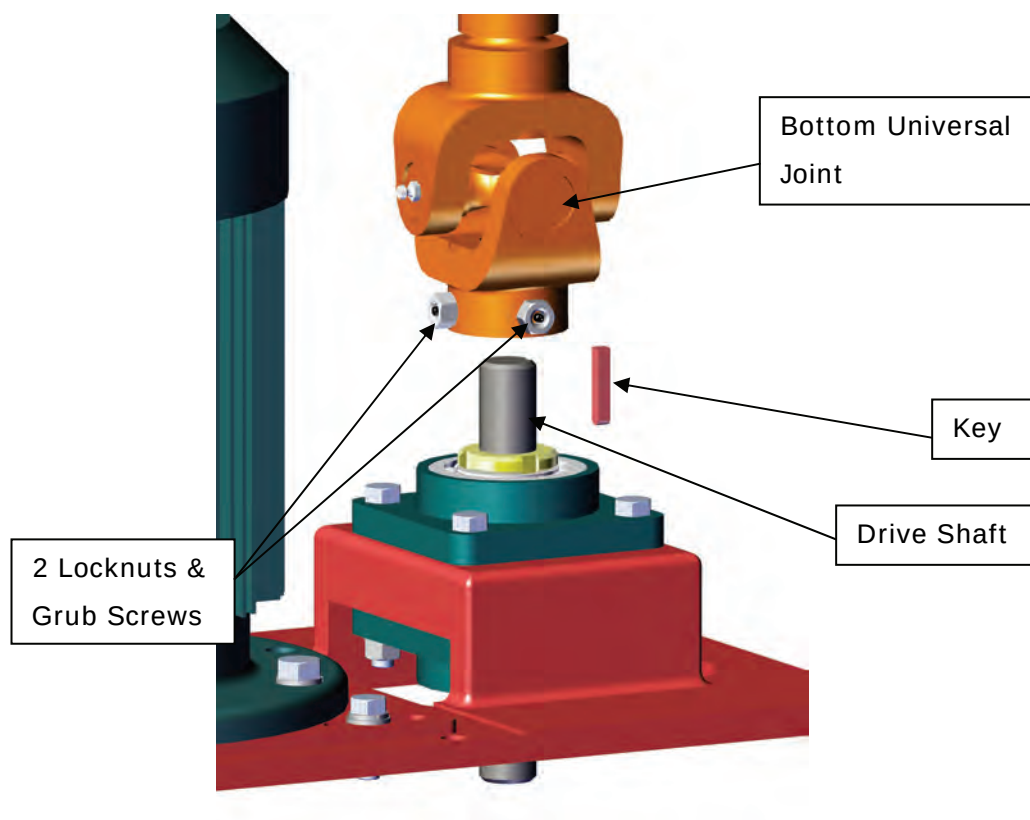


Figure 31 Lower Universal Joint

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Step 3

With assistance, or preferably using lifting equipment, lift the entire mill head assembly, including the mass assembly and the universal shaft, clear of the frame. The separating points being the six (6) springs and the bottom universal joint.

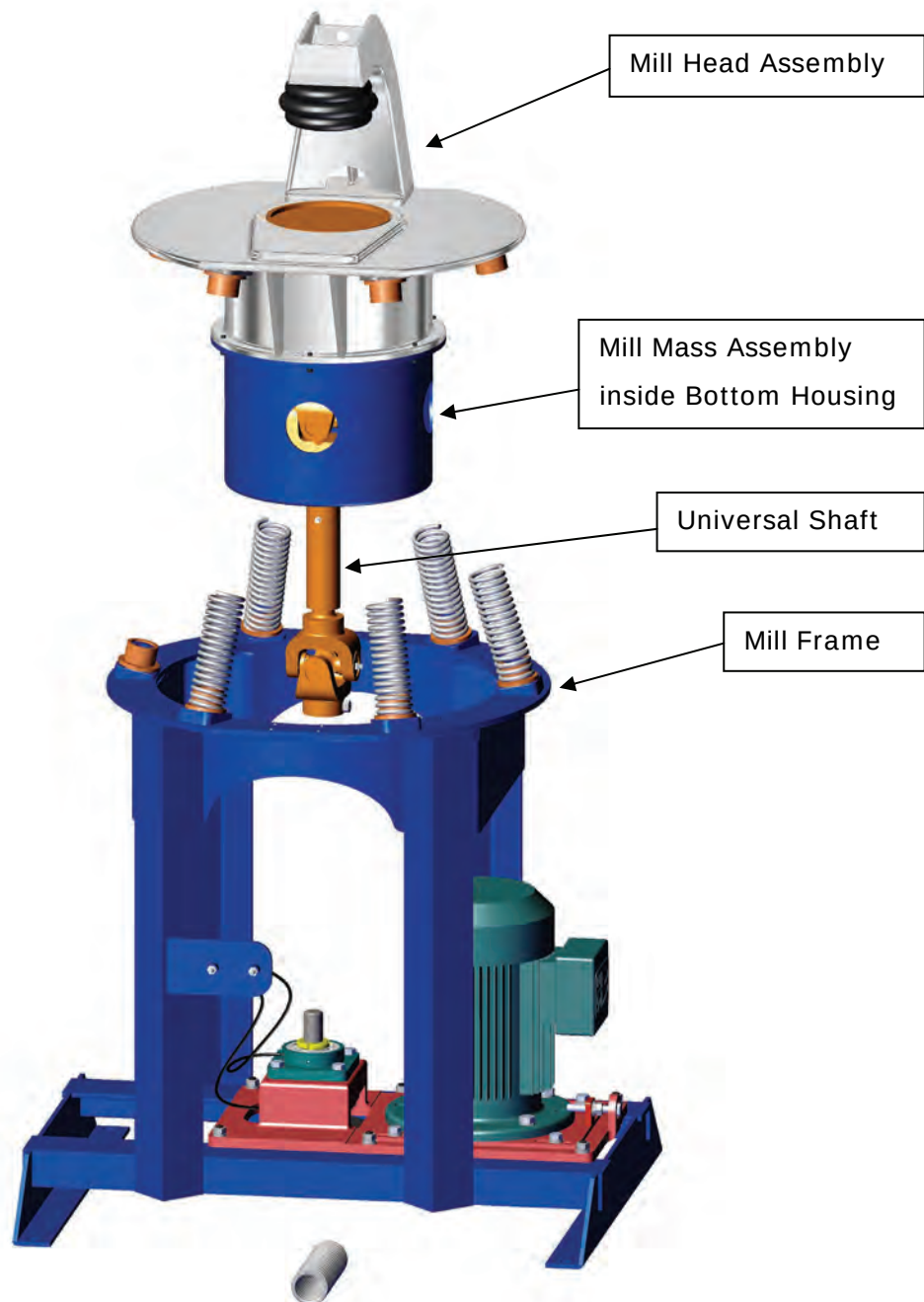


Figure 32 Removing the Mass Assembly

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8.2.7 Disassembly of the Mass Assembly

Follow the steps below and refer to the Figures below, for the disassembly of the mass assembly.

Step 1

Working on a suitable bench, remove the six (6) bolts securing the Mill head to the bottom housing.

Step 2

Using three (3) of the bolts in the threaded holes in the lip of the bottom housing, jack the Mill head away from the bottom housing. The eccentric shaft and mass will remain in the bottom housing and slip out of the top bearing in the head assembly.

Step 3

Undo the two (2) lock nuts and grub screws holding the upper universal joint of the universal shaft to the mass assembly eccentric shaft, working through the holes in the side of the bottom housing. Remove the universal shaft and set aside.

Step 4

The eccentric shaft and mass should now slip out of the bottom bearing in the bottom housing.

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Figure 33 Separating the Mill Head from the Bottom Housing

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Step 5

Remove the five (5) retaining bolts and washers allowing the top seal and bearing to be removed from the bottom housing. Remove the circlip and lower seal from the bottom housing. If necessary, there are two (2) semi circle notches in the bottom housing providing access for a punch to drive out the bearing.

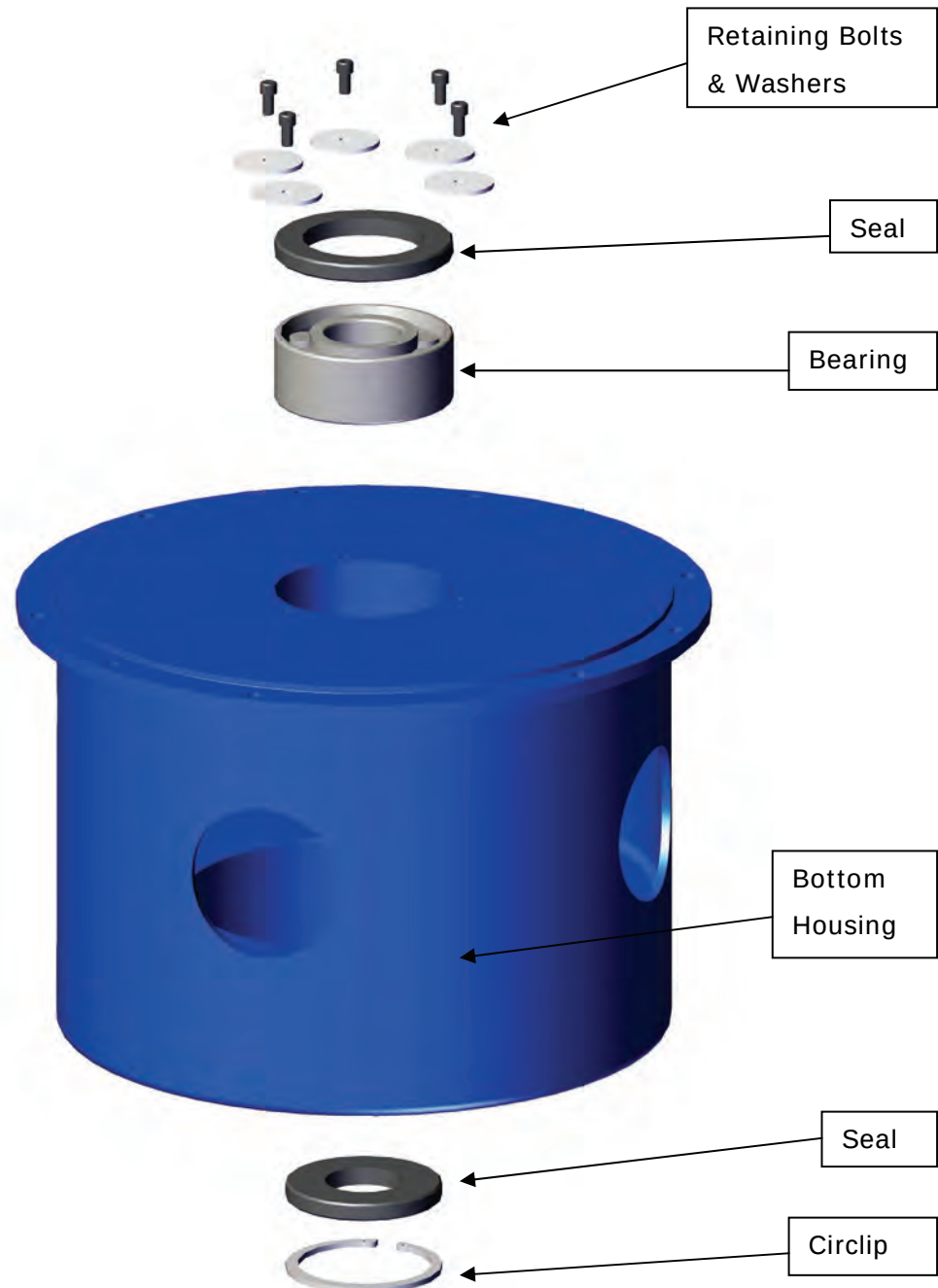


Figure 34 Removing the Bottom Housing Bearing & Seals

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Step 6

Remove the two (2) grub screws from the recess under the platform insert. The circlip can now be removed to allow access to the seal and bearing. Should the bearing be difficult to remove, use a small pin punch through the grub screw holes to carefully drive the bearing from its housing.

