

**INSTALLATION, OPERATION, SPARE
PARTS, AND MAINTENANCE MANUAL**

**MMD 150 SERIES
TWIN SHAFT SIZER
1500MM CENTRES**

S150-0019*

3 TOOTH x 6 RING

CUSTOMER:

**DE BEERS FINCH
SOUTH AFRICA**

*** Please quote in all correspondence.
This number can be found on the identification plate, and
welded onto the machine side plate**



MMD GROUP OF COMPANIES

MMD Mining Machinery Developments Limited

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**MMD 150 SERIES
TWIN-SHAFT MINERAL SIZER
1500MM SHAFT CENTRES**

**CUSTOMER:
DE BEERS FINCH**

MMD JOB NUMBER	19500
MACHINE SERIAL NUMBER	S150-0019
VOITH COUPLING 650TVSC SERIAL NUMBER	MMD S.A. SUPPLIED
GEARBOX SERIAL NUMBER	S1791000-001 S1791000-002
SPARE GEARBOX SERIAL NUMBER	S1791000-003
G.A. DRAWING NUMBER	S150-0019

PREPARED BY :- ALAN YATES
POSITION :- MANUAL DEP'T
DATE COMPLETED :- 31 - 01 - 06

REVISED BY :- N. KELLEY
POSITION :- MANUAL DEP'T
DATE CHECKED :- 27 - 06 - 07

MMD 150 SERIES TWIN-SHAFT MINERAL SIZER

MACHINE CASE ASSEMBLY

TYPE	3 TOOTH x 9 RING CASE
PART NUMBER	141501511

BREAKER SHAFT ASSEMBLIES

TYPE	3 TOOTH x 9 RING
PART NUMBER (RIGHT)	241501509
PART NUMBER (LEFT)	241501510
SHAFT ROTATION	INWARDS
SCROLL DESIGNATION	TOWARDS GEARBOX END

GEARBOX ASSEMBLIES

TYPE	MMD PLANETARY 80:1 RATIO
PART NUMBER	241791000-001 241791000-002

INTERMEDIATE GEARBOX ASSEMBLIES

TYPE	275KW 2:1 RATIO
PART NUMBER	S1799020-001 - LEFT HAND S1799020-002 - RIGHT HAND

GEARBOX COOLER/FILTER/LUBRICATION MODULE

PART NUMBER	241791085 - LEFT HAND 241791086 - RIGHT HAND
-------------	---

FLUID COUPLING ASSEMBLIES

TYPE	VOITH 650 TVSC EPK
PART NUMBER	MMD S.A. SUPPLIED

**PLEASE NOTE:- ALL FIXINGS LISTED IN
THIS MANUAL ARE TO BS EN24014 GRADE 8.8
(UNLESS OTHERWISE STATED)**

MMD 130 SERIES TWIN-SHAFT MINERAL SIZER

VOITH DRIVE ASSEMBLIES

TYPE	VOITH CARDEN SHAFT MT 225.8
PART NUMBER	241791103

WHEEL CARRIAGE ASSEMBLIES

TYPE	CORNER
PART NUMBER	145040591 - FRONT
PART NUMBER	145040592 - FRONT
PART NUMBER	145040589 - REAR
PART NUMBER	145040590 - REAR

**PLEASE NOTE:- ALL FIXINGS LISTED IN
THIS MANUAL ARE TO BS EN24014 GRADE 8.8
(UNLESS OTHERWISE STATED)**



PREFACE

This instruction/spare parts manual forms part of the equipment supplied on this contract, and should be maintained for the life of the equipment, ensuring that any amendments are incorporated. It is vital that any new user/holder of this equipment receives this manual.

The purpose of this manual is to give information and advise on the equipment supplied.

The design and manufacture of MMD products is subject to constant review, and the information given may vary from that manufactured, due to improvements in design techniques.

Before any commissioning or checking of the equipment is carried out, the manual should be studied in its entirety, so that a better understanding of the operations of the equipment is obtained.

PLEASE NOTE: THE INSTRUCTIONS IN THIS MANUAL ARE GIVEN FOR INFORMATION AND GUIDANCE ONLY, AND MMD CANNOT ACCEPT RESPONSIBILITY EITHER FOR THE MANNER IN WHICH THEY ARE OBSERVED OR FOR ANY CONSEQUENCE THEREOF.

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E-Mail: nathan.kelley@mmdsizers.com or jim.techadech@mmdsizers.com

All enquiries for spare parts should be directed to our purchasing department at the above address. Technical queries or requests for further information should be directed to our technical department.

In any correspondence or enquiry, please quote the serial number of the machine, which can be found in two locations on Sizers: on the identification plate, and welded onto the side plate, or on Plate Feeders, the serial number is stamped onto the identification plate.



SPARE PARTS ORDERING GUIDE

THE FOLLOWING INFORMATION IS PROVIDED TO ASSIST IN THE PURCHASE OF SPARE PARTS, E.G. COMPONENT PARTS OR ASSEMBLIES OF COMPONENT PARTS. WHEN ORDERING SPARE PARTS USING THIS MANUAL, THE FOLLOWING INFORMATION IS REQUIRED BY OUR SALES DEPARTMENT.

MACHINE SERIAL NUMBER:

The serial number can be found in two locations on an MMD SIZER™, on the identification plate, and welded onto the side plate. On Plate Feeders, the number can be found on the identification plate only.

PART NUMBER:

ITEM	PART NUMBER	DESCRIPTION	UNIT MASS	QTY
1	0063817-01	Shaft End Cap	13.0	2

This nine figure part number is unique to every part sold by MMD, and is vital when ordering spare parts.

COMPONENT DESCRIPTION:

ITEM	PART NUMBER	DESCRIPTION	UNIT MASS	QTY
1	0063817-01	Shaft End Cap	13.0	2

The component description is required by MMD to act as a cross reference to the part number when ordering spare parts. The description column can also contain other information, such as supplier's part numbers, bolt grades, etc.

UNIT MASS:

ITEM	PART NUMBER	DESCRIPTION	UNIT MASS	QTY
1	0063817-01	Shaft End Cap	13.0	2

The unit mass is not required when ordering spare parts, but is provided for the purpose of on site lifting, packaging, transportation etc. All masses are given in kilograms (kg).

QUANTITY:

ITEM	PART NUMBER	DESCRIPTION	UNIT MASS	QTY
1	0063817-01	Shaft End Cap	13.0	2

Finally, the quantity of spare parts required must be included in the spare parts order.



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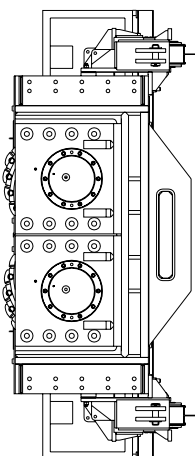
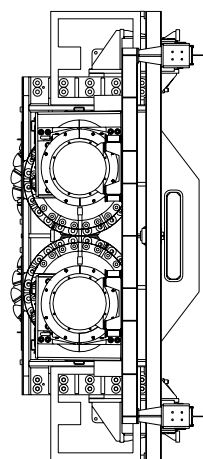
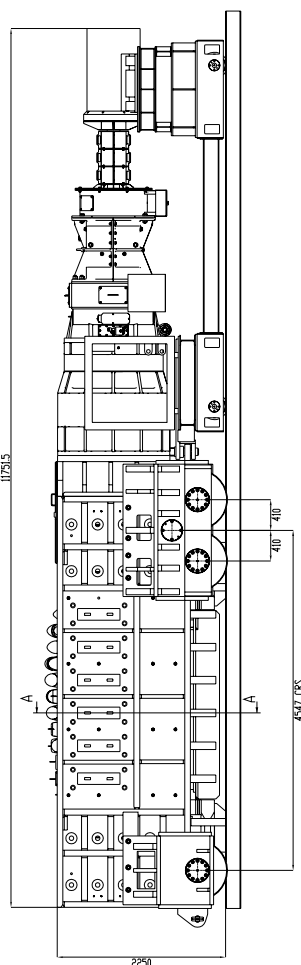
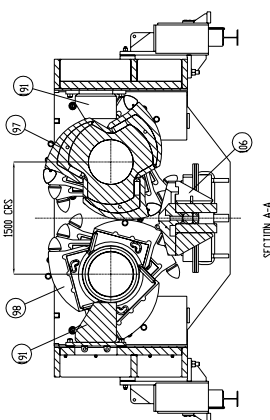
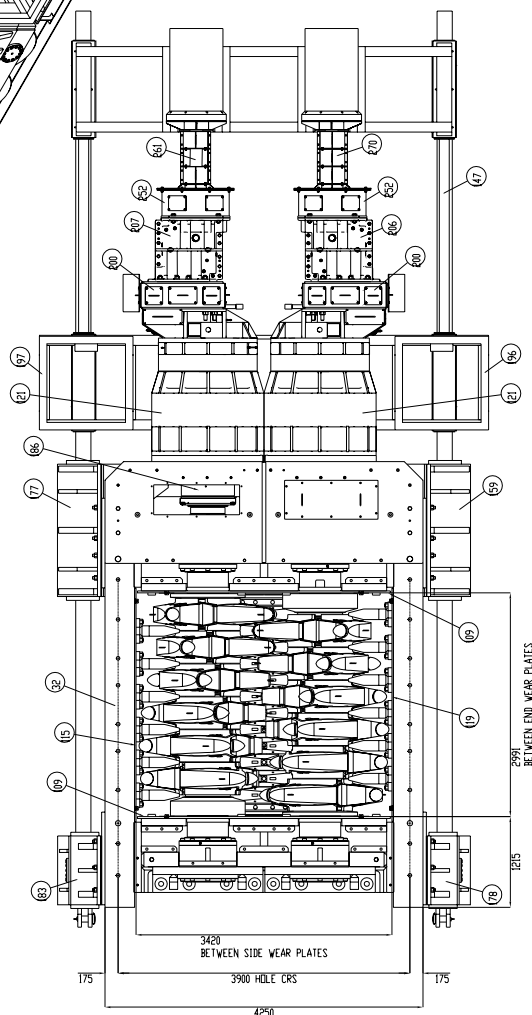
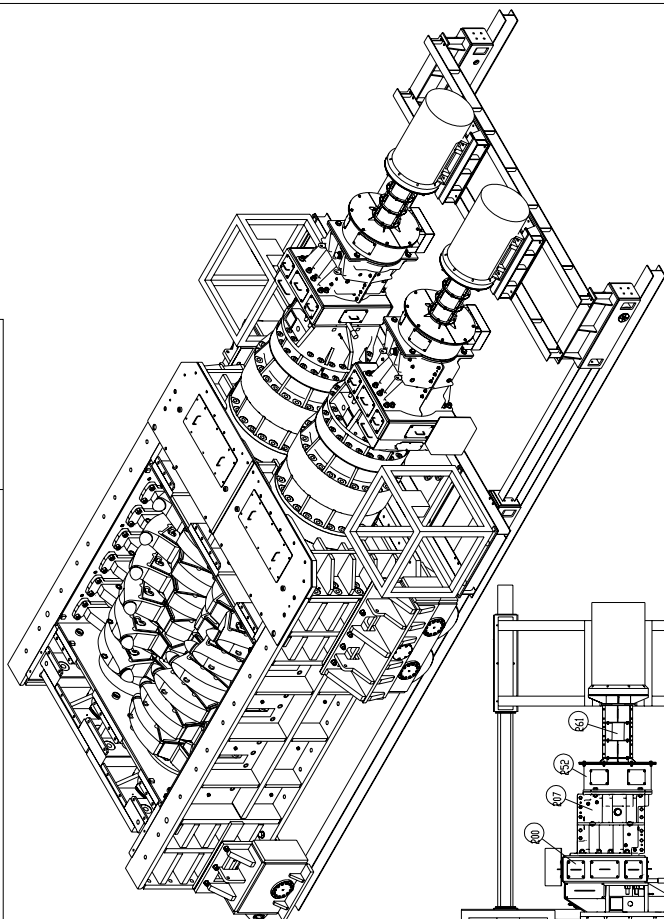


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**MMD 150 SERIES
TWIN SHAFT MINERAL SIZER
GENERAL ARRANGEMENT
DRAWING NUMBER - S150-0019**

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	CORRECT G.A. SHOWN	27 - 06 - 06

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	44501501	CASE ASSEMBLY 1500 DRS 3 10TH/16 RINGS D/O	1
2	44501509	BREAKER SWMT ASSEMBLY 1500 DRS 3 10TH/16 RINGS	1
3	44501510	BREAKER SWMT ASSEMBLY 1500 DRS 3 10TH/16 RINGS	1
4	44507024	BREAKER BAR ASSEMBLY 1500 DRS 3 10TH/16 RINGS	1
5	44501433	END WEAR PLATE ASSEMBLY 1500 WC-33 X 96	2
6	44501433	END WEAR PLATE ASSEMBLY 1500 WC-33 X 96	2
7	44501533	SUB WEAR PLATE ASSEMBLY 1500 DRS 3 10TH/16 RINGS	1
8	44501533	SUB WEAR PLATE ASSEMBLY 1500 DRS 3 10TH/16 RINGS	1
9	51799001-001	L.H. PLANE LARY GEARBOX ASSEMBLY C24791000	1
10	51799001-002	R.H. PLANE LARY GEARBOX ASSEMBLY C24791000	1
11	44504667	ELECTRIC MOTOR AND PUMP SHIP DRIVE WHEEL CARTRIDGE	1
12	44504689	RAW CORNER WHEEL CARTRIDGE ASSEMBLY 1500 DRS SIZER	1
13	44504691	RAW CORNER WHEEL CARTRIDGE ASSEMBLY 1500 DRS SIZER	1
14	44504692	FRONT CORNER WHEEL CARTRIDGE ASSEMBLY 1500 DRS SIZER	1
15	44504692	FRONT CORNER WHEEL CARTRIDGE ASSEMBLY 1500 DRS SIZER	1
16	44506112	GEAR COUPLING ASSEMBLY TOP PLANE LARY GEARBOX 1791000	2
17	44506112	GEAR COUPLING ASSEMBLY 1500 DRS 3 10TH/16 RINGS	10
18	44506130	L.H. ILL. COUPLER FETTER/LUBRICATION MOUNT C24791005	1
19	44506130	R.H. ILL. COUPLER FETTER/LUBRICATION MOUNT C24791005	1
20	44506131	CORNER MISSING ASSEMBLY 1799020 TO 1791000	1
21	44506132	CORNER MISSING ASSEMBLY 1799020 TO 1791000	1
22	51799001-002	R.H. INTERMEDIATE GEARBOX ASSEMBLY RATIO 2:1	1
23	51799001-001	L.H. INTERMEDIATE GEARBOX ASSEMBLY RATIO 2:1	1
24	44506223	CORNER MISSING ASSEMBLY 650 TYPE	2
25	44506223	CORNER MISSING ASSEMBLY 650 TYPE	2
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SIZER ASSEMBLY