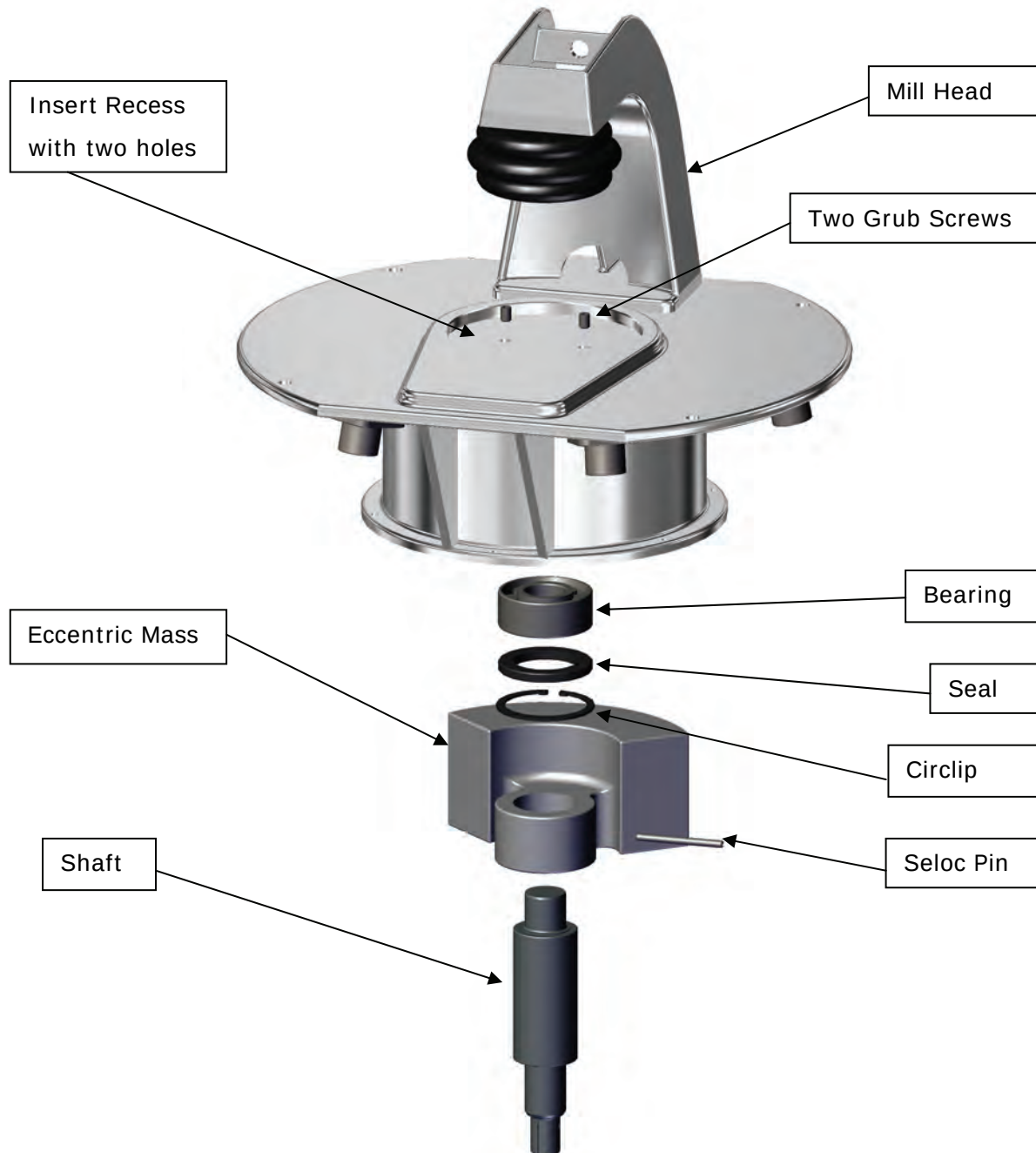


Figure 35 Removing the Mill Head Bearing & Seal

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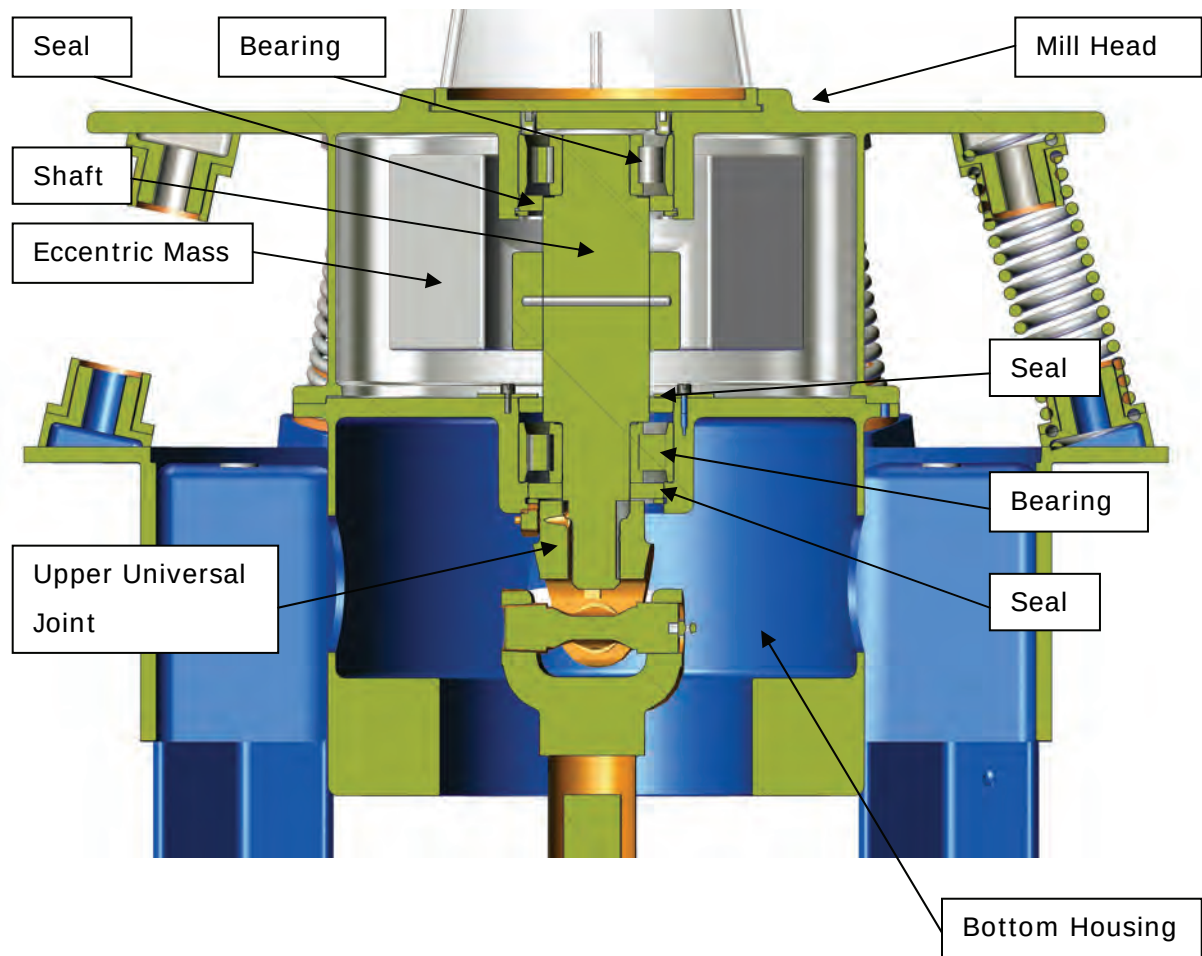


Figure 36 Sectional View of Mass Assembly

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8.2.8 Re-installing the Mass Assembly

Follow the steps below to re-install the mass assembly:

Step 1

After installing new bearings and seals and any other replacements parts in the mass assembly, re-assemble all parts in reverse order of disassembly, paying attention to the following points:

- Ensure both mass assembly bearings are well lubricated and lubricate both ends of the eccentric shaft prior to installation.
- Install the upper bearing in the Mill head with the seal and circlip before replacing the two (2) grub screws in the top of the Mill head, to seal the holes only. Use thread sealant, such as Loctite on the grub screw threads.
- After installing the new lower bearing and seals in the bottom housing, use some silicon sealant to plug the two (2) semi circle notches, before installing the circlip, to prevent loss of lubricant.
- When installing the eccentric shaft through the seals and into the bearings, always turn the lubricated shaft, by hand, to prevent damage to the seals.
- After returning the eccentric shaft and mass to the bottom housing, carefully relocate the upper universal joint of the universal shaft in position on the lower end of the eccentric shaft and seat the two (2) grub screws into the dimples on the eccentric shaft, before tightening the two (2) lock nuts. This needs to be done through the holes in the side of the bottom housing.

Step 2

Using a suitable lifting device, lower the mass assembly with the universal shaft into the Mill frame, taking care to relocate all the springs correctly onto the spigot bushes and the universal shaft onto the drive shaft, ensuring the key and bottom universal joint line up correctly.

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8.2.9 Replacing the Driven Pulley/Drive Shaft Bearings

Follow the steps below and refer to the Figures below, for the replacement of the driven pulley/drive shaft bearings.

Step 1

Remove the LM2 cabinet from the Mill to gain access to the pulleys and drive shaft bearings. See Transportation and Handling, Section 3.3.4, of this manual.

Step 2

Loosen the four (4) belt tensioning bolts at the base of the motor and use the jacking bolt to move the motor closer to the drive shaft to remove the vee belts.

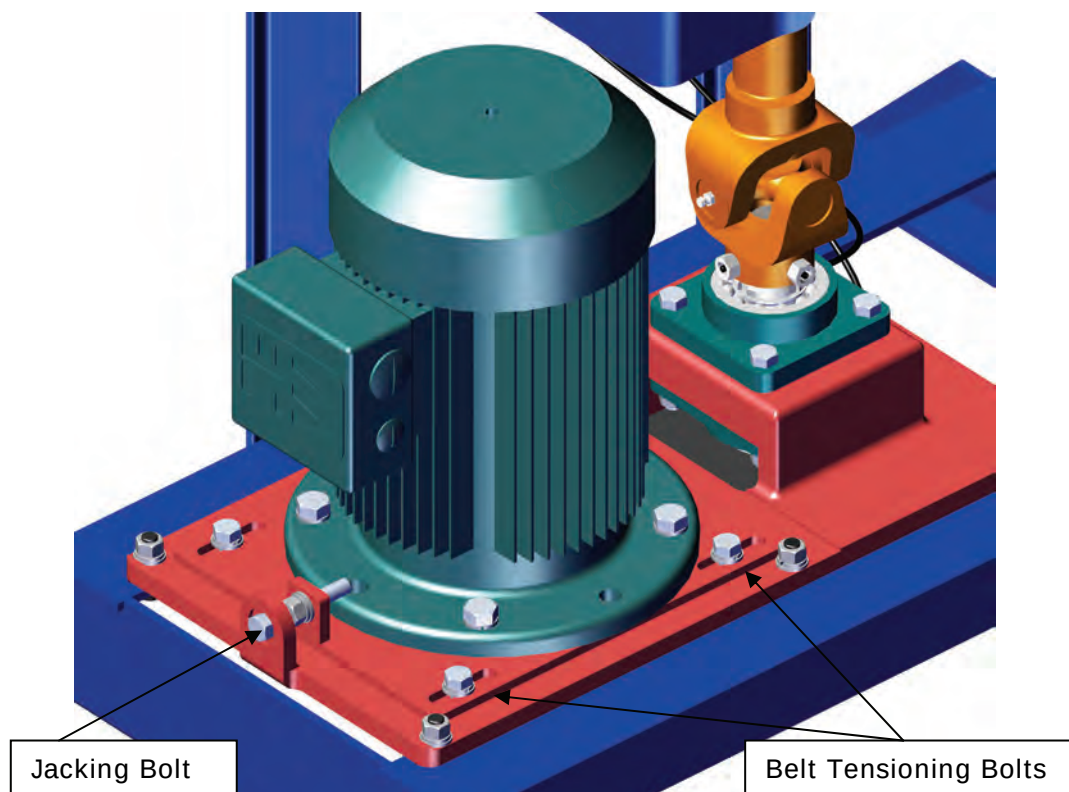


Figure 37 Removing the Vee Belts

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Step 3

Remove the driven pulley from the pulley drive shaft by removing the taperlock bush and key.

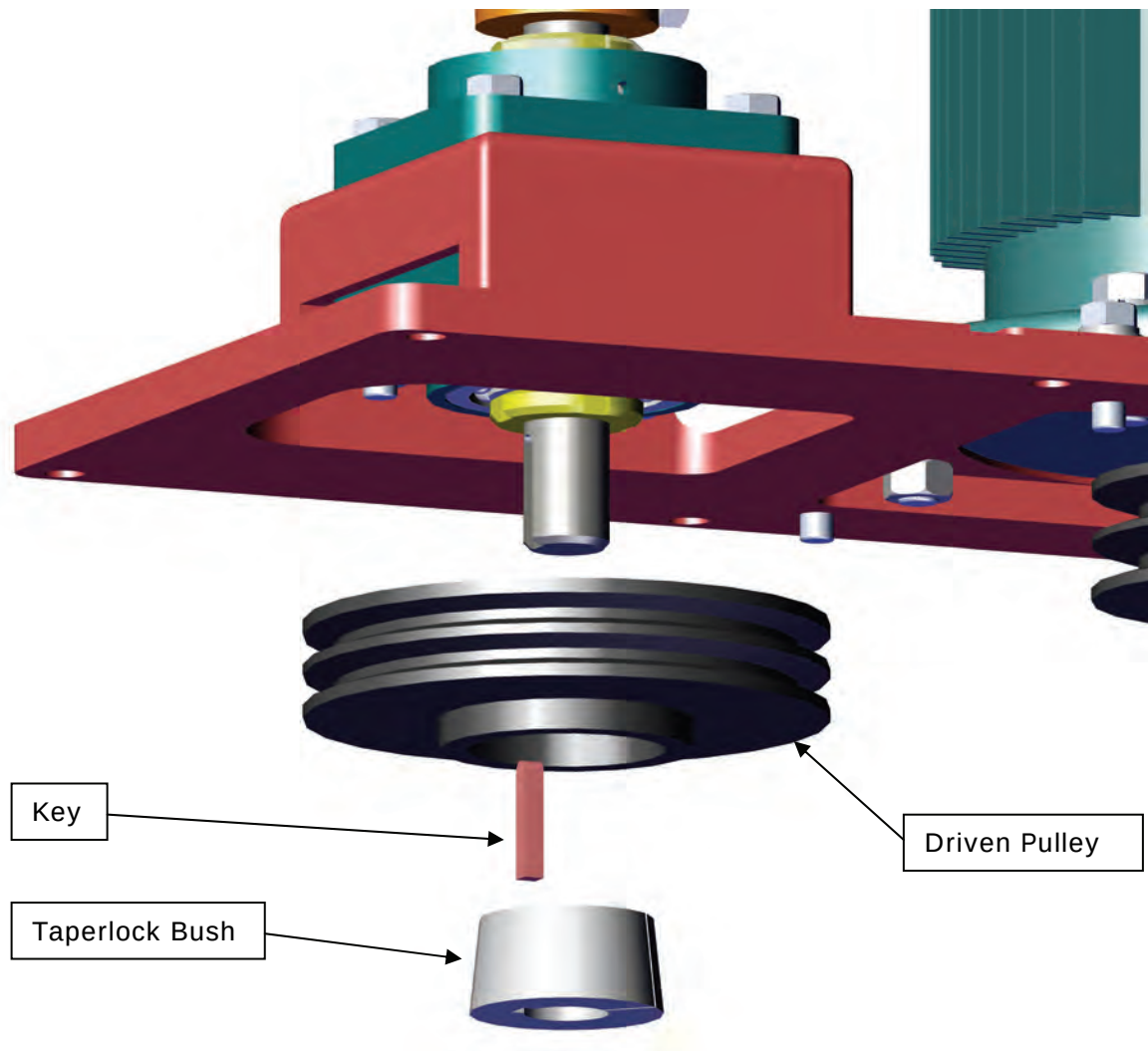


Figure 38 Removing Driven Pulley

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Step 4

Loosen the locknuts and grub screws on the lower universal joint and lever it up just clear from the drive shaft.

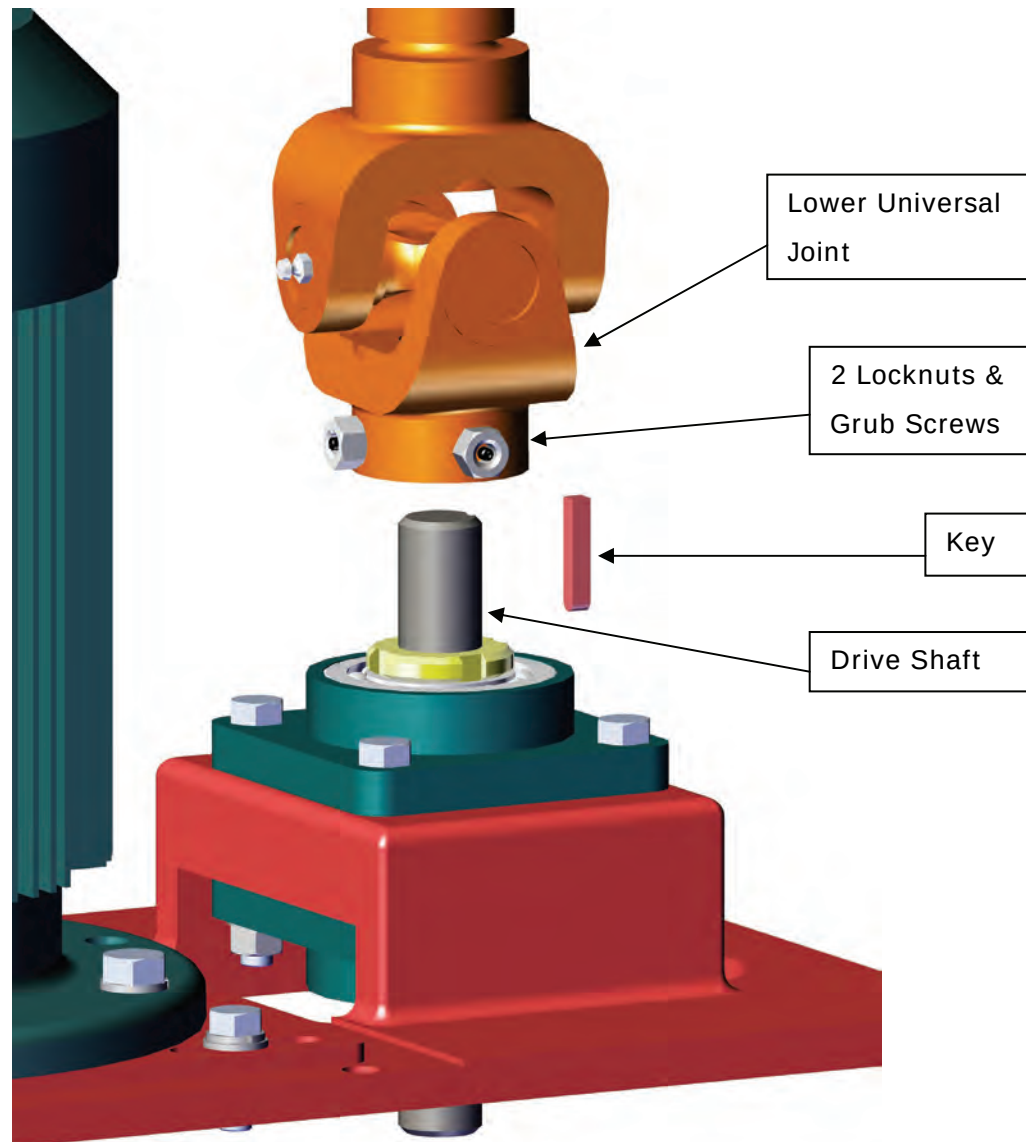


Figure 39 Separating the Lower Universal Joint from the Drive Shaft

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Step 5

Loosen the two (2) bearing adapter sleeves and remove the drive shaft.

Tip: Mark the drive shaft with a felt permanent marker to show its position in the bearing housings for re-assembly later.

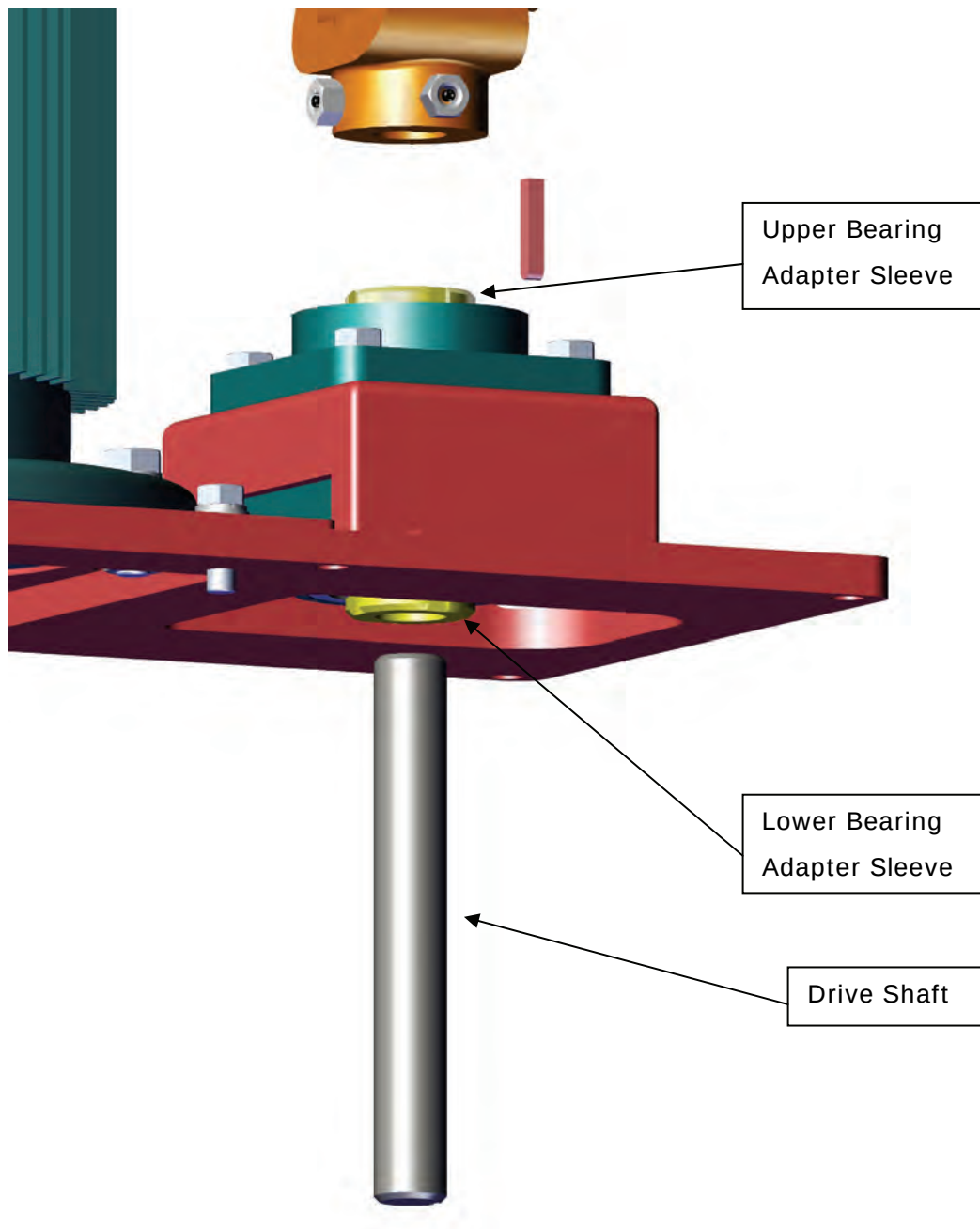


Figure 40 Removing the Drive Shaft

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Step 6

Undo the four (4) bearing housing retaining bolts, nuts and washers and remove the bearing housings from the motor base plate.

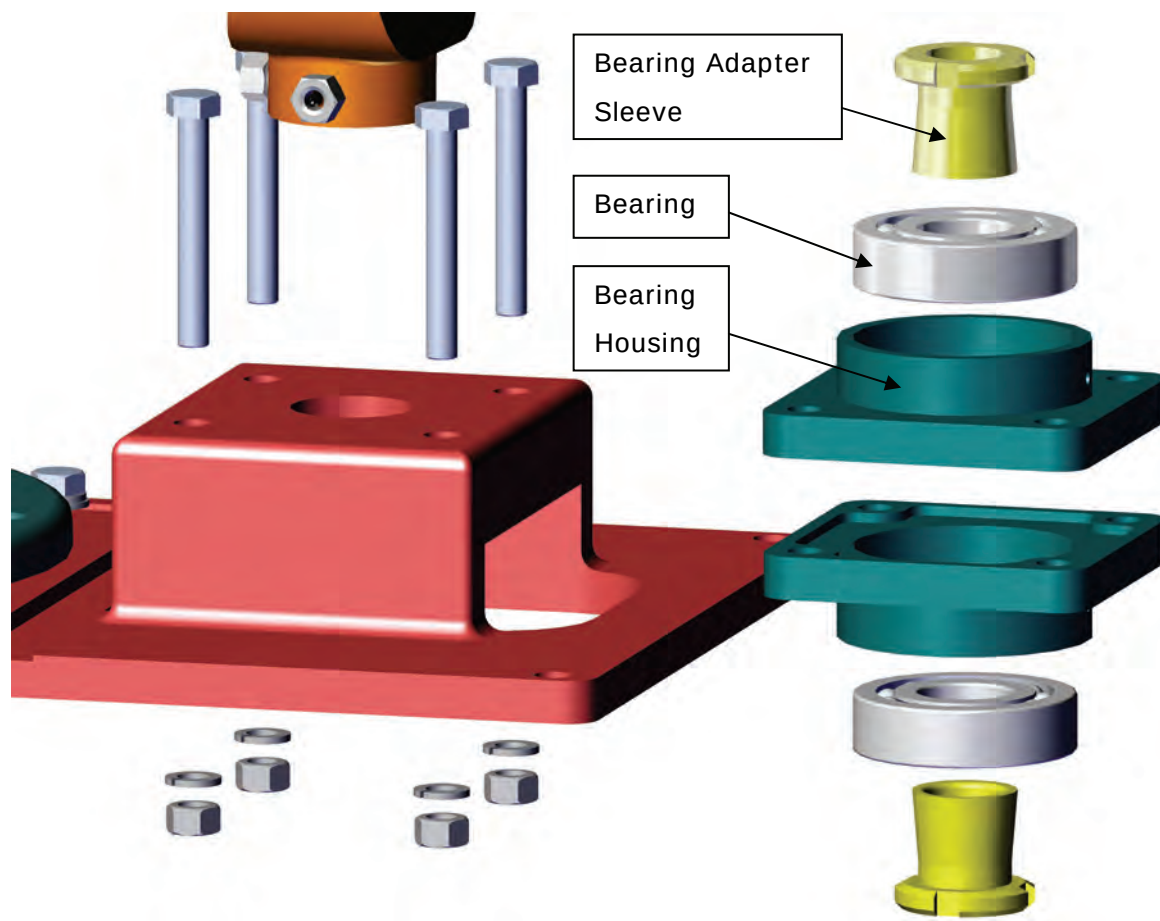


Figure 41 Removing the Bearing Housings

Step 7

Remove the bearings and replace with new ones that have been well lubricated prior to installation.

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8.2.10 Re-installing the Driven Pulley/Drive Shaft Bearings

Follow the steps below, for the re-installation of the driven pulley/drive shaft bearings:

Step 1

Re-install the bearings, housings, drive shaft, pulley and vee belts in the reverse order of disassembly, paying attention to the following points:

- Install the two (2) bearing housings containing the new bearings and the adapter sleeves, with the four (4) bearing housing retaining bolts, nuts and washers and the drive shaft, all finger tight only to allow the parts to fit together correctly.
- With the drive shaft held at the correct height, tip in Step 5 above, screw tighten the upper bearing adapter sleeve to grasp the drive shaft firmly.
- Then screw tighten the lower bearing adapter sleeve.
- Then tighten the four (4) bearing housing retaining bolts, nuts and washers to the correct torque.