SERIAL NUMBER - S150-0019

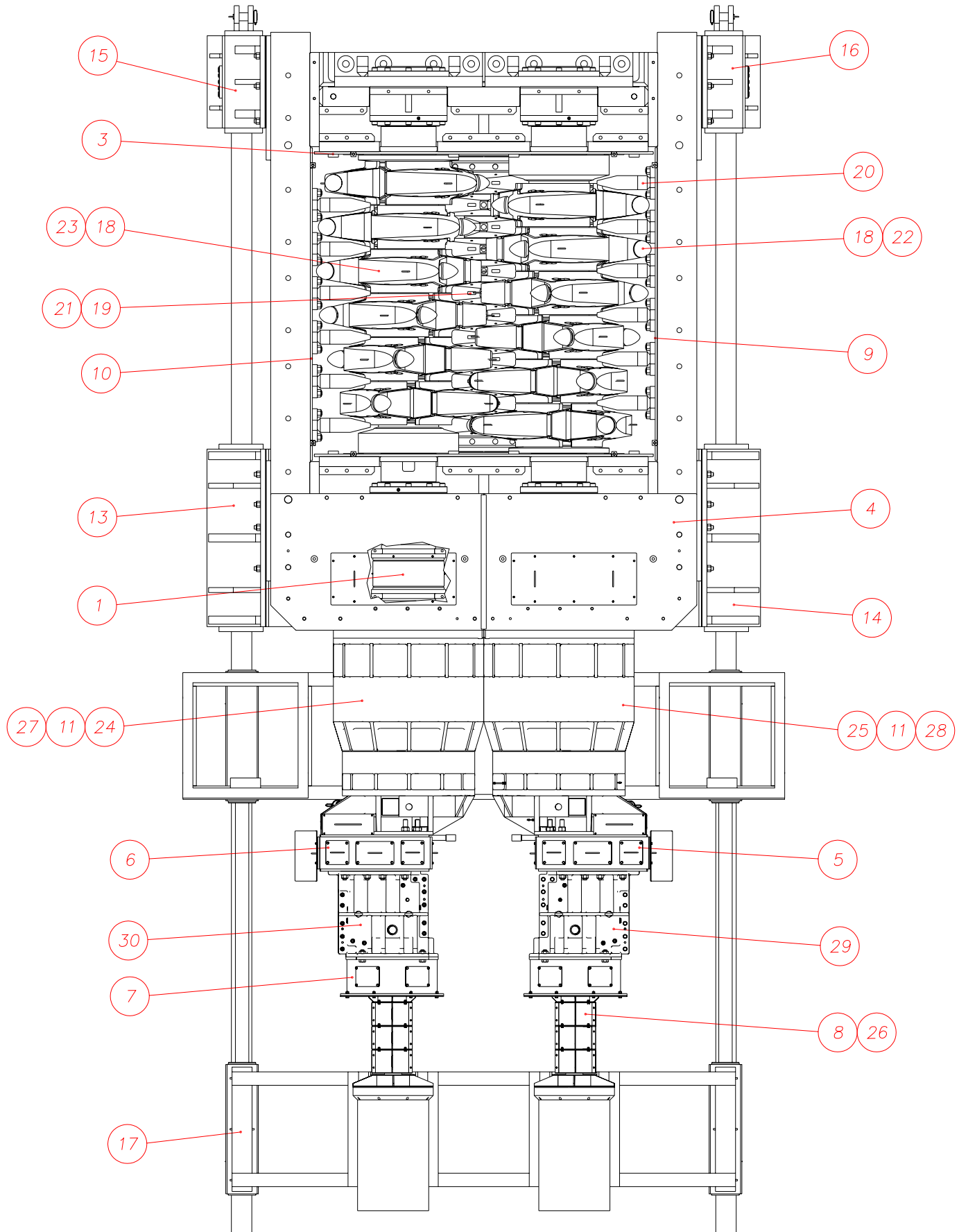
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2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED

1500CRS TWIN SHAFT MINERAL SIZER

Part Number : S150-0019



MMD MINING MACHINERY DEVELOPMENTS LIMITED
1500CRS TWIN SHAFT MINERAL SIZER
Part Number : S150-0019

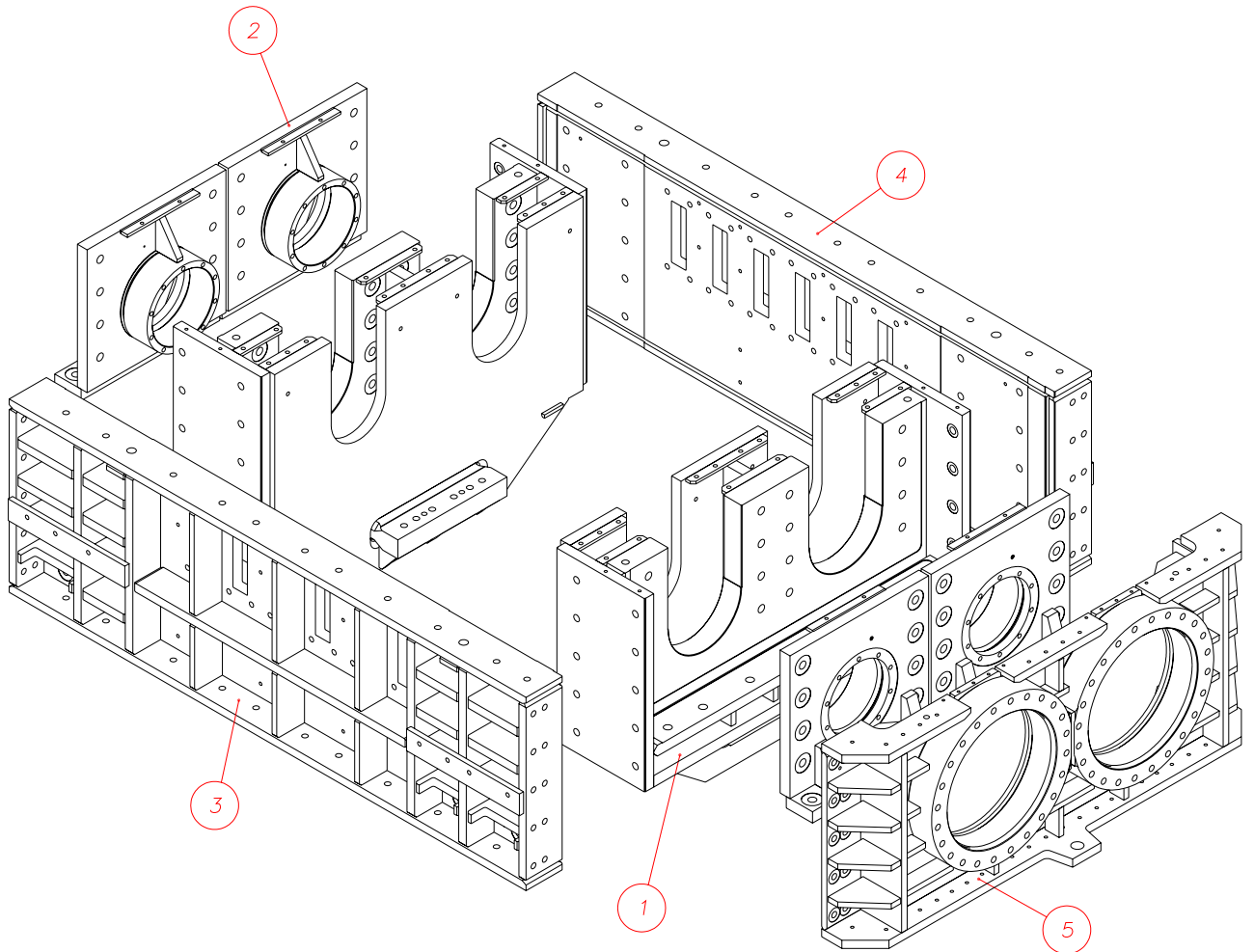
MMD MINING MACHINERY DEVELOPMENTS LIMITED
1500CRS TWIN SHAFT MINERAL SIZER
Part Number : S150-0019

MMD MINING MACHINERY DEVELOPMENTS LIMITED
1500CRS TWIN SHAFT MINERAL SIZER
Part Number : S150-0019

Item	Part Number	Description	Unit Mass	Qty
1	111701186	GEAR COUPLING ASSEMBLY	801.84	2
2	14150-0019	BOLT LIST	608.97	1
3	141501433	END WEARPLATE ASSEMBLY	1,086.16	2
4	141501511	CASE ASSEMBLY	83,116.90	1
5	141501520	COUPLING HOUSING ASSEMBLY	700.26	1
6	141501521	COUPLING HOUSING ASSEMBLY	700.26	1
7	141501523	COUPLING HOUSING ASSEMBLY	311.20	2
8	141501526	PROP SHAFT COVER ASSEMBLY	31.04	1
9	141501532	SIDE WEARPLATE ASSEMBLY	761.05	1
10	141501533	SIDE WEARPLATE ASSEMBLY	761.05	1
11	141791104	TEMPERATURE MOUNITORING ASSEMBLY	0.00	2
12	142991500	BOLT TENSIONING EQUIPMENT	0.00	1
13	145040589	CORNER WHEEL CARRIAGE ASSEMBLY	4,889.86	1
14	145040590	CORNER WHEEL CARRIAGE ASSEMBLY	4,889.86	1
15	145040591	CORNER WHEEL CARRIAGE ASSEMBLY	2,072.64	1
16	145040592	CORNER WHEEL CARRIAGE ASSEMBLY	2,072.64	1
17	145040607	ELECTRIC MOTOR & PROP SHAFT WHEEL CARRIAGE ASSEMBLY	3,704.18	1
18	145061054	WELD ON CAP ASSEMBLY - MMD505	520.70	36
19	145061069	BREAKER BAR CAP ASSEMBLY - MMD501	164.68	12
20	145061132	SIDECOMB ASSEMBLY	312.02	12
21	145070204	BREAKER BAR ASSEMBLY	5,043.66	1
22	241501509	RIGHT-HAND BREAKER SHAFT ASSEMBLY	18,001.19	1
23	241501510	LEFT-HAND BREAKER SHAFT ASSEMBLY	18,001.19	1
24	241791085	LEFT HAND PLANETARY GEARBOX OIL COOLER/FILTER	7,979.74	1
25	241791086	RIGHT HAND PLANETARY GEARBOX OIL COOLER/FILTER	7,979.74	1
26	241791103	VOITH CARDEN SHAFT MT 225.8 DRIVE ASSEMBLY	160.00	2
27	S1791000-001	MMD PLANETARY GEARBOX 80:1 RATIO	14,040.00	1
28	S1791000-002	MMD PLANETARY GEARBOX 80:1 RATIO	14,040.00	1
29	S1791000-003	MMD PLANETARY GEARBOX 80:1 RATIO	14,040.00	1
29	S1799020-001	INTERMEDIATE GEARBOX-275KW 2:1 RATIO	1,670.00	1
30	S1799020-002	INTERMEDIATE GEARBOX-275KW 2:1 RATIO	1,670.00	1
		Total Mass :-	235,958.28 Kg	

CASE ASSEMBLY
PART NUMBER - 141501511

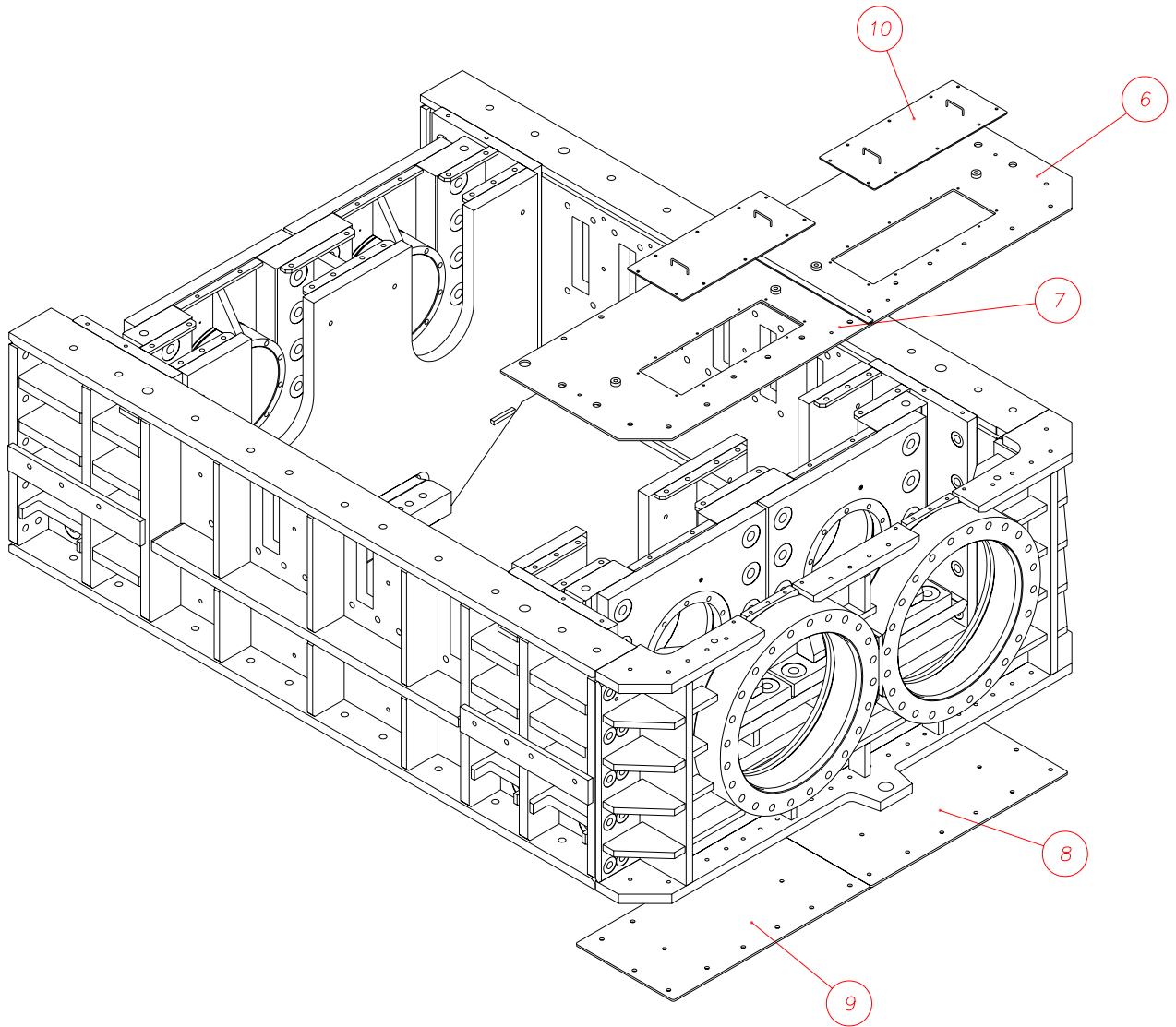
REVISION	MODIFICATION	DATE
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2.0	SECTION REVISED & CORRECTED	27 - 06 - 07



MMD MINING MACHINERY DEVELOPMENTS LIMITED

CASE ASSEMBLY

Part Number : 141501511

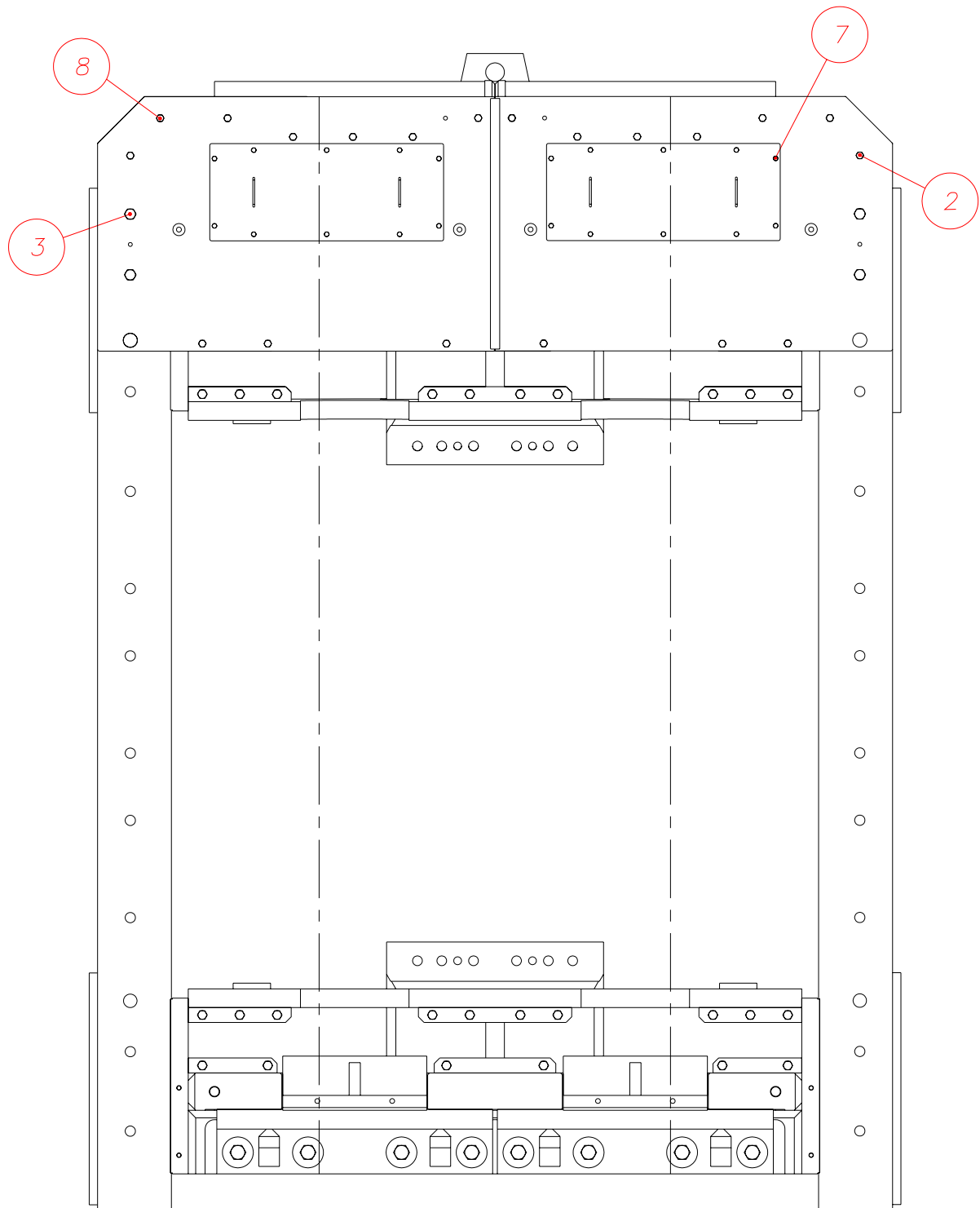


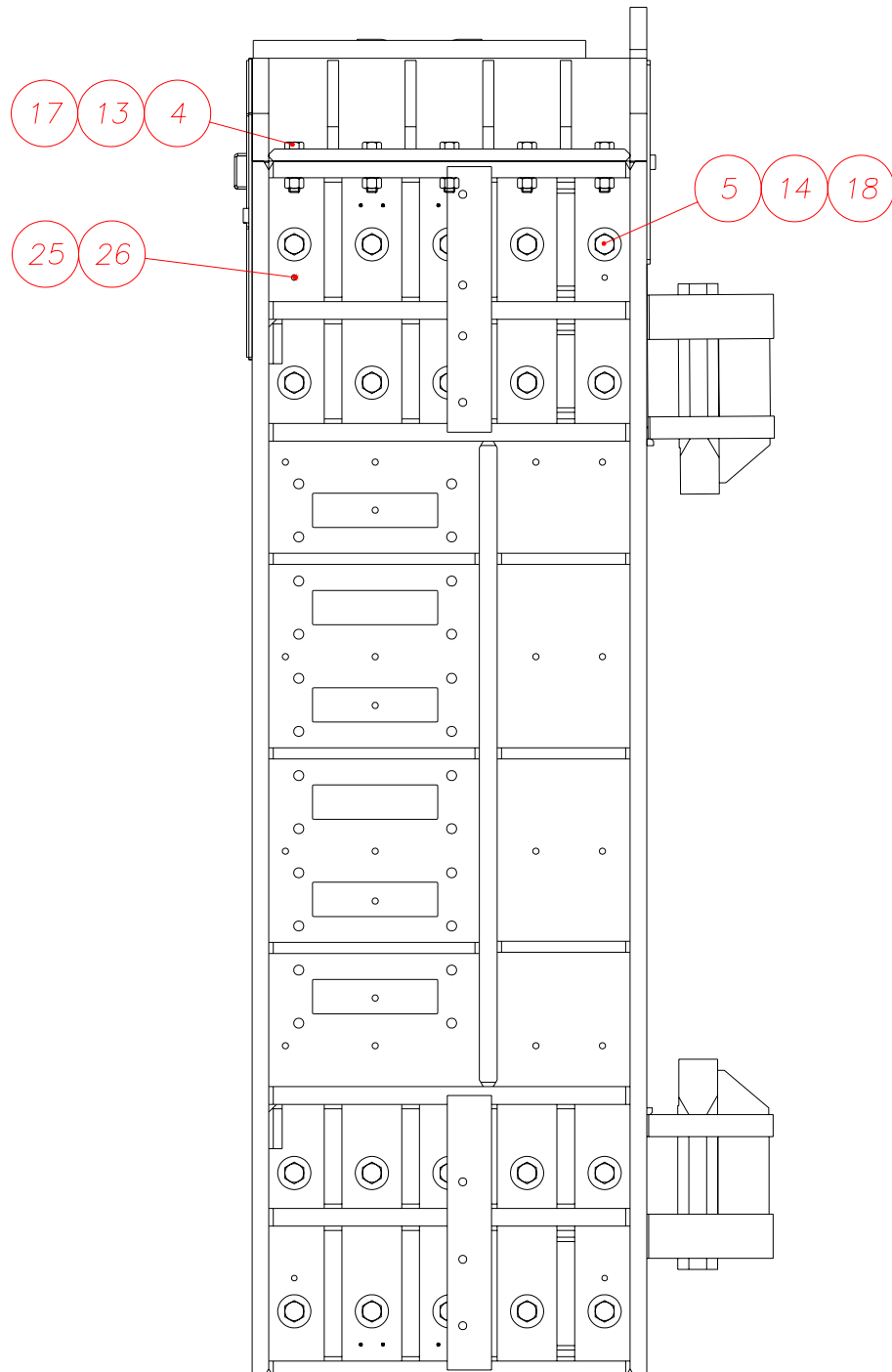
Item	Part Number	Description	Unit Mass	Qty
1	1501415-85	FABRICATED BEARING HOUSING	19,165.00	2
2	1501417-85	FABRICATED BEARING CAPSULE	1,995.00	4
3	1501512-85	SIDEPLATE	13,855.00	1
4	1501513-85	SIDEPLATE	13,313.10	1
5	1501514-85	GEARBOX MOUNTING PLATE	8,564.00	1
6	1501530-84	TOP COVER PLATE	281.50	1
7	1501535-84	TOP COVER PLATE	286.50	1
8	1501536-84	BOTTOM COVER PLATE	204.10	1
9	1501537-84	BOTTOM COVER PLATE	200.50	1
10	1501538-84	ACCESS COVER PLATE	51.10	2
		Total Mass :-	83,116.90 Kg	