Step 2

Install the lower universal joint and key onto the drive shaft and tighten the two (2) grub screws and lock nuts in the correct position.

Step 3

Install the driven pulley with its key and taperlock bush onto the drive shaft so that it aligns correctly with the driving pulley. Ensure all parts can turn freely by hand.

Step 4

Install the vee belts onto the pulleys, pull the motor back from the drive shaft and re-tension the belts using the jacking bolt. Once the belts are correctly tensioned, secure the motor in place by tightening the four (4) belt tensioning bolts. Correct tension should allow 5 mm deflection midway between the pulleys.

Step 5

Reinstall the Mill cabinet and reconnect all power connections before test running the machine. See Transportation and Handling, Section 3.3.4, of this manual.

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8.3 Troubleshooting Procedures

Refer to the Maintenance Section of this Manual for a detailed Troubleshooting Guide and procedures.

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8.4 Bolt Torque Settings

The list that follows indicates recommended torque ratings for bolts used on the LM2 Mill.

Description	Torque Setting Grade 4.6	Torque Setting Grade 8.8	Torque Setting Grade 10.9	Torque Setting Grade 12.9
M5	2 Nm	5 Nm	8 Nm	9.5 Nm
M6	3.5 Nm	9 Nm	13 Nm	16 Nm
M8	8.5 Nm	22 Nm	32 Nm	39 Nm
M10	16.7 Nm	44 Nm	63 Nm	77 Nm
M12	29 Nm	77 Nm	109 Nm	135 Nm
M14	46.4 Nm	122 Nm	174 Nm	215 Nm
M16	71.3 Nm	180 Nm	270 Nm	330 Nm
M18		269 Nm	370 Nm	
M20	139.4 Nm	372 Nm	528 Nm	650 Nm
M22		519 Nm	722 Nm	
M24	241 Nm	640 Nm	914 Nm	1100 Nm
M30	476 Nm	1314 Nm	1817 Nm	2250 Nm
M36		2297 Nm	3173 Nm	3850 Nm
M10 Shoulder Bolt	29 Nm			

Table 12 Bolt Torque Settings

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9 PARTS

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9.1 General Content

The following sections outline details of the Sub Assemblies and Parts of the LM2 Mill.

9.2 Major Assemblies

9.2.1 List of Major Assemblies

The following list and Figures below detail the Major Assemblies of the LM2 Mill.

1. LM2 Mill
2. LM2 Cabinet
3. Millmate

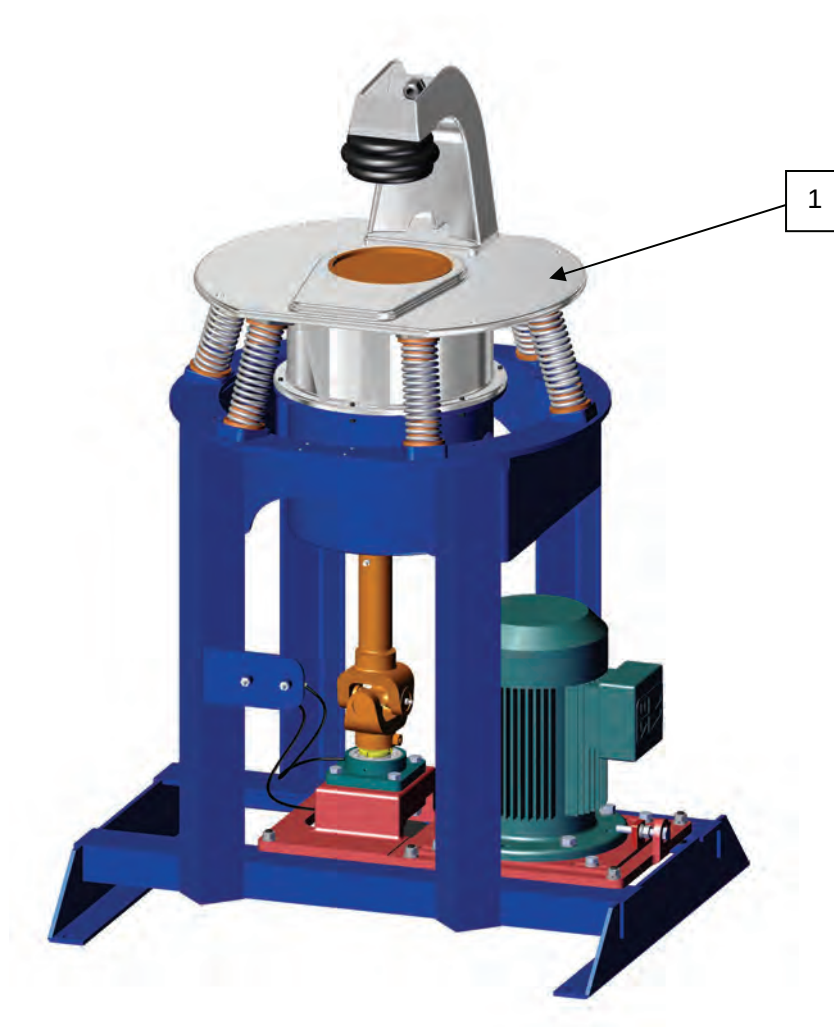


Figure 42 The LM2 Mill

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Figure 43 The LM2 Cabinet

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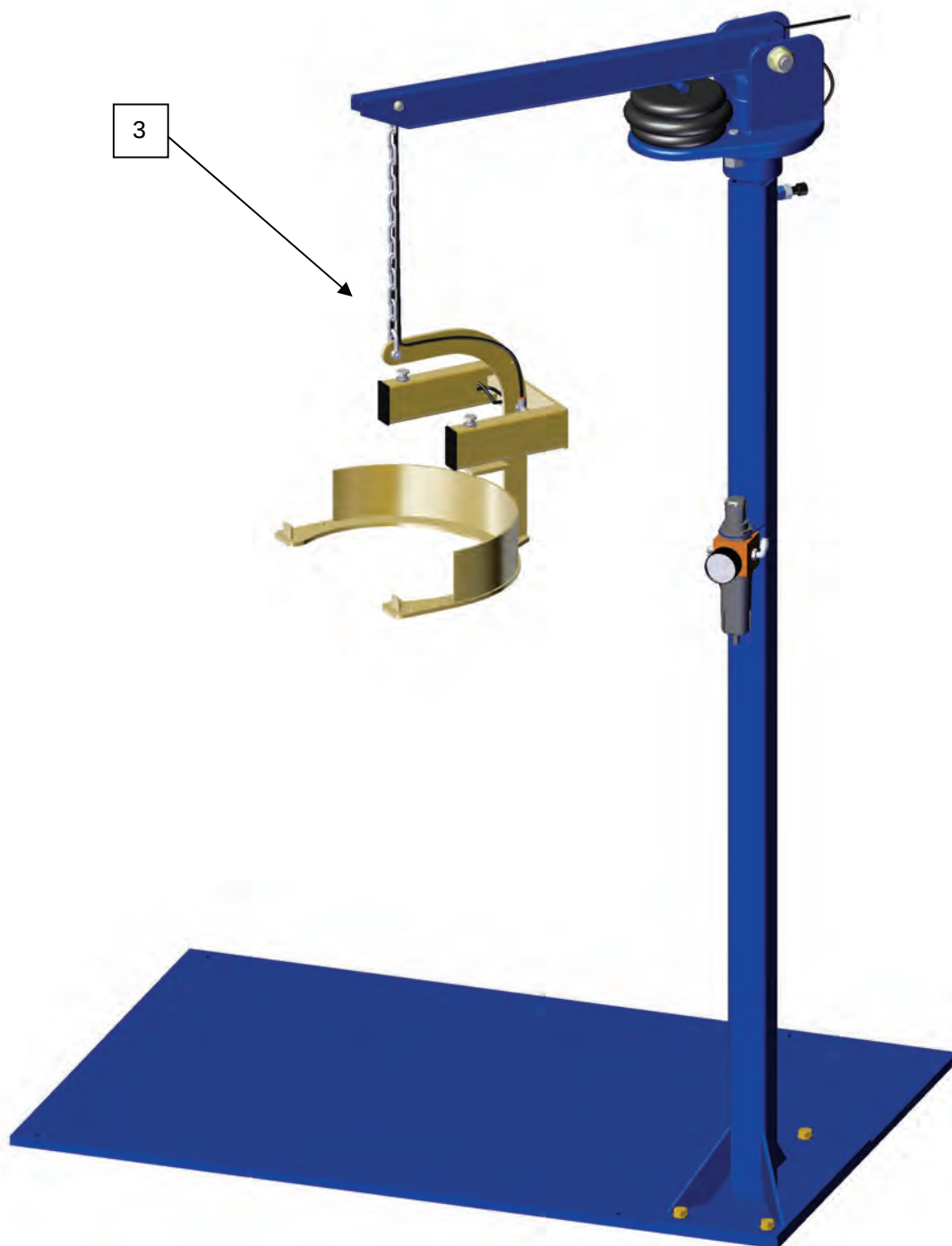


Figure 44 The Millmate

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9.3 Parts Lists

9.3.1 Parts of the LM2 Mill

The Parts List and Figure below, illustrate the details, quantities and location of parts which may be required for use on the LM2 Mill.

Figure Reference No.	Item No.	Description	Qty per machine
1	614007	Drive motor	1
2	112056	Base frame assembly	1
3	115050	Mill spring spigot bush	12
4	350010	Spring	6
5	225031	Universal drive shaft	1
6	112006	Mill head platform	1
7	111070	Airbag clamp	1
8	470029	Platform insert	1
9	221005	Bearing	2
10	221019	Bearing housing	2
11		Jacking bolt & nut	1
12	115013	Motor mount plate	1
13	343088	Grease nipple	2

Table 13 Parts of LM2 Mill

For any parts required, that do not have an Item Number showing, please contact Essa.

Contact details for Essa can be found in Section 1 of this document.

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Figure 45 Parts of the LM2 Mill

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9.3.2 Parts of the LM2 Mass Assembly

The Parts List and Figure below, illustrate the details, quantities and location of parts which may be required for use on the LM2 Mass Assembly.

Figure Reference No.	Item No.	Description	Qty per machine
14	112004	Eccentric weight	1
15	112018	Shaft	1
16	522802	Seloc pin	1
17	223002	Seal	2
18	221004	Bearing	2
19	525307	Plug (grub screw)	2
20	223003	Seal	1
21	229005	Circlip	1
22	229010	Circlip	1
23	112022	LM2 housing lower	1

Table 14 Parts of the LM2 Mass Assembly

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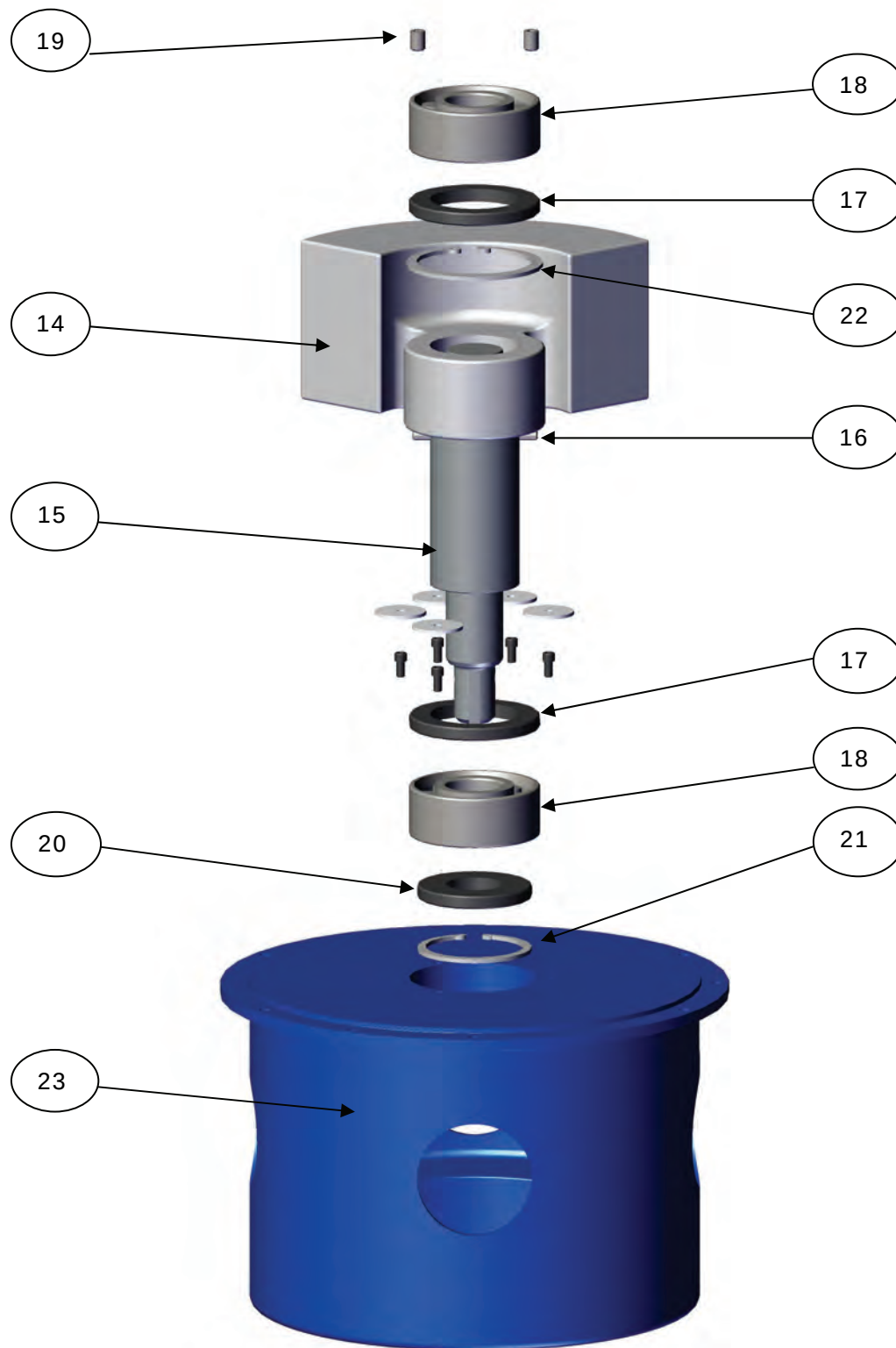