SIZER BOLT LIST

PART NUMBER - 14150-0019

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	10 - 01 - 06

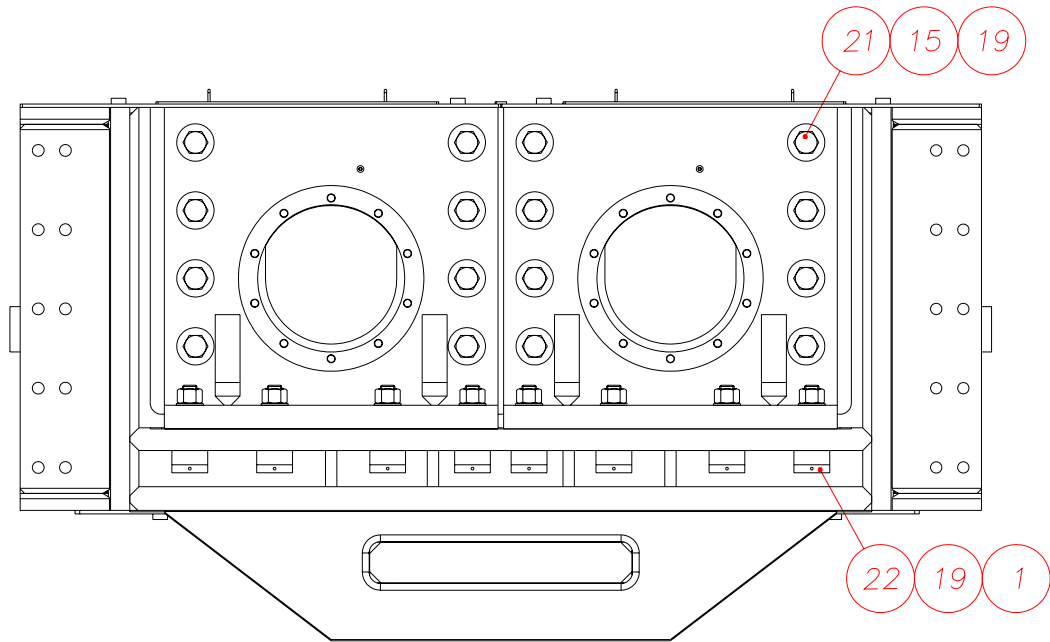




MMD MINING MACHINERY DEVELOPMENTS LIMITED

BOLT LIST

Part Number : 14150-0019



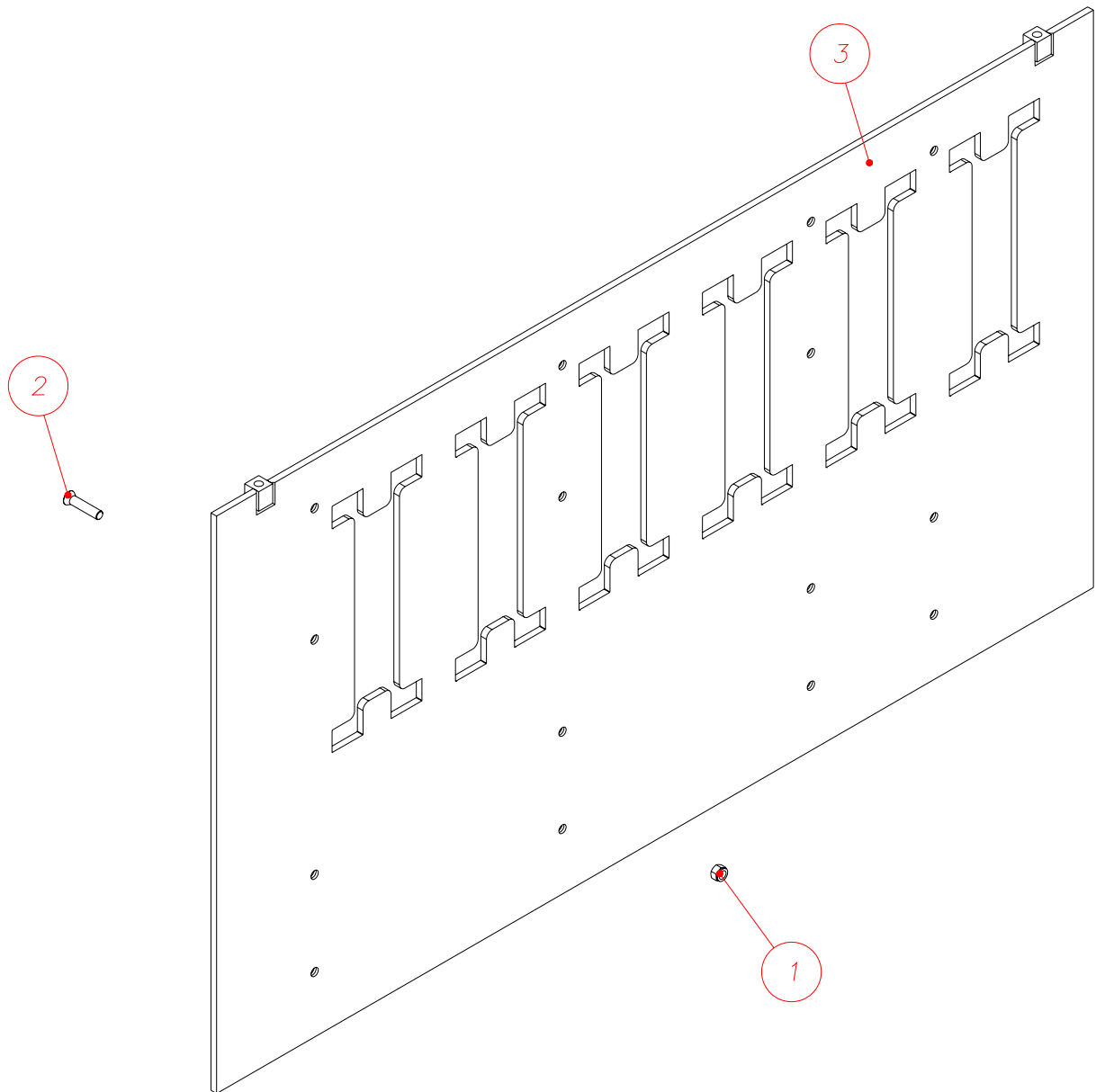
Item	Part Number	Description	Unit Mass	Qty
1	023991708	M64 X 4P HYD NUT	0.00	16
2	030324130	M24 X 130 HEX BOLT EN24014 GR8.8	0.60	4
3	030336090	M36 X 90 HEX BOLT EN24014 GR8.8	1.17	6
4	030348260	M48 X 260 HEX BOLT EN24014 GR8.8	0.00	20
5	030356300	M56 X 300 HEX BOLT EN24014 GR8.8	0.00	40
6	031312025	M12 X 25 HEX SET SCREW BS4168 GR8.8	0.04	40
7	031316030	M16 X 30 HEX SET SCREW BS4168 GR8.8	0.09	16
8	031324050	M24 X 50 HEX SET SCREW BS4168 GR8.8	0.31	37
9	031424000	M24 NYLOC NUT BS4929	0.11	4
10	031436000	M36 NYLOC NUT BS4929	0.36	6
11	032000873	RM0295-30 O RING	0.00	4
12	032742000	M42 HEX NUT 1XD THK BS EN 24032 GR8.8	0.80	64
13	032748000	M48 HEX NUT 1XD THK BS EN 24032 GR8.8	1.00	20
14	032756000	M56 HEX NUT 1XD THK BS EN 24032 GR8.8	1.00	80
15	032764000	M64 FULL HEIGHT NUT	2.20	80
16	035642000	M42 HV WASHER SPECIFICATION DIN 6916	0.16	64
17	035648000	M48 HV WASHER SPECIFICATION DIN 6916	0.28	40
18	035656000	M56 HV WASHER SPECIFICATION DIN 6916	0.38	160
19	035664000	M64 HV WASHER SPECIFICATION DIN 6916	0.62	80
20	1501308-01	M42 X 270 STUD	3.00	32
21	1501461-01	M64 X 525 LONG STUD	13.00	32
22	1501462-01	M64 X 425 LONG STUD	10.50	16
23	3992020-01	DOWEL 35MM DIA 140 LONG	1.05	4
24	3992021-01	DOWEL 35MM DIA 160 LONG	1.20	8
25	3992022-01	DOWEL 35MM DIA	1.35	8
26	3992023-01	RETAINING PLATE FOR DOWEL	0.30	20
		Total Mass :-	608.97 Kg	

**SIDE WEARPLATE
ASSEMBLY**

PART NUMBER - 141501532 AS DRAWN

PART NUMBER - 141501533 OPP HAND

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION CORRECT TO SHOW ASS' MASS	27 - 06 - 07

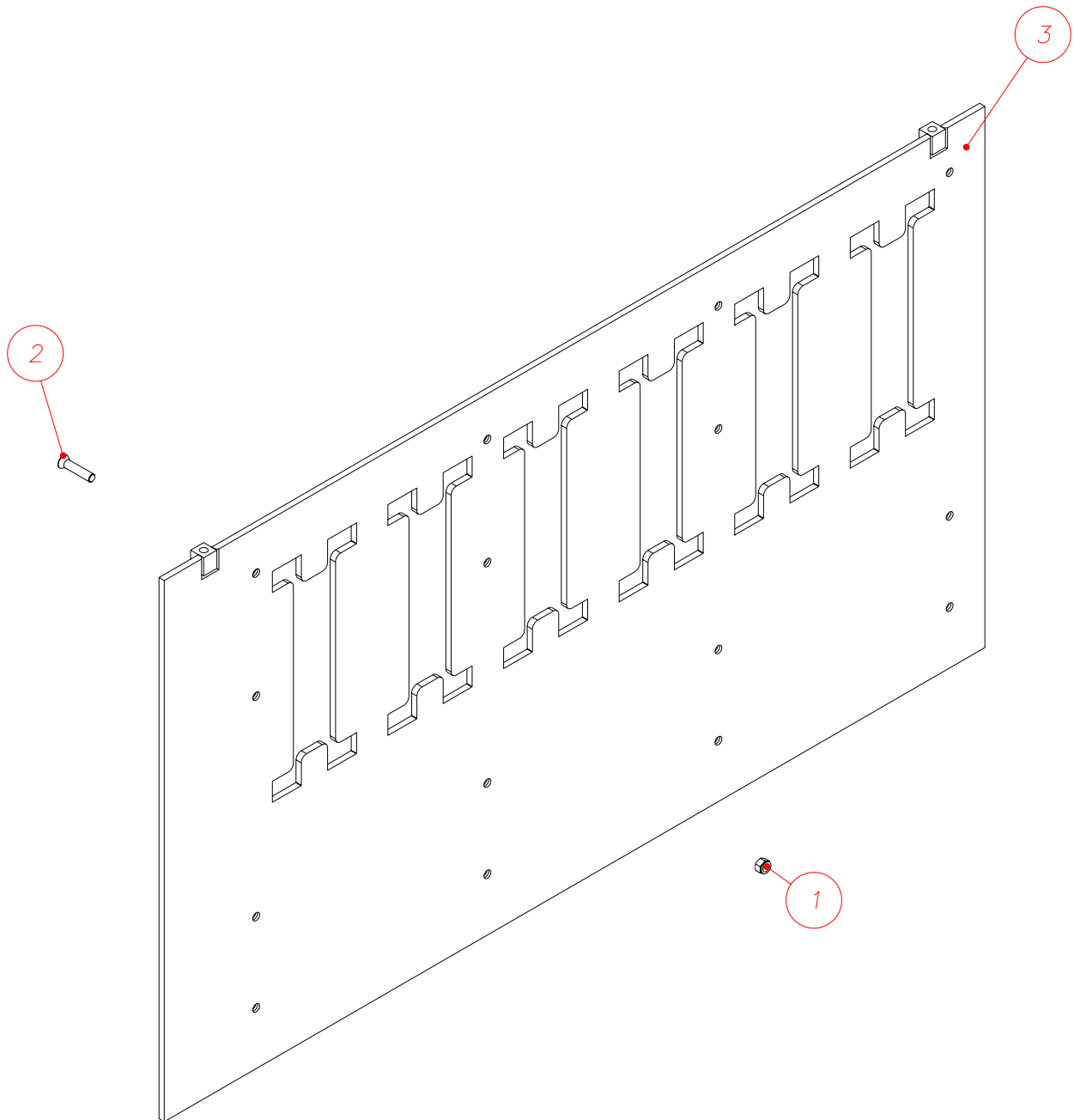
MMD MINING MACHINERY DEVELOPMENTS LIMITED**SIDE WEARPLATE ASSEMBLY****Part Number : 141501532**

Item	Part Number	Description	Unit Mass	Qty
1	031424000	M24 NYLOC NUT BS4929	0.11	15
2	031824110	M24 X 110 CSK SKT SCREW BS4168	0.42	15
3	1501532-84	SIDE WEARPLATE	753.10	1
Total Mass :-			761.05 Kg	

MMD MINING MACHINERY DEVELOPMENTS LIMITED

SIDE WEARPLATE ASSEMBLY

Part Number : 141501533



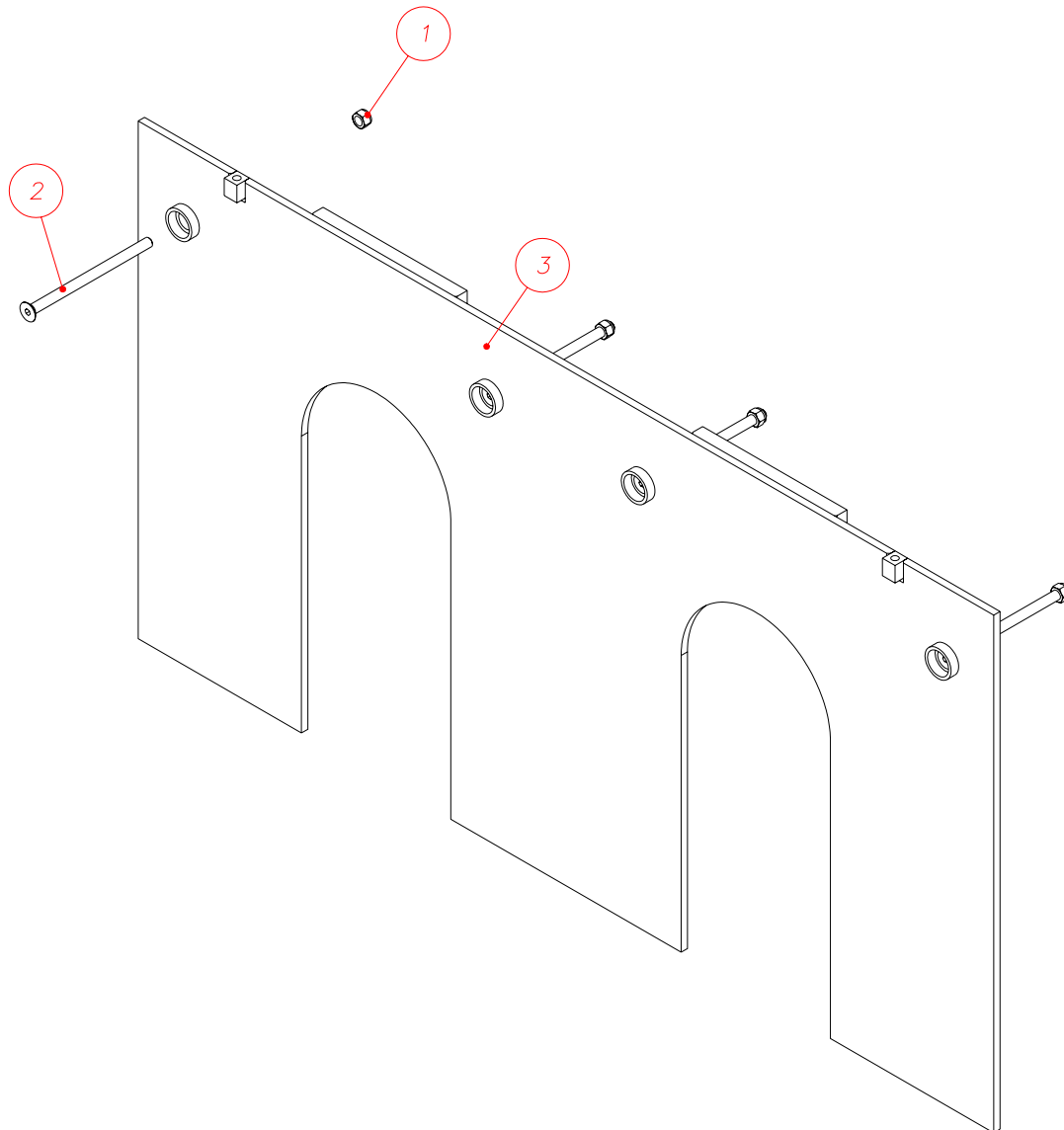
Item	Part Number	Description	Unit Mass	Qty
1	031424000	M24 NYLOC NUT BS4929	0.11	15
2	031824110	M24 X 110 CSK SKT SCREW BS4168	0.42	15
3	1501533-84	SIDE WEARPLATE	753.10	1
		Total Mass :-	761.05 Kg	

**END WEARPLATE
ASSEMBLY**

PART NUMBER - 141501433

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	07 - 12 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED
END WEARPLATE ASSEMBLY
Part Number : 141501433



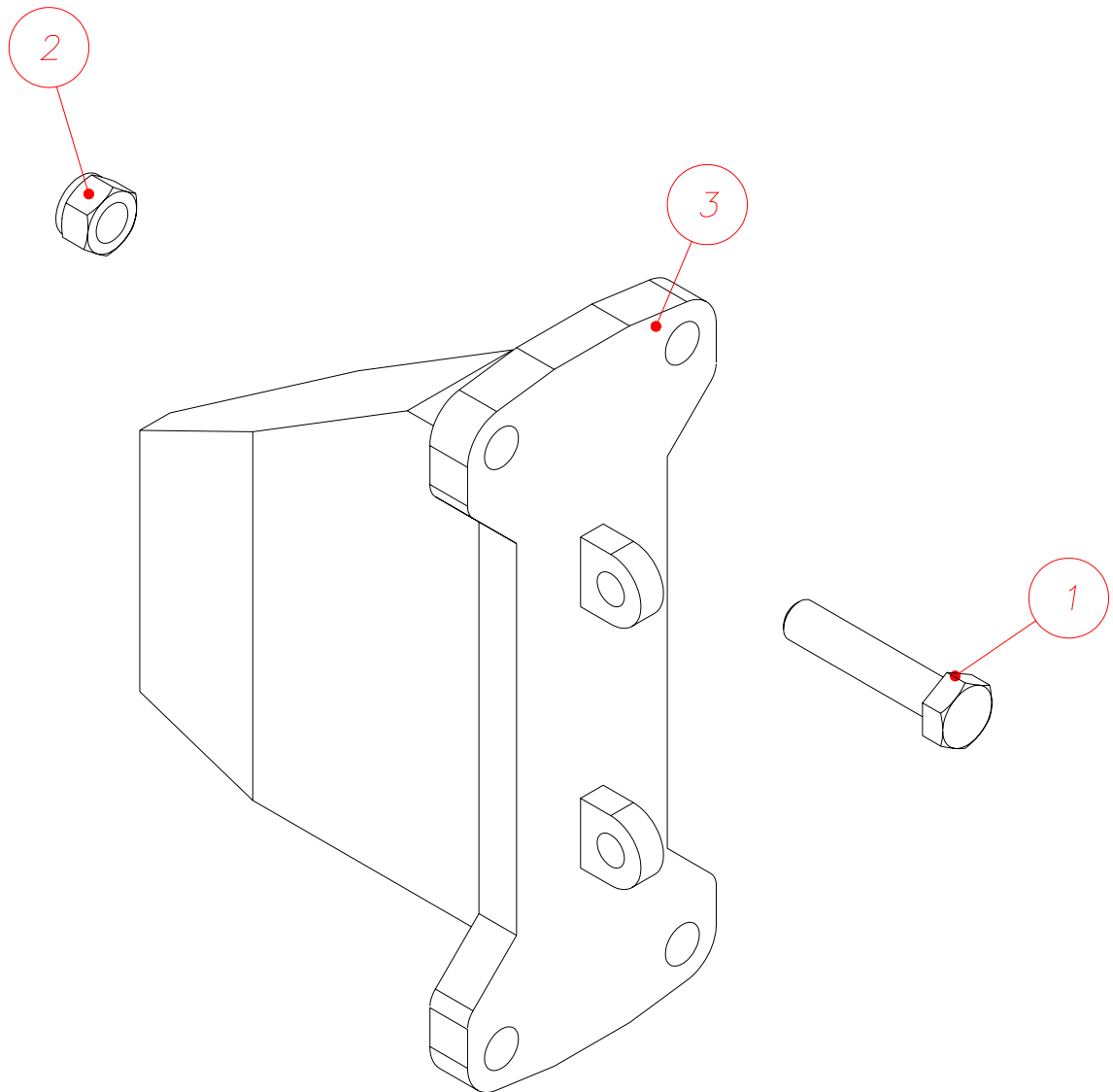
Item	Part Number	Description	Unit Mass	Qty
1	031430000	M30 NYLOC NUT BS4929	0.21	4
2	031830160	M30 X 160 CSK SKT SCREW BS4168	0.08	4
3	1501433-84	END WEARPLATE	1,085.00	1
		Total Mass :-	1,086.16 Kg	

**SIDECOMB
ASSEMBLY**

PART NUMBER - 145061132

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	07 - 12 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED
SIDECOMB ASSEMBLY
Part Number : 145061132



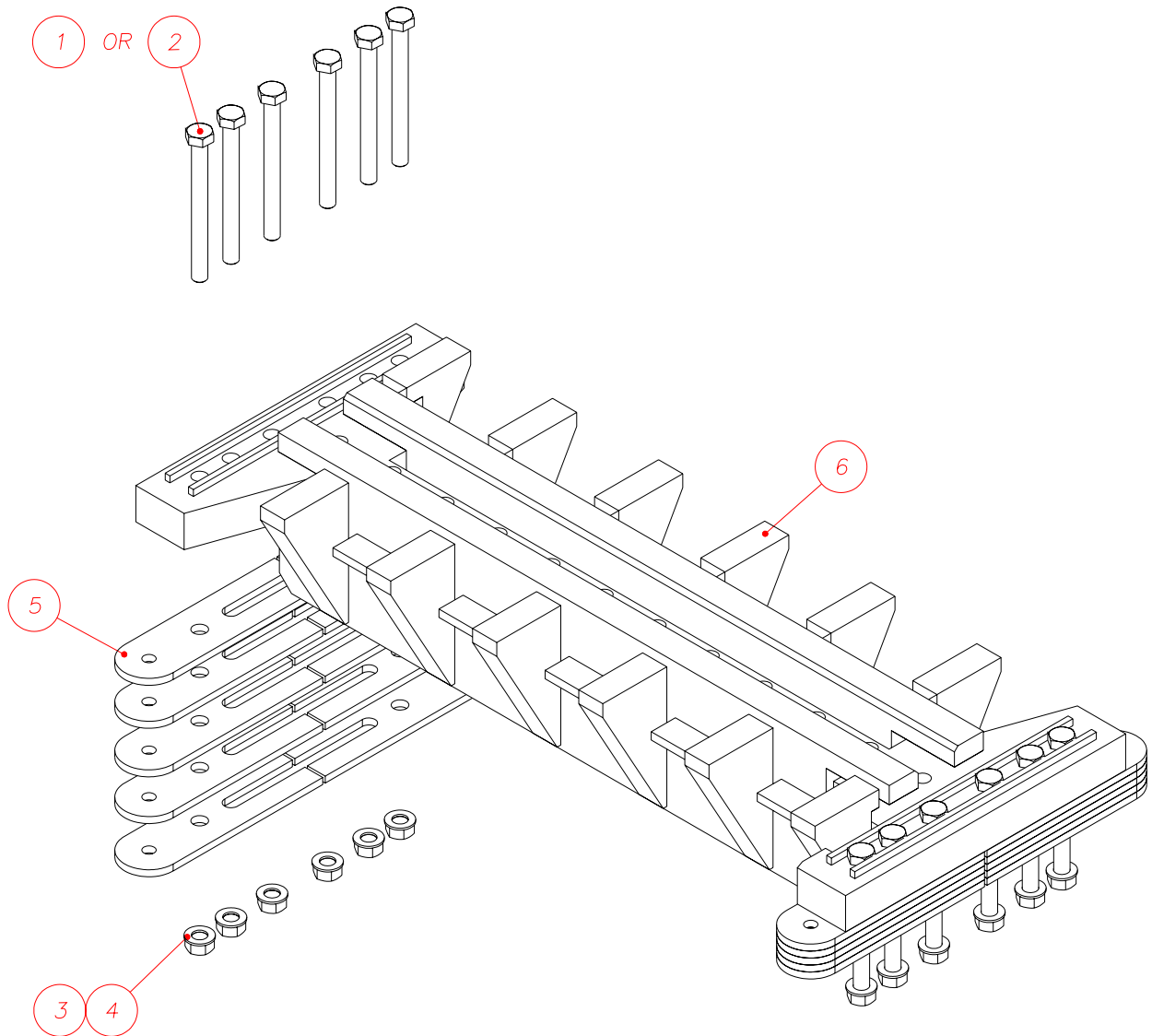
Item	Part Number	Description	Unit Mass	Qty
1	030342200	M42 X 200 HEX BOLT EN24014 GR8.8	2.90	4
2	031442000	M42 NYLOC NUT BS4929	0.62	4
3	5061132-84	FABRICATED SIDECOMB	308.50	1
		Total Mass :-	312.02 Kg	

**BREAKER BAR
ASSEMBLY**

PART NUMBER - 145070204

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 12 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED
BREAKER BAR ASSEMBLY
Part Number : 145070204

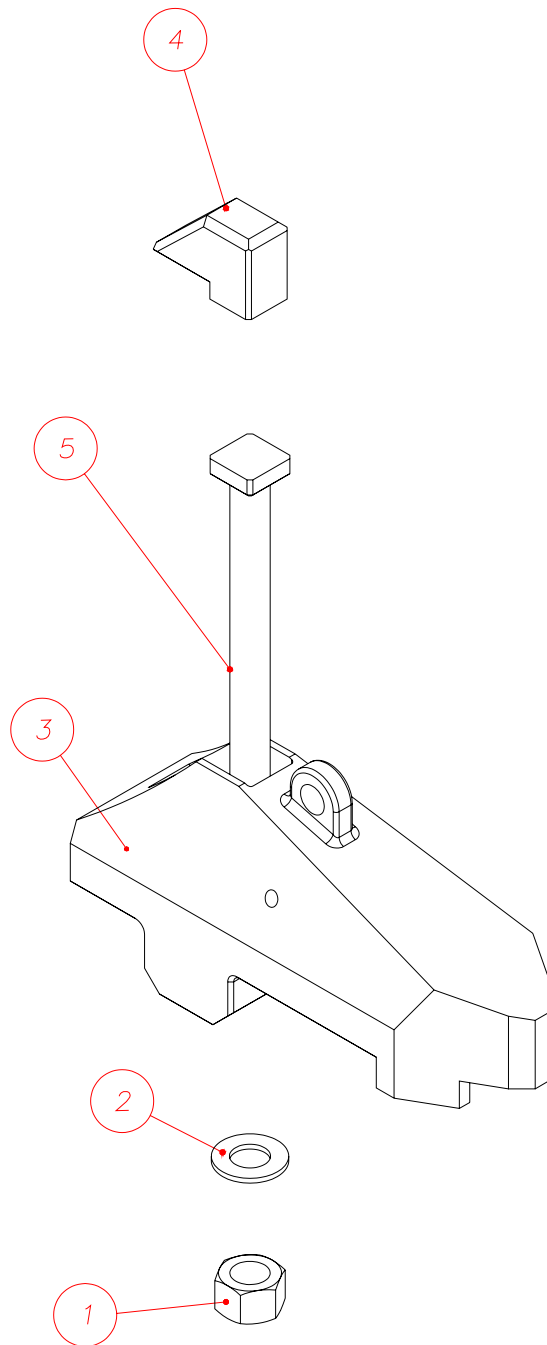


Item	Part Number	Description	Unit Mass	Qty
1	030348400	M48 X 400 HEX BOLT EN24014 GR8.8	5.30	12
2	030348500	M48 X 500 HEX BOLT EN24014 GR8.8	5.30	12
3	031448000	M48 NYLOC NUT BS4929	0.90	12
4	035648000	M48 HV WASHER SPECIFICATION DIN 6916	0.28	12
5	5070185-91	BREAKER BAR PACKER 25MM	18.00	16
6	5070204-85	BREAKER BAR	4614.3	1
		Total Mass :-	5043.66 Kg	

**BREAKER BAR CAP
ASSEMBLY**

PART NUMBER - 145061069

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 12 - 05

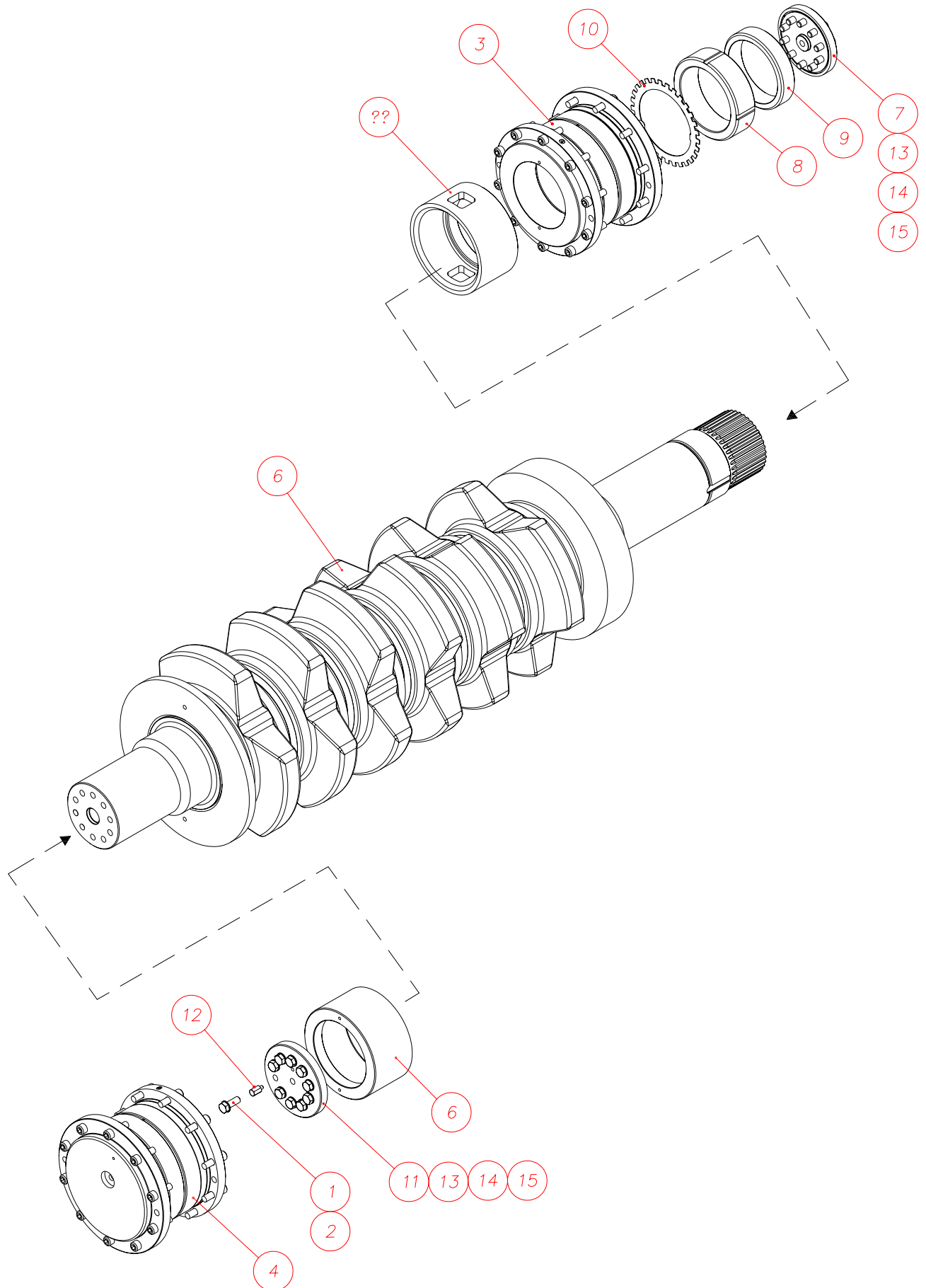
MMD MINING MACHINERY DEVELOPMENTS LIMITED**BREAKER BAR CAP ASSEMBLY****Part Number : 145061069**