Figure 46 Parts of the LM2 Mass Assembly

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9.3.3 Parts of the LM2 Cabinet

The Parts List and Figure below, illustrate the details, quantities and location of parts which may be required for use on the LM2 Cabinet

Figure Reference No.	Item No.	Description	Qty per machine
24	112030	Cabinet lid	1
25	112051	Cabinet hinge	1
26	112079	Cabinet sound foam kit	1
27	343422	Removable front inspection panel	1
28	613200	Axial fan (on rear panel)	1
29	611040	Control box (enclosure only)	1
30	605813	Timer	1
31	605911	Hour meter	1
32	340002	Air regulator	1
33	607004	3 phase plug & lead	1
34	652168	Lid locking safety switch	1

Table 15 Parts of the Cabinet

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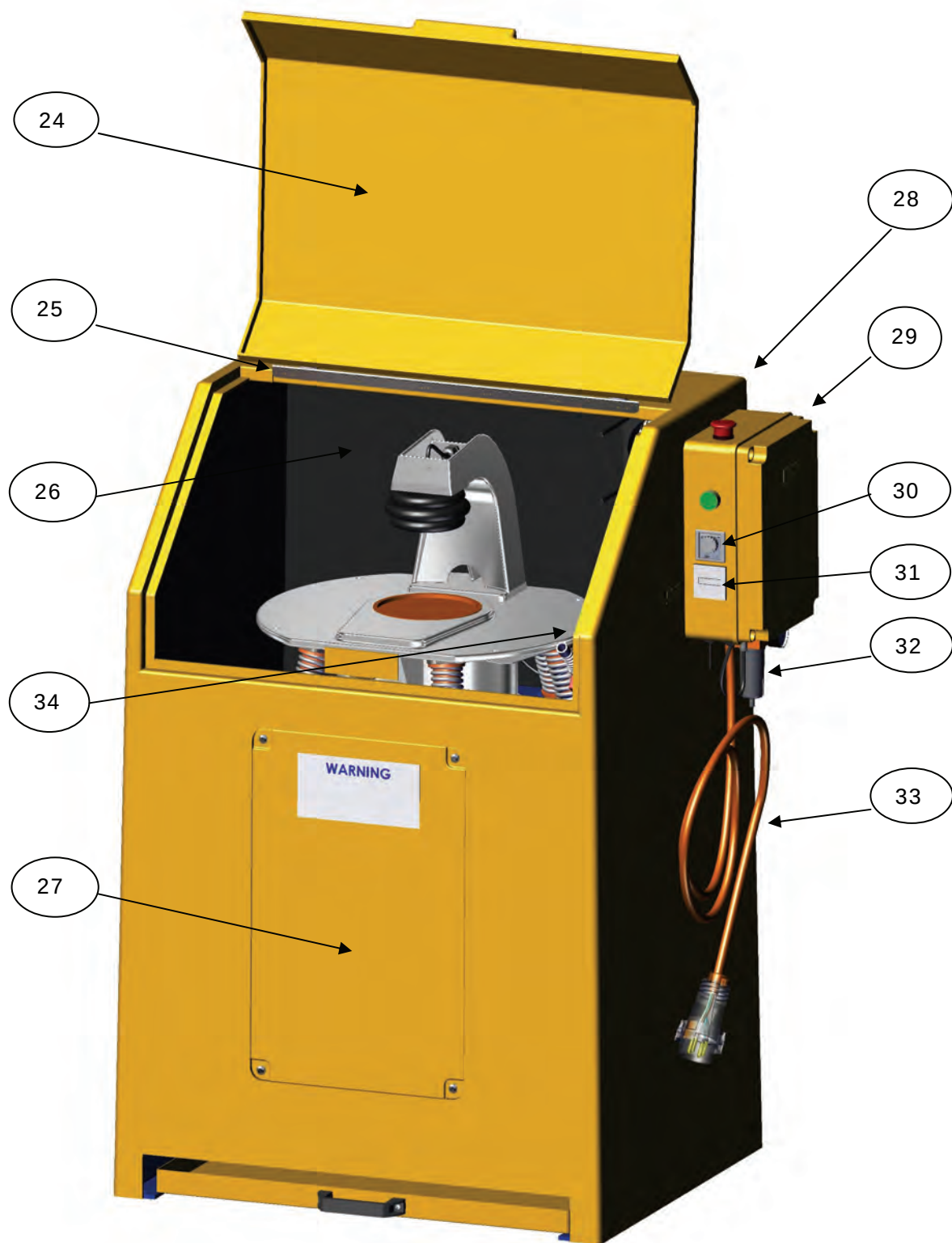


Figure 47 Parts of the Cabinet

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9.3.4 Accessory Parts

The Parts List and Figure below, illustrate the details and quantities of accessory parts supplied with the LM2 Mill.

Figure Reference No.	Item No.	Description	Qty per machine
35	470015	Disc (puck) hook	1
36	350017	Grease tube	1
37	512708	Dynabolt M12 X 60	4
	346790	Torx key T20 for lid locking safety switch	1

Table 16 Accessories

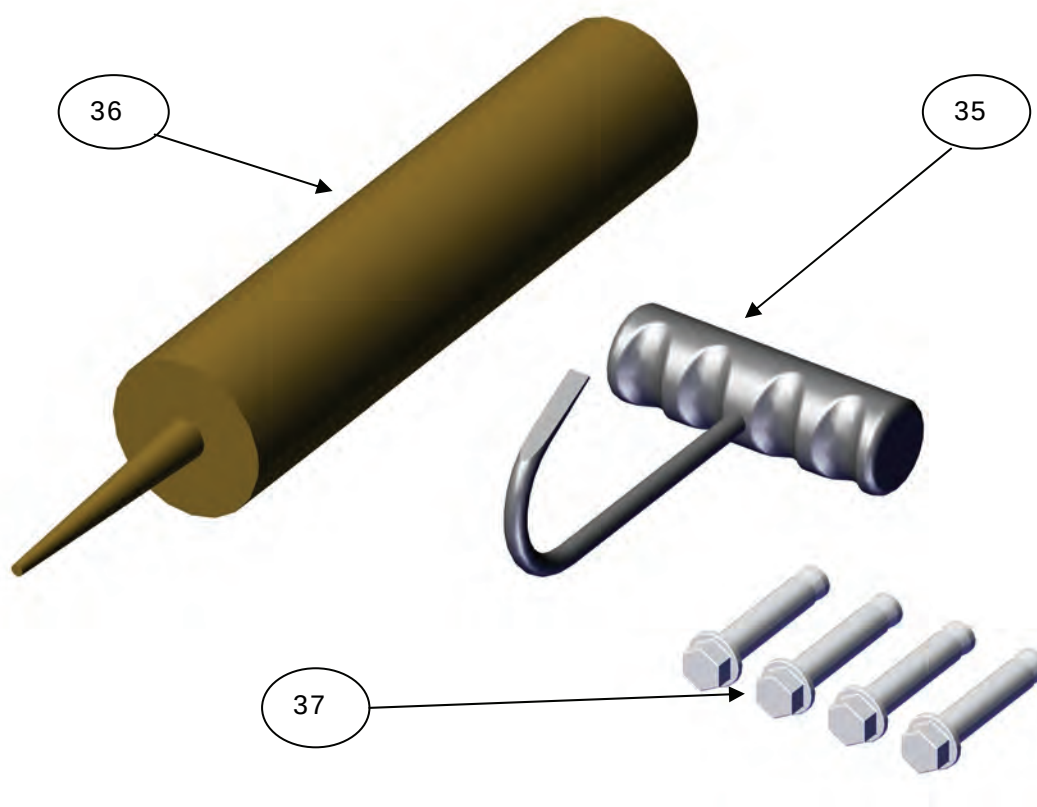


Figure 48 Accessories (T20 Torx Key not illustrated)

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9.3.5 Drive Belts & Pulleys

The Parts List and Figure below, illustrate the details, quantities and location of parts which may be required for use on the LM2 drive belts and pulleys, for both 60 Hz and 50 Hz applications.

Figure Reference No.	Item No.	Description	Qty per machine
		For 60 Hz applications	
38	225012	Motor pulley	1
39	225006	Driven pulley	1
40	225010	Motor bush taper lock	1
41	225007	Driven bush taper lock	1
42	225011	Vee belt	2
		For 50 Hz applications	
38	225004	Motor pulley	1
39	225006	Driven pulley	1
40	225005	Motor bush taper lock	1
41	225007	Driven bush taper lock	1
42	225003	Vee belt	2

Table 17 Drive Belts & Pulleys

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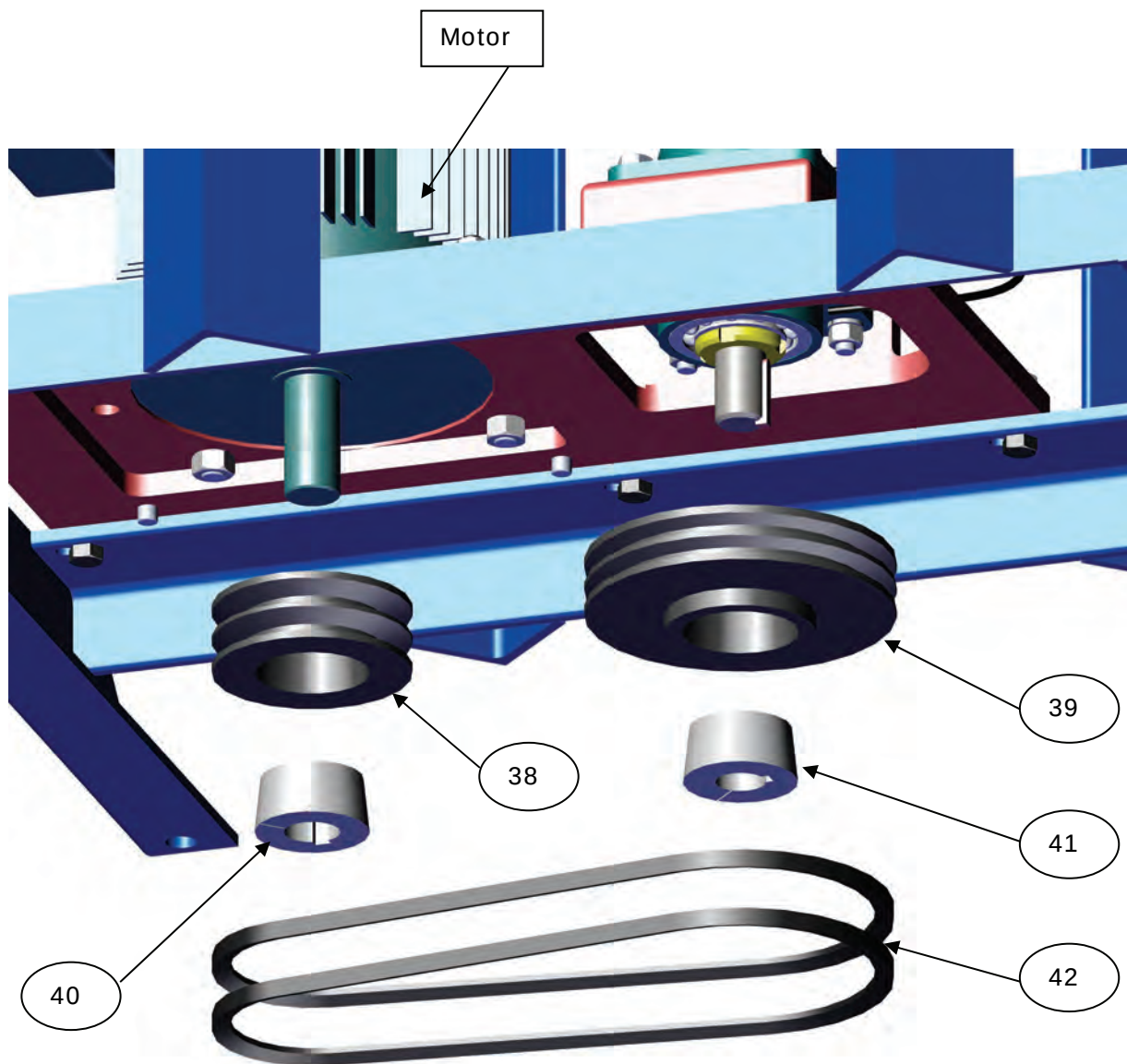


Figure 49 Drive Belts & Pulleys

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9.3.6 Electrical Parts of the LM2 Pulverising Mill

Refer to the Table and Figures below, for replacement of any control box component parts.
Please engage a qualified electrician or technician to work on the control box parts.