Item	Part Number	Description	Unit Mass	Qty
1	032748000	M48 HEX NUT 1XD THK BS EN 24032 GR8.8	1.00	1
2	035648000	M48 HV WASHER SPECIFICATION DIN 6916	0.28	1
3	5061069-84	BREAKER BAR CAP	155.00	1
4	5061119-84	INFILL PIECE FOR BREAKER BAP CAP	1.20	1
5	5110139-01	M48 X 450 SQ HEAD B/BAR CAP BOLT	7.20	1
		Total Mass :-	164.68 Kg	

**LEFT-HAND BREAKER SHAFT
ASSEMBLY**

PART NUMBER - 241501510

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07



MMD MINING MACHINERY DEVELOPMENTS LIMITED
BREAKER SHAFT ASSEMBLY
Part Number : 241501509

MMD MINING MACHINERY DEVELOPMENTS LIMITED
BREAKER SHAFT ASSEMBLY
Part Number : 241501509

MMD MINING MACHINERY DEVELOPMENTS LIMITED
BREAKER SHAFT ASSEMBLY
Part Number : 241501509

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**LEFT-HAND BREAKER SHAFT
ASSEMBLY**

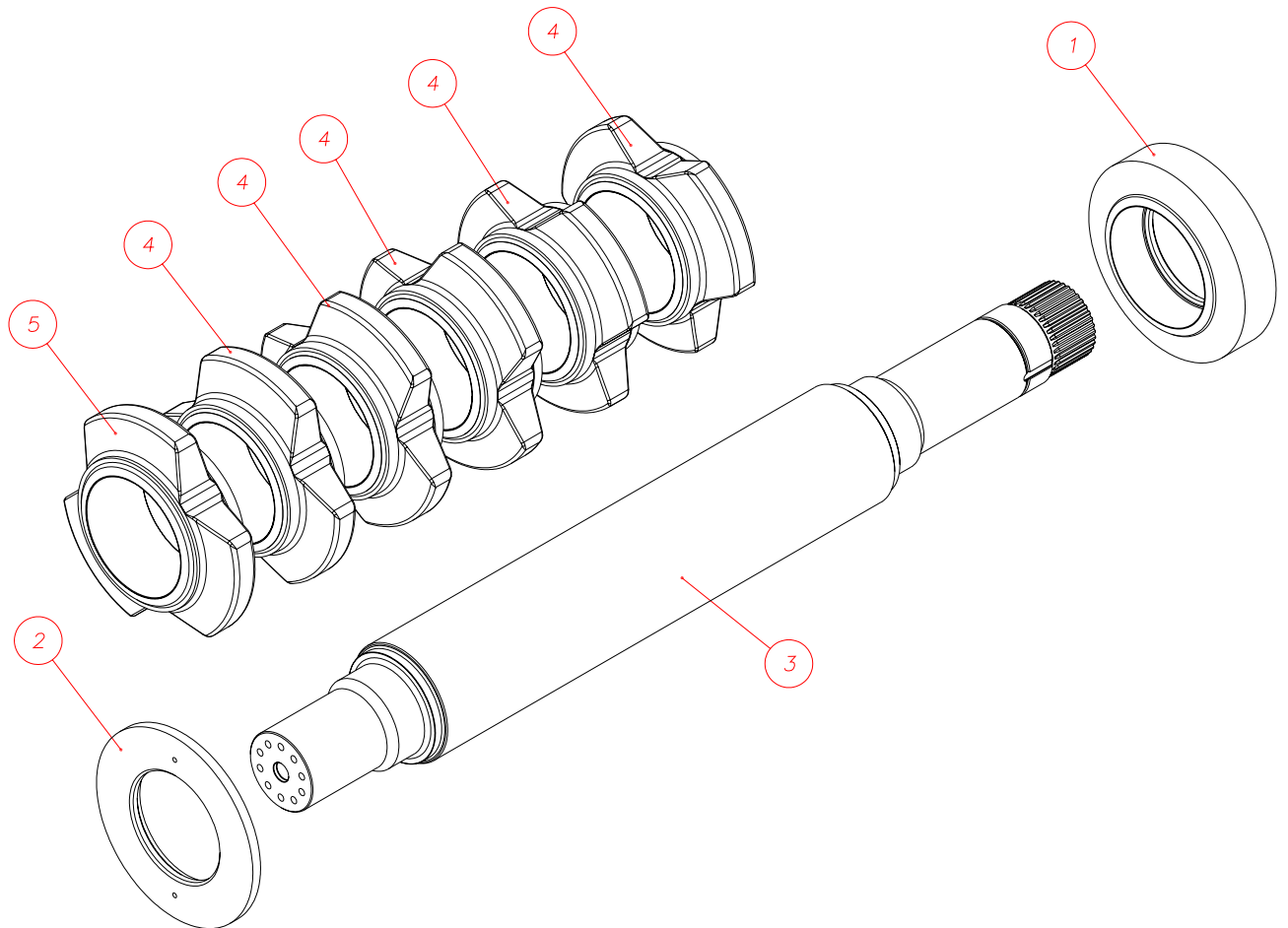
PART NUMBER - 145010439

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED

LEFT-HAND BREAKER SHAFT ASSEMBLY

Part Number : 145010439



Item	Part Number	Description	Unit Mass	Qty
1	1501435-06	END COLLAR	940.00	1
2	1501436-06	END COLLAR	295.00	1
3	5010438-06	BREAKER SHAFT	8,630.00	1
4	5051225-06	3 TOOTH FORGED RING	970.00	5
5	5051451-06	3 TOOTH FORGED END RING	935.00	1
		Total Mass :-	15,650.00 Kg	

**FIXED BEARING
ASSEMBLY**

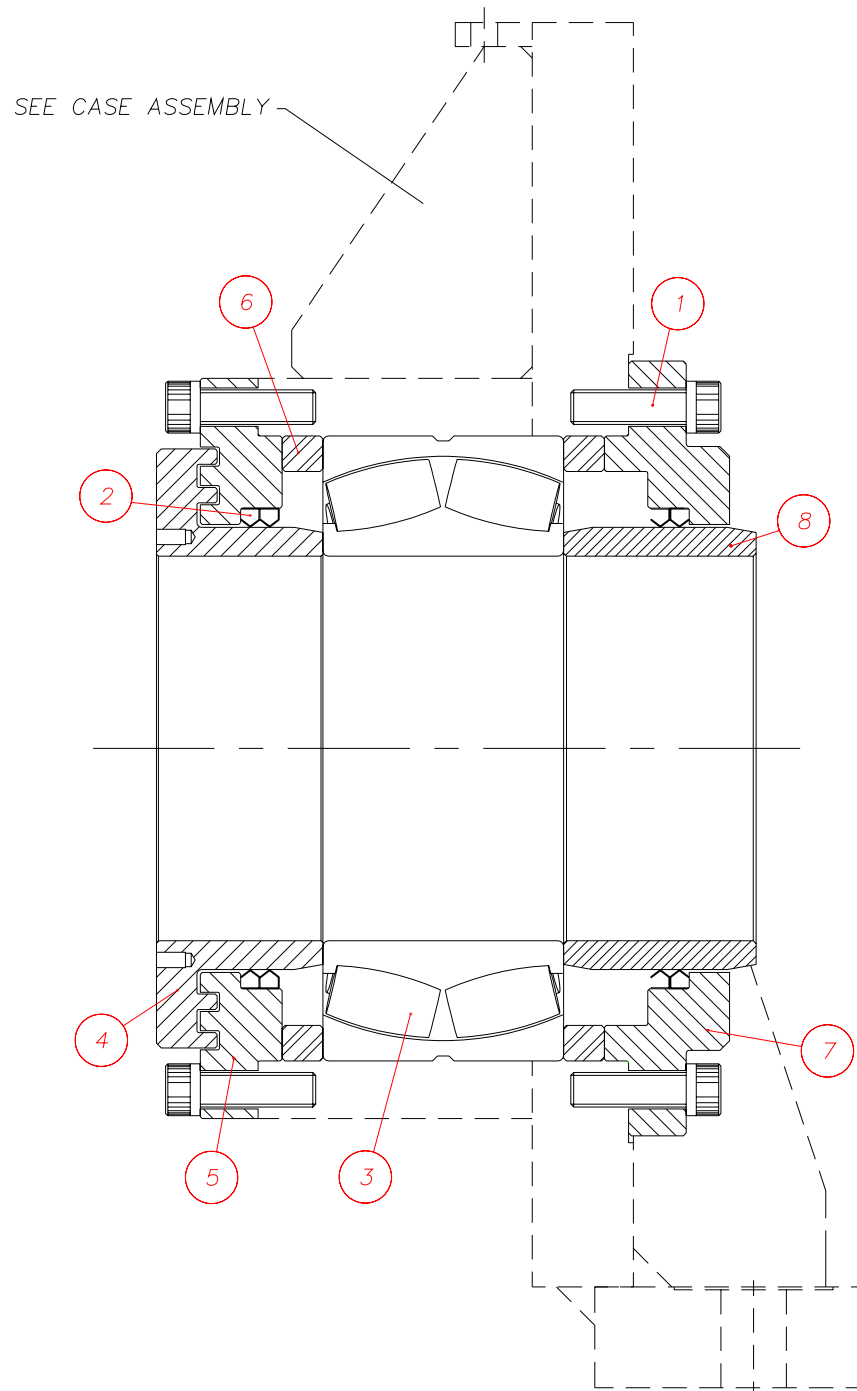
PART NUMBER - 141500111

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	12 - 12 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FIXED BEARING ASSEMBLY

Part Number : 141500111



Item	Part Number	Description	Unit Mass	Qty
1	030536120	M36 X 120 SKT CAP SCREW BS4168	1.30	20
2	032000870	500 X 460 X 20 R21 F1 VITON OIL SEAL	1.20	4
3	035000649	24180 ECA/W33 C3 EXPLORER BEARING	340.00	1
4	1501419-01	LABYRINTH	100.00	1
5	1501420-01	LABYRINTH RETAINING PLATE	140.00	1
6	1501421-01	BEARING FIXING RING	23.50	2
7	1501423-01	SEAL RETAINING PLATE	185.00	1
8	1501425-01	SEAL PATH	62.00	1
		Total Mass :-	904.80	Kg

**FLOATING BEARING
ASSEMBLY**

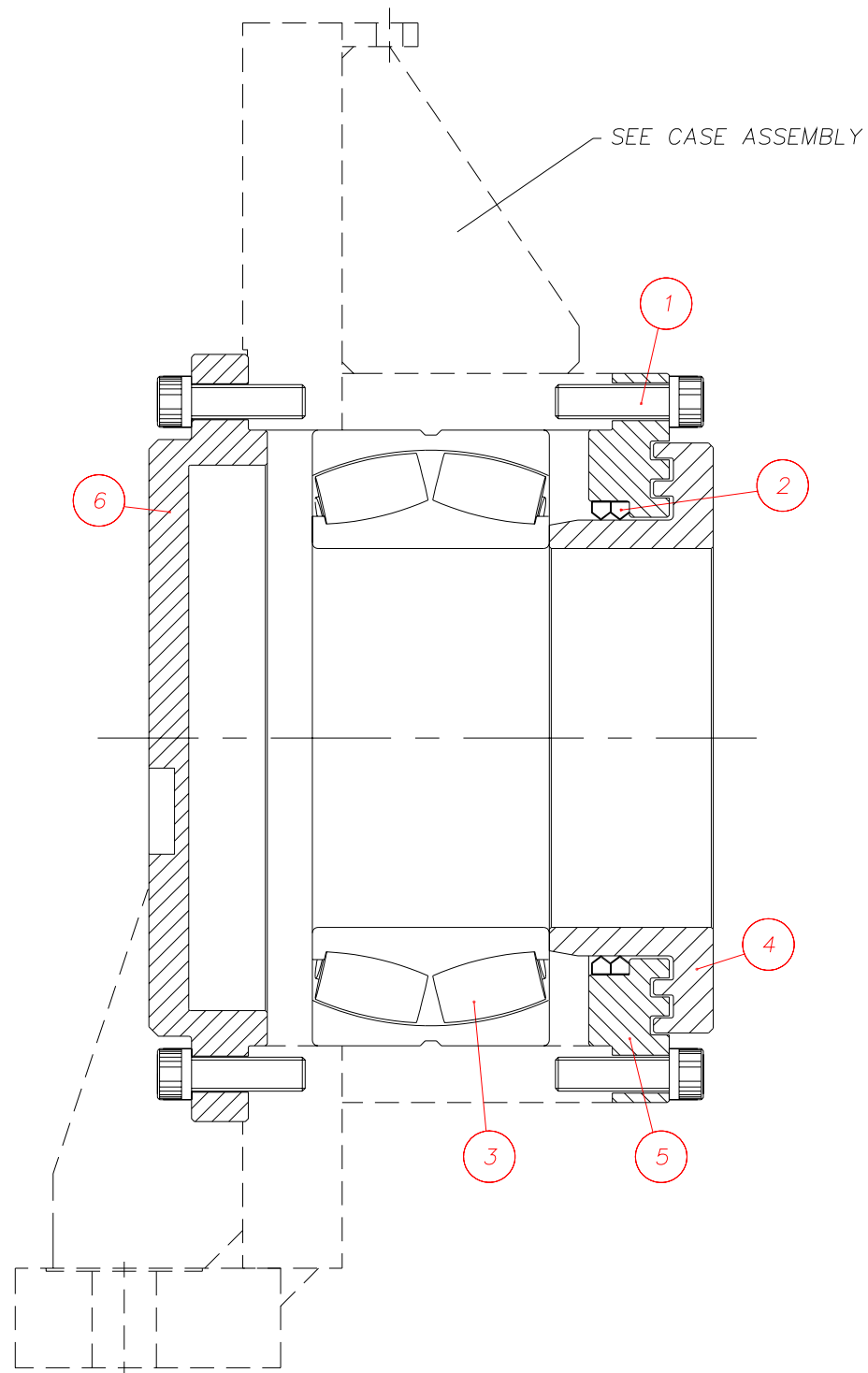
PART NUMBER - 141500112

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	12 - 12 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FREE BEARING ASSEMBLY

Part Number : 141500112

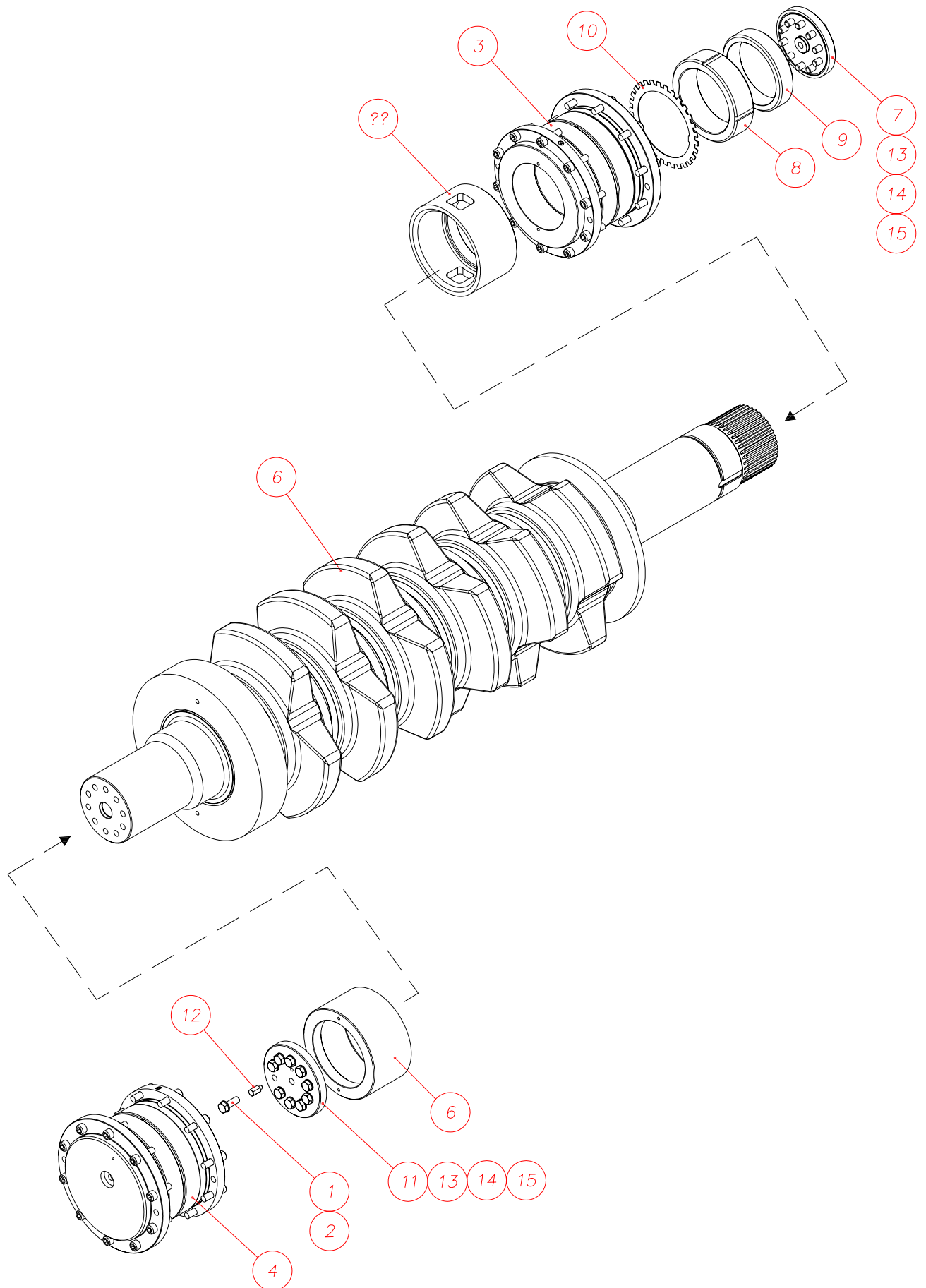


Item	Part Number	Description	Unit Mass	Qty
1	030536120	M36 X 120 SKT CAP SCREW BS4168	1.30	20
2	032000870	500 X 460 X 20 R21 F1 VITON OIL SEAL	1.20	2
3	035000649	24180 ECA/W33 C3 EXPLORER BEARING	340.00	1
4	1501419-01	LABYRINTH	100.00	1
5	1501420-01	LABYRINTH RETAINING PLATE	140.00	1
6	1501424-01	BLANKING PLATE	220.00	1
		Total Mass :-	828.40	Kg

**RIGHT-HAND BREAKER SHAFT
ASSEMBLY**

PART NUMBER - 241501509

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07



MMD MINING MACHINERY DEVELOPMENTS LIMITED
RIGHT-HAND BREAKER SHAFT ASSEMBLY
Part Number : 241501509

MMD MINING MACHINERY DEVELOPMENTS LIMITED
RIGHT-HAND BREAKER SHAFT ASSEMBLY
Part Number : 241501509

MMD MINING MACHINERY DEVELOPMENTS LIMITED
RIGHT-HAND BREAKER SHAFT ASSEMBLY
Part Number : 241501509

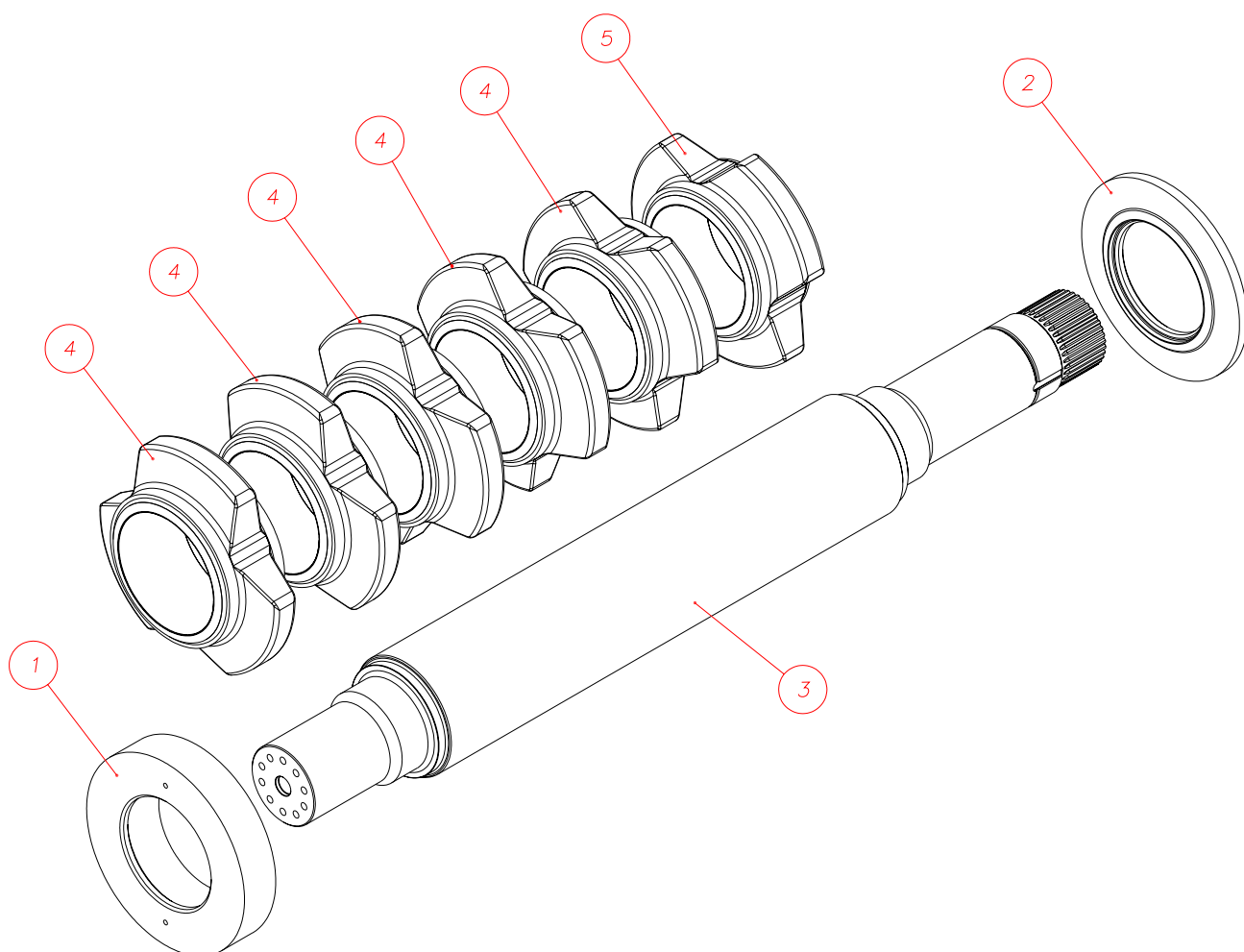
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**RIGHT-HAND BREAKER SHAFT
ASSEMBLY**

PART NUMBER - 145010438

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED
RIGHT-HAND BREAKER SHAFT ASSEMBLY
Part Number : 145010438



Item	Part Number	Description	Unit Mass	Qty
1	1501435-06	END COLLAR	940.00	1
2	1501436-06	END COLLAR	295.00	1
3	5010438-06	BREAKER SHAFT	8,630.00	1
4	5051225-06	3 TOOTH FORGED RING	970.00	5
5	5051451-06	3 TOOTH FORGED END RING	935.00	1
		Total Mass :-	15,650.00 Kg	

**FIXED BEARING
ASSEMBLY**

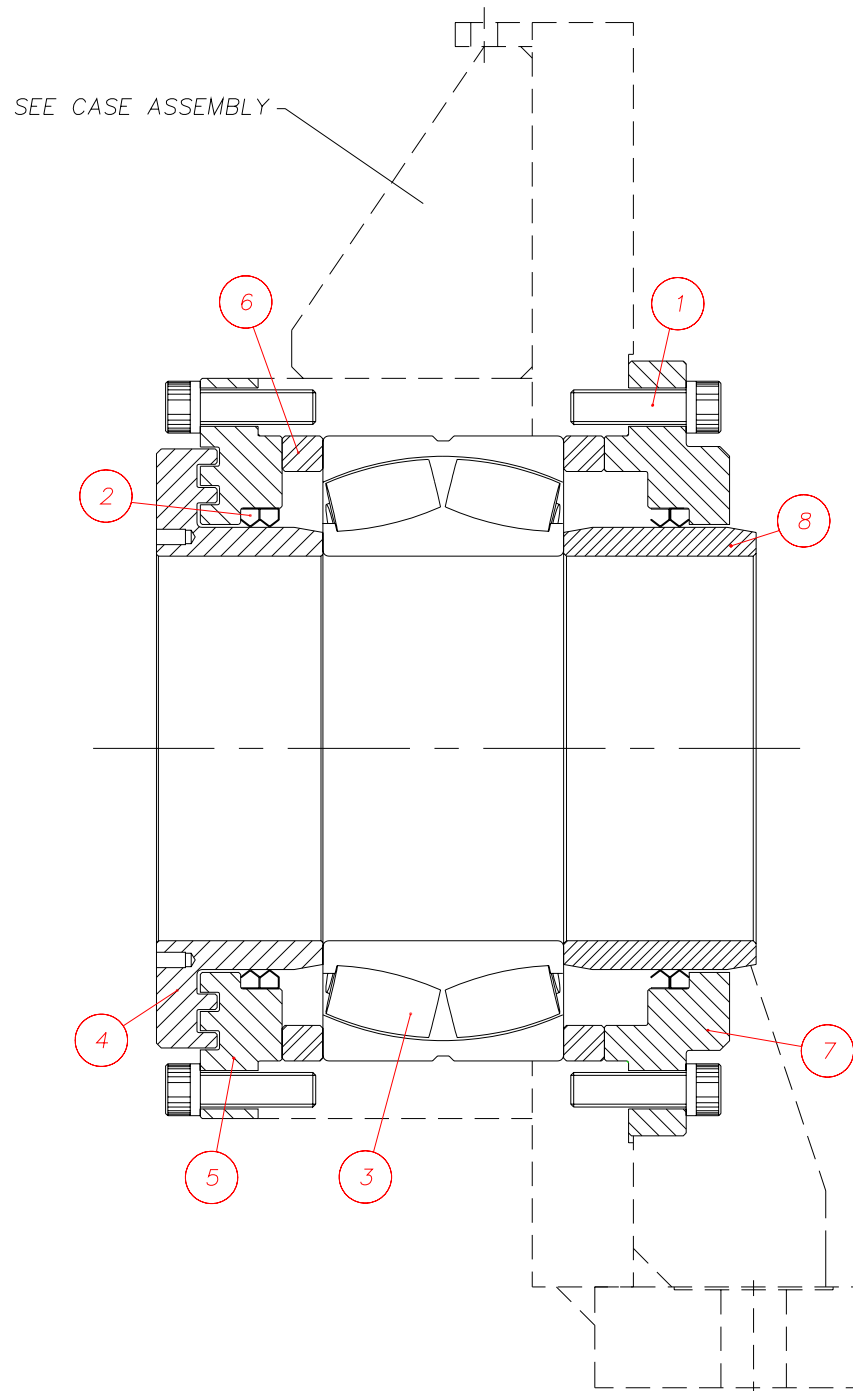
PART NUMBER - 141500111

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	13 - 12 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FIXED BEARING ASSEMBLY

Part Number : 141500111



Item	Part Number	Description	Unit Mass	Qty
1	030536120	M36 X 120 SKT CAP SCREW BS4168	1.30	20
2	032000870	500 X 460 X 20 R21 F1 VITON OIL SEAL	1.20	4
3	035000649	24180 ECA/W33 C3 EXPLORER BEARING	340.00	1
4	1501419-01	LABYRINTH	100.00	1
5	1501420-01	LABYRINTH RETAINING PLATE	140.00	1
6	1501421-01	BEARING FIXING RING	23.50	2
7	1501423-01	SEAL RETAINING PLATE	185.00	1
8	1501425-01	SEAL PATH	62.00	1
		Total Mass :-	904.80 Kg	