Fig Ref #	Item No. for 220-240V	Item No. for 380-415V	Description	Qty
1	611040	611040	Enclosure	1
2	612000	612000	Transformer	1
3	604059	604059	Contactor	1
4	604252	604250	Overload relay	1
5	605813	605813	Timer	1
6	605911	605911	Hour run meter	1
7	652244	652244	Start button	1
8	652243	652243	Stop button	1
9	340064	340064	Solenoid valve 50/60 Hz	1
10	616200	616200	Air pressure switch	1
11	340001	340001	Air clamp bleed control	1
12	340003	340003	Air pressure gauge	1
13	340002	340002	Filter regulator	1
14	605918	605918	Start switch actuator	1
15	605919	605919	Stop switch actuator	1
16	340024	340024	Air fitting elbow	1
17	340027	340027	Straight connector	2
18	340040	340040	Special tee fitting	1
19	340048	340048	Tee plug	1
20	340096	340096	Swivel elbow	2
21	605814	605814	Timer mounting bracket	1

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22	609500	609500	Cable gland 16 mm	1
23	609514	609514	Cable gland 25 mm	1
24	609521	609521	Cable gland 12 mm	2
25	652011	652011	Cable	1
26	652006	652006	Wiring harness	1
27	340039	340039	Air bleed plug	1
28	340035	340035	Bulkhead connector – 6 mm	1
29	340041	340041	Tee	1
30	340026	340026	Straight connector	1
31	340012	340012	Air hose 6 mm	2
32	340182	340182	Air hose 4 mm	2
33	607004	607004	3 Phase plug & lead	1
34	605804	605804	Crouzet multi function timer	1

Table 18 Parts List for the Electrical Control Box

Note: Fig Ref' 34 in the control box parts list above, the Crouzet multi function timer, is for the new lid locking safety switch and provides the factory set seven second delay before allowing the cabinet lid to be opened. See the Figure below.

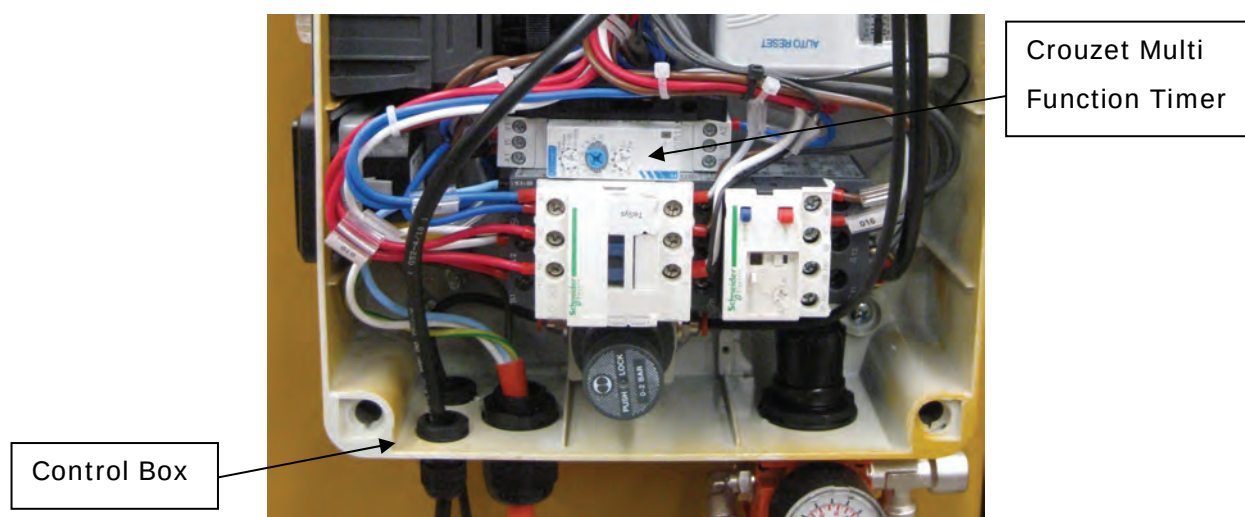


Figure 50 Crouzet Multi Function Timer

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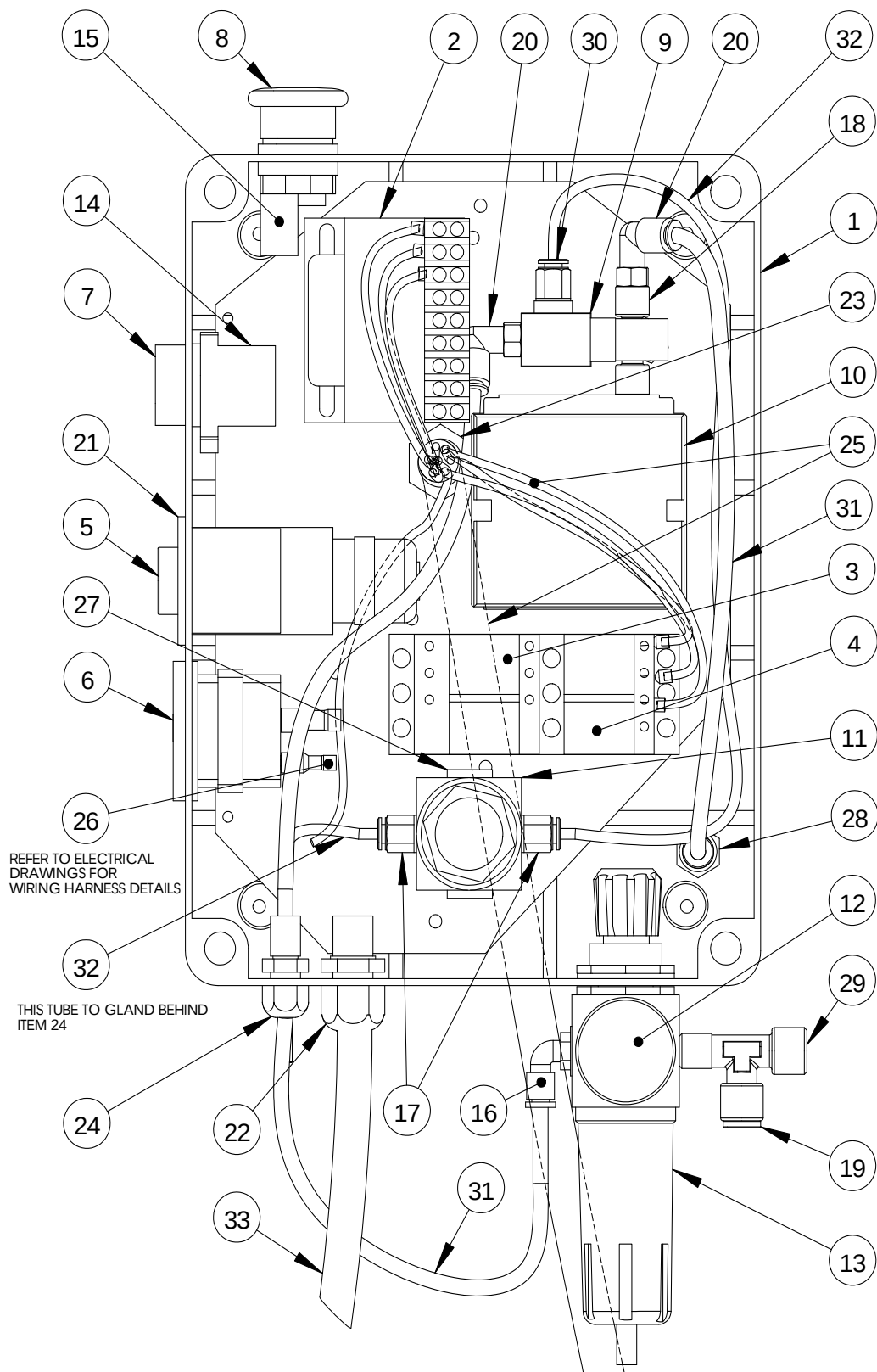


Figure 51 Illustration of the Parts of the Electrical Control Box

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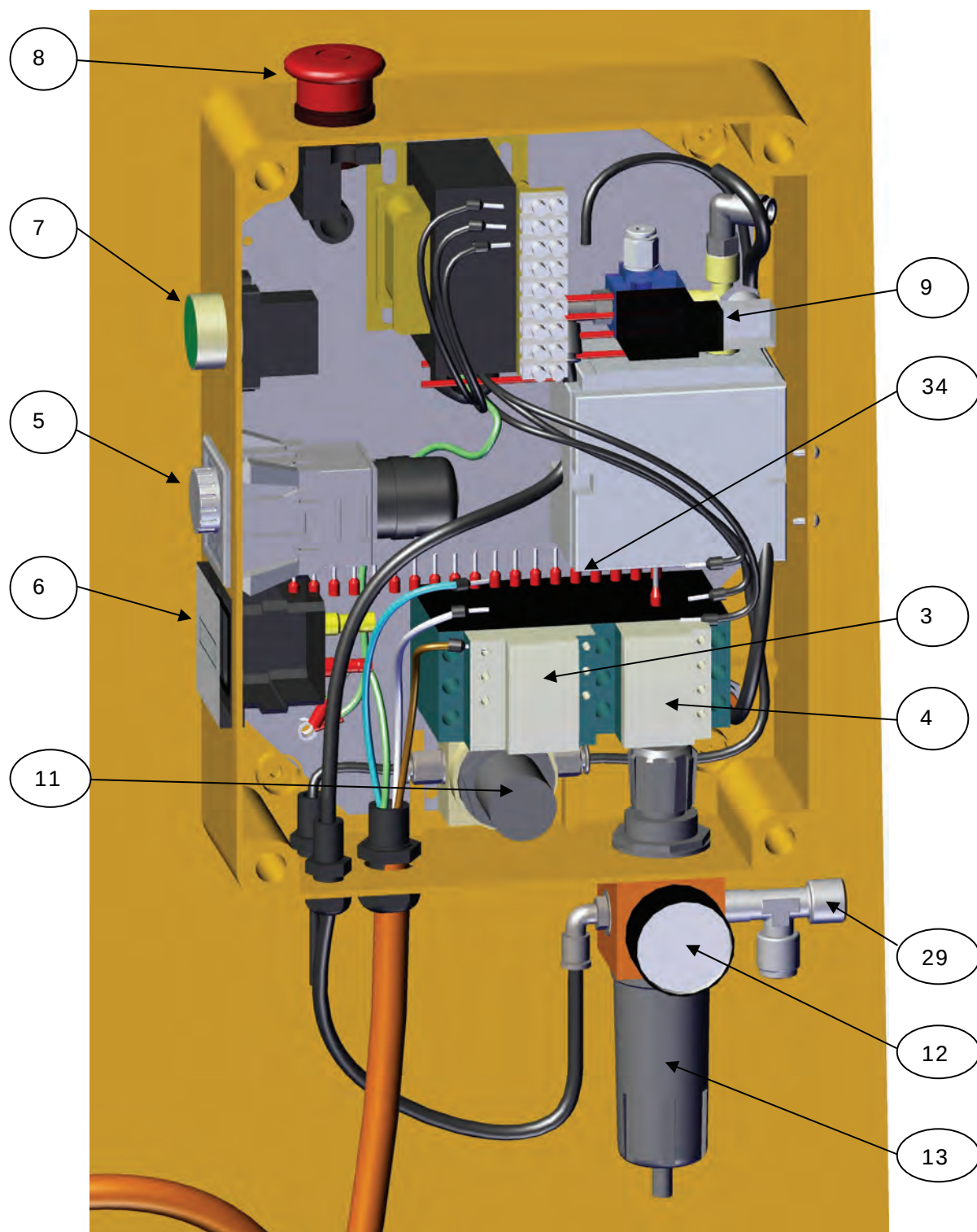


Figure 52 Main Parts of the Electrical Control Box

Note: Fig Ref' 34 indicates the location of the Crouzet multi function timer (not depicted).

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9.3.7 Bowls, Lids, Rings, Rollers, Grinding Elements & Seals

The Parts List, Figure and Table below, illustrate the Item Numbers of the bowls, lids and grinding elements etc, which may be ordered for use on the LM2 Mill.

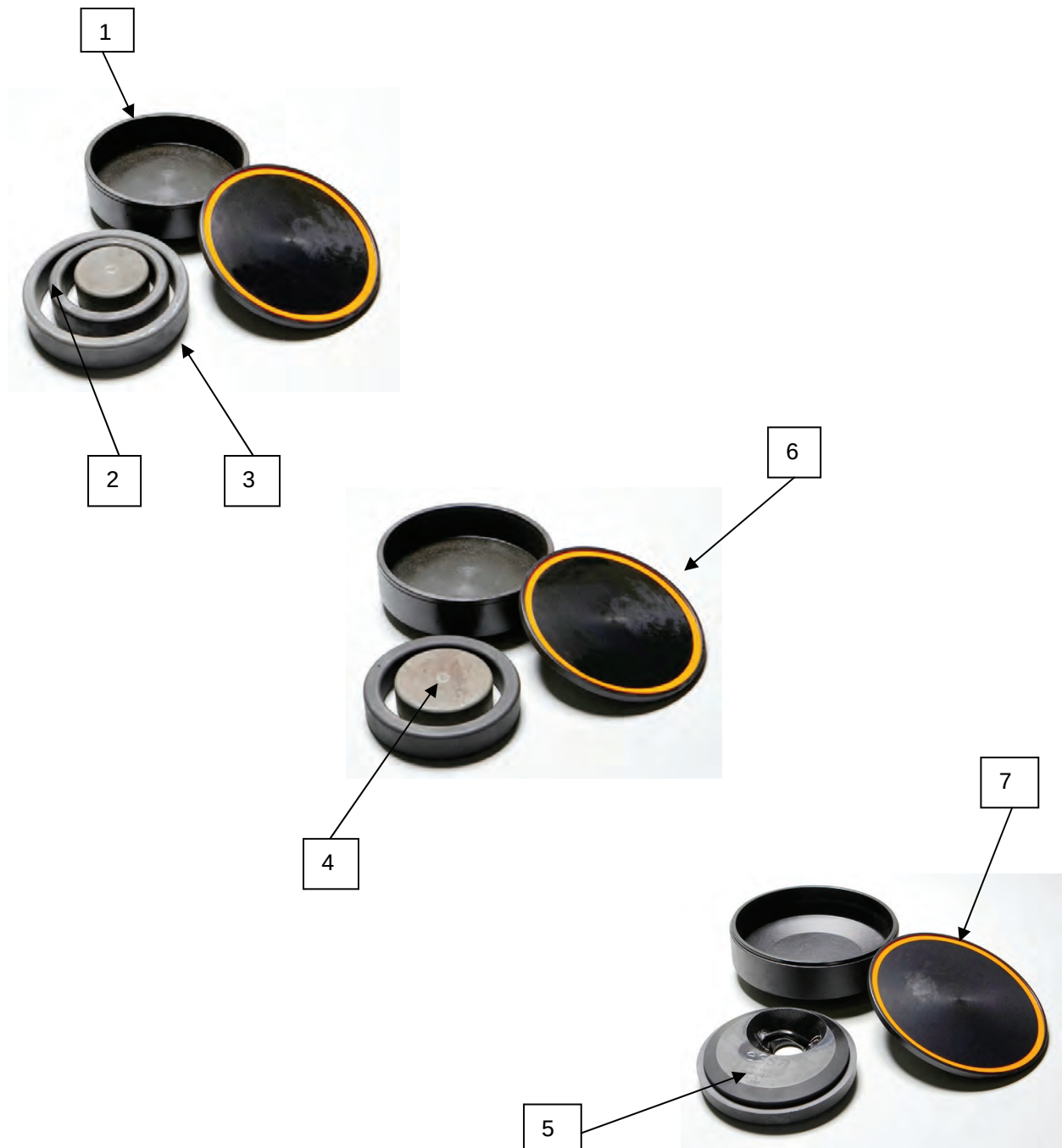


Figure 53 Bowls, Rings, Rollers, Discs & Lids

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Bowl Model	Steel Type	Bowl (1)	Inner Ring (2)	Outer Ring (3)	Roller (4)	Grinding Element (5)	Lid (6)	O Ring / Lid Seal (7)
B50	CS	471002			471003		471004	470049
	SS	477002			477003		471004	470049
B100	CS	471042	471007		471008		471009	223020
	SS	477006	477007		477008		471009	223020
B125	CS	471014	471007		471008		471009	223020
	SS	477014	477007		477008		471009	223020
B300	CS	471016	471096	471095	471097		471018	470040
	SS	477016	477096	477095	477097		471018	470040
B400	CS	471016	471098		471099		471018	470040
	SS	477016	477098		477099		471018	470040
B800	CS	471025				471026	471027	470039
	SS	477025				477026	471027	470039
B1000	CS	471029				471030	471032	470038
	SS	477029				477030	471032	470038
B2000	CS	471034				471035	471036	470021
	SS	477034				477035	471036	470021
WC125	TC	474073 for the whole set						

Table 19 Bowl Parts Re-order Item Numbers

Note: Steel Types are – CS = Chrome Steel, SS = Standard Steel, TC = Tungsten Carbide

For further details about Bowl and Disc types, such as Typical Element Analysis, please contact Essa.

Contact details for Essa can be found in Section 1 of this document.

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9.3.8 Spacer Rings for use with Bowls

Due to the limited range of the air bag clamp and the variation in the size of the bowls, spacer rings are used with the smaller bowls to achieve the necessary height for effective clamping of the bowls and lids by the air bag clamp.

The Parts List below illustrates the Item Numbers of the spacer rings applicable to specific bowl sizes which may be re-ordered for use on the LM2 Mill.

Bowl Model	Spacer Rings Item No.
B50	470001
B100	470003
B125	470005
B300	
B400	
B800	470007
B1000	
B2000	Item No. not required
WC125	470066

Table 20 Bowl Spacer Ring Item Numbers

9.3.9 Additional Parts not illustrated

For any additional parts required that are not illustrated in this Manual Parts List, please contact Essa.

Contact details for Essa can be found in Section 1 of this document.

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10 MATERIAL SAFETY DATA SHEETS

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10.1 Material Safety Data Sheets Overview

The following pages contain the Material Safety Data Sheets for the lubricants used on the LM2 Mill.

It is advised that you read and understand the properties of the lubricants used and the hazards involved in the use of these lubricants prior to using the machine.

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10.1.1 **MSDS – Castrol EPL 2 Grease (4 Pages)**

The following document contains important information relating to the properties of the Castrol EPL 2 Grease to lubricate the bearings used on the machine.

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1. Identification of the material and supplier

Product name	EPL 2
SDS #	462339
Product use	Multi-purpose product. Grease For specific application advice see appropriate Technical Data Sheet or consult our company representative.
Supplier	BP Australia Pty Ltd (ABN 53 004 085 616) Melbourne Central, 360 Elizabeth Street, Melbourne, Victoria 3000, Australia Tel: +61 (03) 9268 4111 Fax: +61 (03) 9268 3321
EMERGENCY TELEPHONE NUMBER	1800 638 556
Product code	462339-AU10

2. Hazards identification

Statement of hazardous/dangerous nature	NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.
---	---

3. Composition/information on ingredients

Highly refined base oil and additives

This product does not contain any hazardous ingredients at or above regulated thresholds.

4. First-aid measures

Eye contact	In case of contact, immediately flush eyes with a copious amount of water for at least 15 minutes. Get medical attention if irritation occurs.
Skin contact	Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if irritation develops.
Inhalation	If inhaled, remove to fresh air. Get medical attention if symptoms appear.
Ingestion	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately.

5. Fire-fighting measures

Extinguishing Media	
Suitable	In case of fire, use water fog, foam, dry chemical or carbon dioxide extinguisher or spray.
Not Suitable	Do not use water jet.
Hazards from combustion products	These products are carbon oxides phosphorus oxides metal oxide/oxides
Unusual fire/explosion Hazards	This material is not explosive as defined by established regulatory criteria.
Special fire-fighting procedures	None identified.
Protection of fire-fighters	Fire-fighters should wear self-contained positive pressure breathing apparatus (SCBA) and full turnout gear.

6 . Accidental release measures

Emergency Procedures

Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (See Section: "Exposure controls/personal protection"). Follow all fire fighting procedures (See Section: "Fire-fighting measures").

Methods and materials for containment and clean-up

If emergency personnel are unavailable, contain spilled material. For small spills add absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container for disposal. For large spills dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal. Avoid contact of spilt material with soil and prevent runoff entering surface waterways. See Section 13 for Waste Disposal Information.

7 . Handling and storage

Handling

Avoid prolonged or repeated contact with skin. Wash thoroughly after handling.

Storage

Keep container tightly closed. Keep container in a cool, well-ventilated area.

Combustibility Classification

Combustible liquid Class C2 (AS 1940).

8 . Exposure controls/personal protection

Ingredient name

Base oil - unspecified

Occupational exposure limits

NOHSC (Australia).

TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral

Residual oils (petroleum), solvent-dewaxed (Highly refined mineral oil)

NOHSC (Australia).

TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral

Whilst specific OELs for certain components are included in this SDS, it should be noted that other components of the preparation will be present in any mist, vapour or dust produced. For this reason, the specific OELs may not be applicable to the product and are provided for guidance purposes.

Biological Limit Values

No biological limit allocated.

Control Measures

Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.

Personal protective equipment

Respiratory system

Avoid breathing of vapours, mists or spray. Select and use respirators in accordance with AS/NZS 1715/1716. When mists or vapours exceed the exposure standards then the use of the following is recommended: Approved respirator with organic vapour and dust/mist (Type P1) filters. Filter capacity and respirator type depends on exposure level.

Skin and body

Avoid prolonged or repeated contact with skin. Wear protective clothing if prolonged or repeated contact is likely.

Hands

Wear protective gloves if prolonged or repeated contact is likely. Chemical resistant gloves. Recommended: Nitrile gloves.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Eyes

Safety glasses with side shields.

9 . Physical and chemical properties

Physical state

Grease

Colour

Brown.

Odour

Not available.

Flash point

>200 °C (Closed cup)

Boiling point / range

Not available.

Melting point / range

Not available.

Vapour density

Not available.

Vapour pressure

Not available.

Solubility

Insoluble in water.

pH

Not available.

10 . Stability and reactivity

Stability	The product is stable.
Conditions to Avoid	Avoid extreme temperatures, strong oxidizers, fire.
Incompatibility with various substances/Hazardous Reactions	No hazardous reactions identified.
Hazardous polymerization	Will not occur.
Hazardous Decomposition Products	These products are carbon oxides phosphorus oxides metal oxide/oxides

11 . Toxicological information

Effects and symptoms

Eyes	Unlikely to cause more than transient stinging or redness if accidental eye contact occurs.
Skin	Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.
Inhalation	Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.
Ingestion	Unlikely to cause harm if accidentally swallowed in small doses, though larger quantities may cause nausea and diarrhoea.

Chronic toxicity

Carcinogenic effects	No component of this product at levels greater than or equal to 0.1% is identified as a carcinogen by ACGIH, the International Agency for Research on Cancer (IARC), the European Commission (EC), or the National Occupational Health and Safety Commission (Australia).
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12 . Ecological information

Ecotoxicity	Not classified as environmentally hazardous in accordance with the 'Approved Criteria for Classifying Hazardous Substances' [NOHSC (1008)/2004 as amended and adapted].
Biodegradability	
Persistence/degradability	The biodegradability of this material has not been determined.

13 . Disposal considerations

Disposal Consideration / Waste information	Avoid contact of spilled material and runoff with soil and surface waterways. Consult an environmental professional to determine if local, regional or national regulations would classify spilled or contaminated materials as hazardous waste. Use only approved transporters, recyclers, treatment, storage or disposal facilities. Dispose of in accordance with all applicable local and national regulations.
Special Precautions for Landfill or Incineration	No additional special precautions identified.

14 . Transport information

Not classified as dangerous for transport (ADG, IMDG, ICAO/IATA).

Special precautions for user	No known special precautions required. See Section: "Handling and storage" for additional information.
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15 . Regulatory information

Standard for the Uniform Scheduling of Drugs and Poisons

Not regulated.

Control of Scheduled Carcinogenic Substances

Ingredient name

Schedule

No Listed Substance

Other Classification Information

Other regulations

Inventories

Europe inventory: Not determined.
United States inventory (TSCA 8b): Not determined.
Australian Inventory Status: All components are listed or exempted.

Canada inventory: Not determined.

China inventory (IECSC): Not determined.

Japan inventory (ENCS): Not determined.

Korea inventory (KECI): Not determined.

Philippines inventory (PICCS): Not determined.

16 . Other information

Key to abbreviations

AMP = Acceptable Maximum Peak

ACGIH = American Conference of Governmental Industrial Hygienists, an agency that promulgates exposure standards.

ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail

ADG Code = Australian Code for the Transport of Dangerous Goods by Road and Rail

CAS Number = Chemical Abstracts Service Registry Number

HAZCHEM Code = Emergency action code of numbers and letters which gives information to emergency services. Its use is required by the ADG Code for Dangerous Goods in bulk.

ICAO = International Civil Aviation Organization.

IATA = International Air Transport Association, the organization promulgating rules governing shipment of goods by air.

IMDG = International Maritime Organization Rules, rules governing shipment of goods by water.

IP 346 = A chemical screening assay for dermal toxicity. The European Commission has recommended that Method IP 346 be used as the basis for labelling certain lubricant oil base stocks for carcinogenicity. The EU Commission has stipulated that the classification as a carcinogen need not apply if it can be shown that the substance contains less than 3% DMSO extract as measured by IP 346. (See Note L, European Commission Directive 67/548/EEC as amended and adapted.) DMSO is a solvent.

NOHSC = National Occupational Health & Safety Commission, Australia

TWA = Time weighted average

STEL = Short term exposure limit

UN Number = United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.

History

Date of issue 05/03/2007.

Date of previous issue 05/03/2007.

Prepared by Product Stewardship

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from us.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.

10.1.2 **MSDS – Castrol LMX Grease (4 Pages)**

The following document contains important information relating to the properties of the Castrol LMX Grease to lubricate the bearings used on the machine.

Section:	Material Safety Data	Equipment Type:	Pulverising Mill
Document No.:	882118	Model Number:	LM2
Revision No.:	A	Date:	November 2010
Page No.:	10-4		

1. Identification of the material and supplier

Product name	LMX Grease
SDS no.	450414
Product use	Multi-purpose product. Grease. For specific application advice see appropriate Technical Data Sheet or consult our company representative.
Supplier	BP Oil New Zealand Limited 20 Customs House Quay Wellington 1 New Zealand Phone 04 495 5000
EMERGENCY TELEPHONE NUMBER	0800 243643 (0800 CHEMHELP) (NZ use only) 0800 764 766 National Poison Centre
New Zealand National Poisons Centre	0800 764 766 National Poison Centre
OTHER PRODUCT INFORMATION	Technical Helpline 0800 10 40 60
Product code	450414-AU13

2. Hazards identification

Physical/chemical hazards	Not classified as hazardous.
Health hazards	Not classified as hazardous.
Environmental hazards	Not classified as hazardous.
Effects and symptoms	
Eyes	No significant health hazards identified.
Skin	Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.
Inhalation	No significant health hazards identified.
Ingestion	No significant health hazards identified.

3. Composition/information on ingredients

Highly refined base oil (IP 346 DMSO extract < 3%). Proprietary performance additives.

Ingredient name	CAS no.	Concentration
Base oil - unspecified	Varies	79.145 - 109.67
Zinc dialkyl dithiophosphate	Proprietary	1 - 5

No component is present in sufficient concentrations to require a hazardous classification according to the applicable New Zealand regulations.

4. First-aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
Skin contact	Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if irritation develops.
Inhalation	If inhaled, remove to fresh air. Get medical attention if symptoms appear.
Ingestion	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If potentially dangerous quantities of this material have been swallowed, call a physician immediately.

Note: High Pressure Applications

Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency. Injuries may not appear serious at first but within a few hours tissue becomes swollen, discoloured and extremely painful with extensive subcutaneous necrosis. Surgical exploration should be undertaken without delay. Thorough and extensive debridement of the wound and underlying tissue is necessary to minimise tissue loss and prevent or limit permanent damage. Note that high pressure may force the product considerable distances along tissue planes.

5 . Fire-fighting measures

Extinguishing media

Suitable

In case of fire, use water spray (fog), foam, dry chemical or CO₂.

Not suitable

Do not use water jet.

Hazardous decomposition products

Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
phosphorus oxides
metal oxide/oxides

Unusual fire/explosion hazards

This material is not explosive as defined by established regulatory criteria.

Special fire-fighting procedures

None identified.

Protection of fire-fighters

Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

6 . Accidental release measures

Personal precautions

No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Put on appropriate personal protective equipment (see section 8).

Environmental precautions

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Large spill

Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill

Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling

Avoid prolonged or repeated contact with skin. Wash thoroughly after handling.

Storage

Keep container tightly closed. Keep container in a cool, well-ventilated area.

8 . Exposure controls/personal protection

Ingredient name

Base oil - unspecified

Occupational exposure limits

NZ OSH (NZ, 1/2002).

WES-STEL: 10 mg/m³ 15 minute(s).

WES-TWA: 5 mg/m³ 8 hour(s).

Whilst specific OELs for certain components may be shown in this section, other components may be present in any mist, vapour or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Exposure controls

Occupational exposure controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapours below their respective occupational exposure limits.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.

Personal protective equipment

Respiratory protection

None required. However, use of adequate ventilation is good industrial practice.

Skin and body

Avoid prolonged or repeated contact with skin. Wear protective clothing if prolonged or repeated contact is likely.

Hand protection

Wear protective gloves if prolonged or repeated contact is likely. Chemical-resistant gloves.
Recommended: Nitrile gloves.
The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Eye protection

Safety glasses with side shields.

9 . Physical and chemical properties

Physical state	Grease
Colour	Blue.
Odour	Mild
Flash point	244 °C (Closed cup) Pensky-Martens.
Viscosity	Kinematic: 200 mm ² /s (200 cSt) at 40°C
Relative density/Specific gravity	0.9
Solubility	insoluble in water.

10 . Stability and reactivity

Stability	The product is stable.
Conditions to avoid	Avoid extreme temperatures, strong oxidizers, fire.
Incompatibility with various substances/Hazardous Reactions	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	Decomposition products may include the following materials: carbon dioxide carbon monoxide phosphorus oxides metal oxide/oxides

11 . Toxicological information

Chronic toxicity	
Carcinogenic effects	No component of this product at levels greater than or equal to 0.1% is identified as a carcinogen by ACGIH, the International Agency for Research on Cancer (IARC), the European Commission (EC), or the National Occupational Health and Safety Commission (Australia).
Mutagenic effects	No known significant effects or critical hazards.

12 . Ecological information

Biodegradability	
Persistence/degradability	The biodegradability of this material has not been determined.
Environmental hazards	No ecotoxicity or ecological information to report.

13 . Disposal considerations

Disposal considerations / Waste information	The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. If disposal is to be via incineration, this must use an approved process, e.g., combustion in a cement kiln.
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14 . Transport information

International transport regulations

Not classified as hazardous for transport (NZ Standard 5433, UN, IATA/ICAO, IMO).

15 . Regulatory information

New Zealand Hazard Classification

Not classified as hazardous according to the New Zealand HSNO Regulation, as amended and adapted.

Risk and Safety Phrases

Risk phrases	Not applicable.
Other regulations	
Europe inventory	All components are listed or exempted.
United States inventory (TSCA 8b)	All components are listed or exempted.
Australia inventory (AICS)	All components are listed or exempted.
Canada inventory	All components are listed or exempted.
China inventory (IECSC)	All components are listed or exempted.
Japan inventory (ENCS)	At least one component is not listed.
Korea inventory (KECI)	Not determined.
Philippines inventory (PICCS)	All components are listed or exempted.

16 . Other information

Key to abbreviations

AMP = Acceptable Maximum Peak
ACGIH = American Conference of Governmental Industrial Hygienists, an agency that promulgates exposure standards.
ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail
ADG Code = Australian Code for the Transport of Dangerous Goods by Road and Rail
CAS Number = Chemical Abstracts Service Registry Number
HAZCHEM Code = Emergency action code of numbers and letters which gives information to emergency services. Its use is required by the ADG Code for Dangerous Goods in bulk.
ICAO = International Civil Aviation Organization.
IATA = International Air Transport Association, the organization promulgating rules governing shipment of goods by air.
IMDG = International Maritime Organization Rules, rules governing shipment of goods by water.
IP 346 = A chemical screening assay for dermal toxicity. The European Commission has recommended that Method IP 346 be used as the basis for labelling certain lubricant oil base stocks for carcinogenicity. The EU Commission has stipulated that the classification as a carcinogen need not apply if it can be shown that the substance contains less than 3% DMSO extract as measured by IP 346. (See Note L, European Commission Directive 67/548/EEC as amended and adapted.) DMSO is a solvent.
NOHSC = National Occupational Health & Safety Commission, Australia
TWA = Time weighted average
STEL = Short term exposure limit
UN Number = United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.

History

Date of issue	03/03/2009.
Date of previous issue	27/09/2007.
Prepared by	Product Stewardship

Notice to reader

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It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.

10.1.3 MSDS – Mainlube 340 Grease (3 Pages)

The following document contains important information relating to the properties of the Mainlube 340 Grease to lubricate the bearings used on the machine.

Section:	Material Safety Data	Equipment Type:	Pulverising Mill
Document No.:	882118	Model Number:	LM2
Revision No.:	A	Date:	November 2010
Page No.:	10-5		



Mainlube Superior Maintenance Lubricants Pty Ltd

14 Underwood Ave, Botany NSW, 2017

Ph 02-9700-0880. ACN No. 001 748 876 Fax 02-9700-0881.

STATEMENT OF HAZARDOUS NATURE

Non Hazardous According to Criteria of Worksafe Australia

MATERIAL SAFETY DATA SHEET MAINLUBE 340

IDENTIFICATION

Page 1 of 3
Aug-06

Product Name:	Mainlube 340 Heavy Duty Multi Application Grease
Chemical Name:	Petroleum Hydrocarbon plus Additives
Other Names:	Not Applicable
Manufacturer's Product Code:	340
UN Number:	None Assigned
Dangerous Goods Class	None Assigned
Subsidiary Risk[s]:	None Assigned
Hazchem Code:	None Assigned
EPG NO:	None Assigned
Poisons Schedule Number:	None Assigned
Toxic and Hazardous	
Ingredients:	None
Uses:	Petroleum Lubricating Grease

PHYSICAL DESCRIPTION AND PROPERTIES

Colour:	Brown
Appearance	Grease
Form:	Semi-Solid
Boiling Point:	Not Applicable.
Melting Point:	>300°C
Vapour Pressure:	Not Applicable
Specific Gravity:	(Water=1) @ room temperature Approx 0.9
Volatiles:	Not Applicable
Evaporation Rate:	Not Applicable
Vapour Density:	Not Applicable
Odour:	Mineral oil
Solubility in Water:	(by weight %) negligible at 25°C

FLASH POINT

Solvent:	Not Applicable
Lubricant residue:	>235°C
Flammability Limits:	Not Applicable
Auto ignition	
Temperature:	No Data

MATERIAL SAFETY DATA SHEET MAINLUBE 340

INGREDIENTS

Page 2 of 3
Aug-06

Chemical Name

CAS Number

Proportion

Proprietary Non Harzardous Formulation

HEALTH HAZARD INFORMATION

HEALTH EFFECTS:

Acute:

Swallowed: Mild toxicity expected if small amount swallowed, if swallowed and person is still conscious give, water or milk to drink.

Skin: Expected to cause minor irritation.

Eyes: Expected to cause minor irritation.

Inhaled: None expected

Chronic: None when used with good personal hygiene practices. May otherwise cause skin and eye irritation upon prolonged or repeated contact.

LC 50: No Data

LD 50: No Data

FIRST AID:

Swallowed: Contact a physician.

Skin: Remove excess with cloth or paper and area thoroughly with soap and water. For high pressure injection under the skin see a physician immediately.

Eyes: Immediately flush with large quantities of water for at least 15 minutes. call a physician.

Inhaled: Removed exposed person to fresh air if discomfort is experienced while handling hot product.

FIRST AID FACILITIES:

ADVICE TO PHYSICIANS:

High velocity injection under the skin may result in serious injury. If left untreated the effected area is subjected to infection, disfigurement, lack of blood circulation and may require amputation. When dispensed by high-pressure equipment this material can easily penetrate the skin and leave a bloodless puncture wound. Material injected into a finger can be deposited into the palm of the hand. Within 24-48 hours the patient may experience swelling, discolouration, and throbbing pain in the affected area. Immediate treatment by a surgical specialist is recommended.

PRECAUTIONS FOR USE

Exposure Standards: None Established

Personal Protection: Avoid prolonged or frequently repeated contact. Wash skin thoroughly with soap and water after contact. Use safety glasses and neoprene or nitrile rubber gloves for frequent contact.

Flammability: Product is not classed flammable. Flash Point greater than 190°C

Product may support combustion. Do not store with strong oxidants.

MATERIAL SAFETY DATA SHEET MAINLUBE 340

SAFE HANDLING INFORMATION

Page 3 of 3
Aug-06

Storage and Transport:	Keep container closed until ready for use.
Storage Temperature:	Store in a cool dry place.
UN Class:	None Assigned
Packaging Group:	None Assigned
UN Number:	None Assigned
EPG Number:	None Assigned
Correct Shipping Name:	Petroleum Lubricating Grease.
Spills and Disposals:	Dispose of in accordance with all applicable federal, state and local regulations.
Fire/Explosion Hazard:	Dense smoke
Decomposition Products:	Carbon Monoxide and carbon dioxide from burning. Oxides of phosphorous from burning. Oxides of nitrogen. Oxides of sulfur. Sulfur dioxide or hydrogen sulfide, depending upon decomposition conditions oxides of calcium.
Hazchem Code:	Not Applicable
Extinguishant:	Dry chemical or waterfog or CO ₂ or Foam or sand/earth. Water may cause frothing. Closed containers exposed to fire may be cooled with water.

DANGER OF VIOLENT REACTION OR EXPLOSION: No

Protective Clothing;	Apron, face shield, gloves if product handled hot.
Appropriate Measures;	No Data
Evacuate;	Not Normally

OTHER INFORMATION:

ENVIRONMENTAL/SAFETY REGULATIONS ---SECTION 1X

Section 313 (Title III Superfund Amendment and Reauthorisation Act):

This product does not contain any chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorisation Act of 1986 and 40 CFR Part 372.

CONTACT POINT:

Mr Steve Simmonds
Mainlube Superior Maintenance Lubricants Pty Ltd.
14 Underwood Ave, Botany. NSW, 2019, Australia
Ph 02-9700-0880. Fax 02-9700-0881.
Mob 0412-644-244.

24 Hour Emergency Tel No. Above Mobile Phones

Emergency Services

Dial 000

We believe the statement, technical information and recommendation contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assure no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

11 THIRD PARTY MANUALS

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Section:	Third Party Manuals	Equipment Type:	Pulverising Mill
Document No.:	882118	Model Number:	LM2
Revision No.:	A	Date:	November 2010
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11.1 Third Party Equipment Manuals Overview

For information relating to items fitted, it is advised that you contact Essa and obtain a copy of the relevant Third Party Manuals.

Once acquired, the Third Party Equipment Manual can be inserted into this document behind the relevant heading page for future reference.

Contact details for Essa can be found in Section 1 of this document.

Section:	Third Party Manuals	Equipment Type:	Pulverising Mill
Document No.:	882118	Model Number:	LM2
Revision No.:	A	Date:	November 2010
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