**FLOATING BEARING
ASSEMBLY**

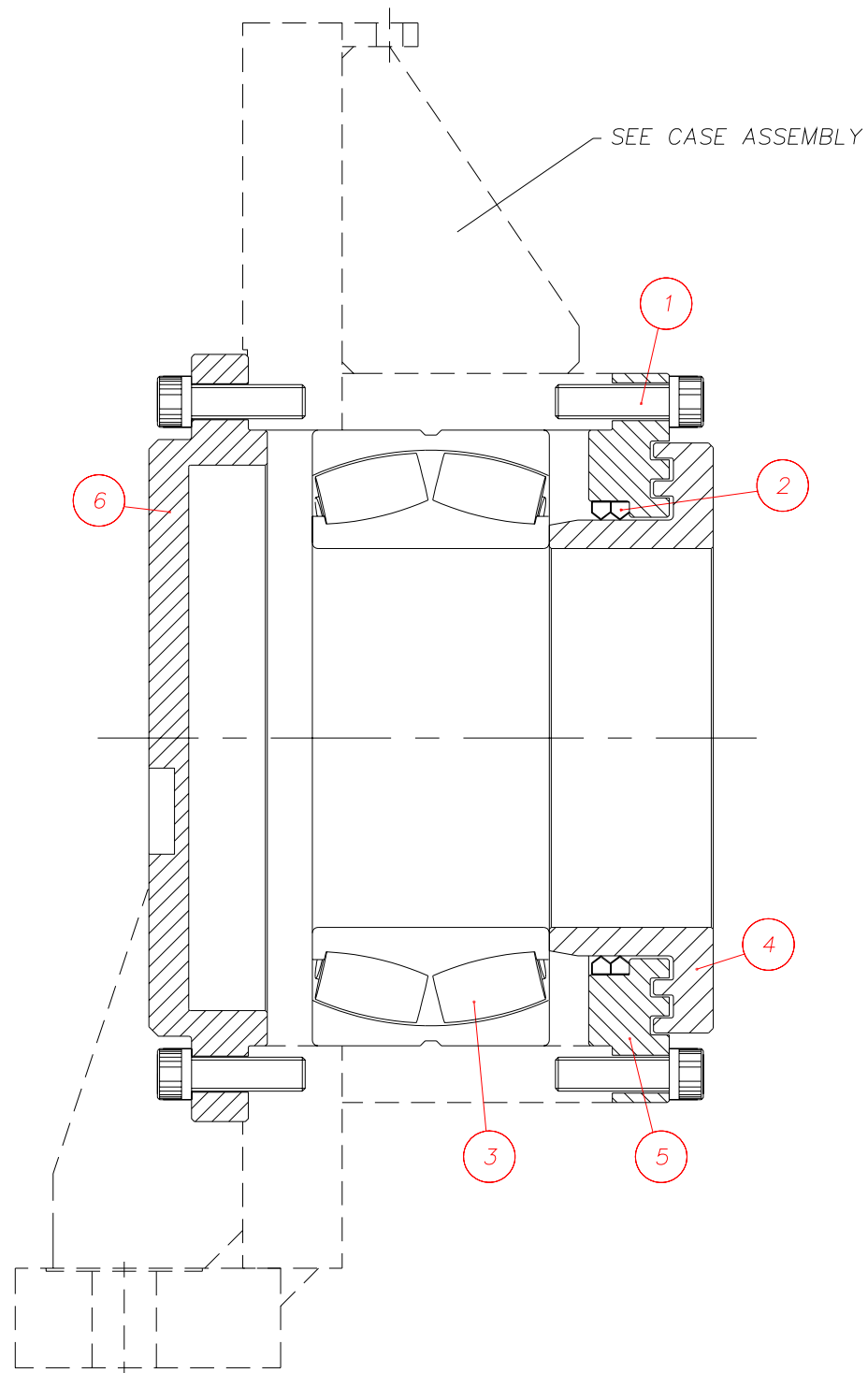
PART NUMBER - 141500112

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	13 - 12 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FREE BEARING ASSEMBLY

Part Number : 141500112

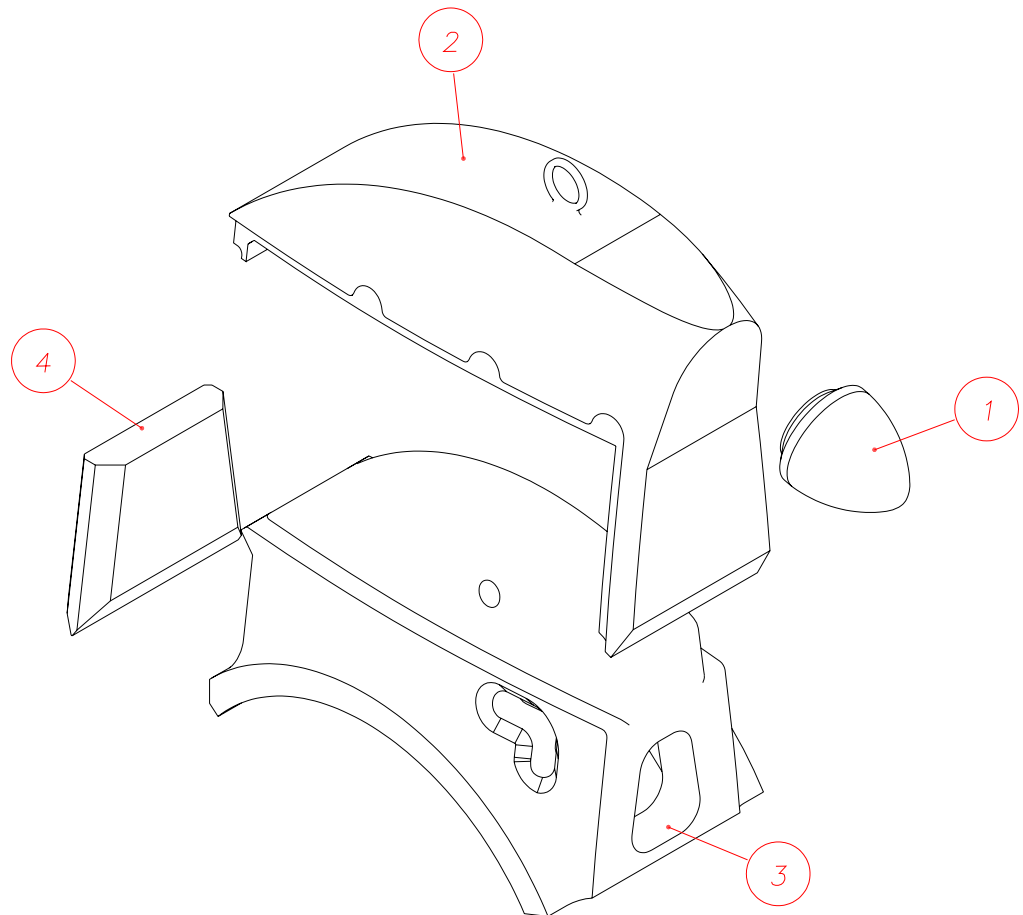


Item	Part Number	Description	Unit Mass	Qty
1	030536120	M36 X 120 SKT CAP SCREW BS4168	1.30	20
2	032000870	500 X 460 X 20 R21 F1 VITON OIL SEAL	1.20	2
3	035000649	24180 ECA/W33 C3 EXPLORER BEARING	340.00	1
4	1501419-01	LABYRINTH	100.00	1
5	1501420-01	LABYRINTH RETAINING PLATE	140.00	1
6	1501424-01	BLANKING PLATE	220.00	1
		Total Mass :-	828.40 Kg	

**WELD-ON TOOTH CAP
ASSEMBLY**

PART NUMBER - 145061054

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED**WELD-ON TOOTH CAP ASSEMBLY****Part Number : 145061054**

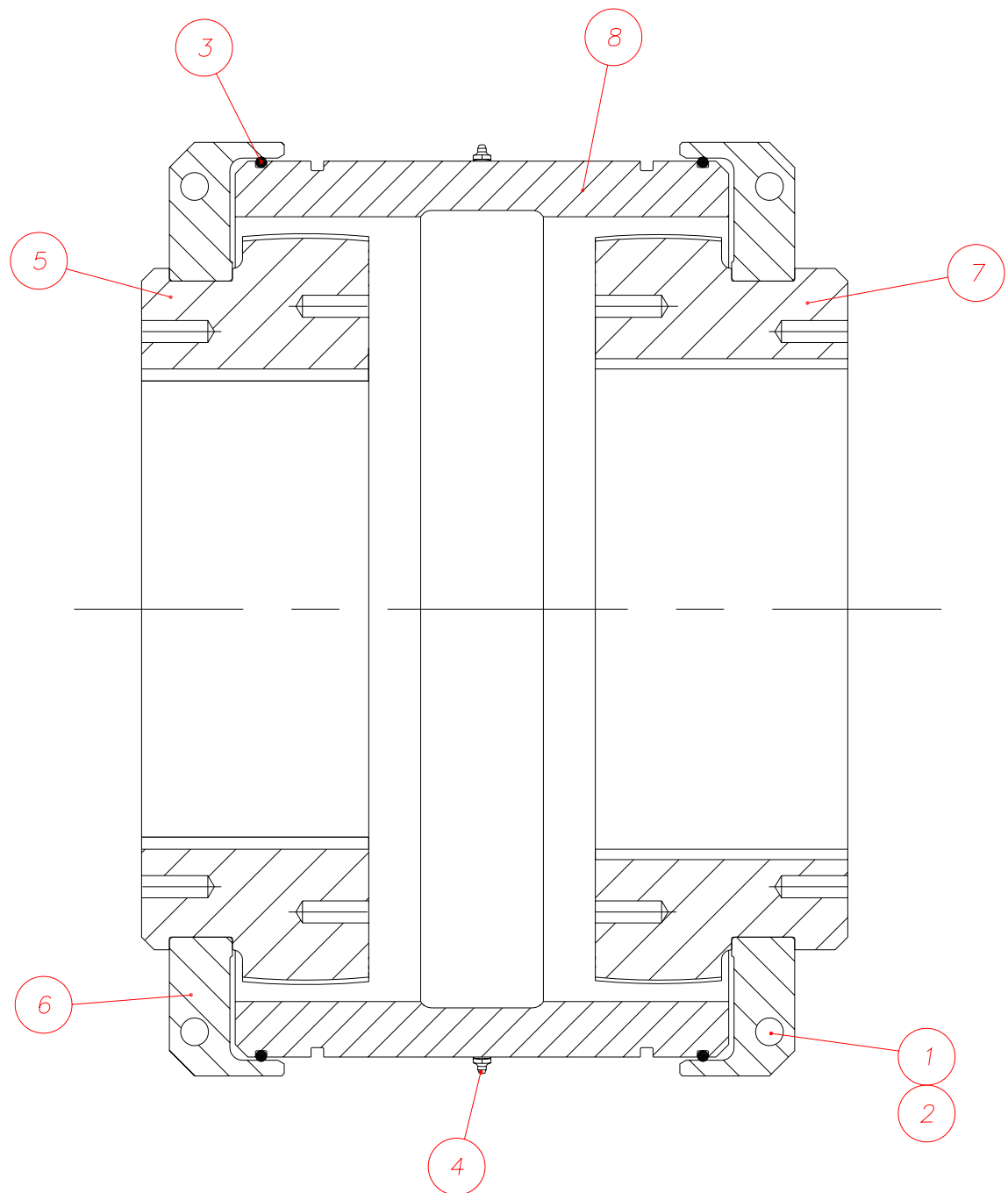
Item	Part Number	Description	Unit Mass	Qty
1	5061052-01	HEAVY DUTY WELD ON TIP - MMD101	20.70	1
2	5061054-01	WELD ON TOP CAP - MMD505	200.00	1
3	5061058-01	WELD ON BASE CAP - MMD505	266.00	1
4	5061065-91	WELD ON BACK PLATE	34.00	1
		Total Mass :-	520.70 Kg	

GEAR COUPLING ASSEMBLY

PART NUMBER - 111701186

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED
GEAR COUPLING ASSEMBLY
Part Number : 111701186



Item	Part Number	Description	Unit Mass	Qty
1	030520110	M20 X 110 SKT CAP SCREW BS4168	0.32	4
2	031420000	M20 NYLOC NUT BS4929	0.06	4
3	032000857	RM6991-84 'O' RING	0.00	2
4	036000604	1/4 BSP GREASE NIPPLE	0.01	2
5	1701144-01	GEAR COUPLING HUB	208.00	1
6	1701146-01	GEAR COUPLING CLAMP	41.00	2
7	1701187-01	GEAR COUPLING HUB	298.60	1
8	1701188-01	GEAR COUPLING SLEEVE	211.70	1
		Total Mass :-	801.84Kg	

**MMD 80:1 RATIO PLANETARY
GEARBOX ASSEMBLY**

PART NUMBER - 241791000

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	31 - 01 - 06

MMD 707 SERIES

80:1 RATIO GEARBOX

GEARBOX DISMANTLEMENT PROCEDURE

PROCEDURE FOR REMOVAL AND RE-FITTING BEARING ASSEMBLIES ON GEAR TRAIN ASSEMBLIES

REMOVAL

Split gear the coupling, and remove gearbox from machine.

Completely drain oil from gearbox.

Remove two end plates and two seal housings, taking care not to damage seals.

Split gearbox case halves, taking care not to damage machined faces.

With all assemblies now exposed, they can be stripped and rebuilt in the normal way. Standard extractors and press tools can be used for all of these gear trains, but attention should be given to assembly procedure.

ASSEMBLY SCHEDULE

- 1) Split gearcase and clean all inside surfaces.
- 2) Check for any transportation damage on machined faces and clean up as necessary.

NOTE: Ensure inside un-machined surfaces have been painted.

- 3) Collect pre-selected gears, pinions, bearings and bolts etc., from stores. Fit 2" and 0.75" BSPT Plugs to both gearcase halves.

NOTE: All wheels and pinions to be cleaned with paraffin spray or likewise prior to starting to assembly.

- 4) Using available G.A.s and Parts Lists proceed to assembly gear train assemblies.

NOTE: All items where practicable to be lifted with eye bolts in holes provided especially wheels and final assemblies.

First Item: 2nd Reduction Pinion Assembly;

- (a) Put bearings on Induction heater after setting up for bearing setting at 110°C.
- (b) Put gear wheel in oven or similar and heat to 100°C.
- (c) Fit bearing 23218 CC C3 when up to temperature.
- (d) As in (c) fit second bearing 22218 EC3.
- (e) Fit spacer 4001910-01.
- (f) Fit keys to pinion 5090016-01.
- (g) Fit wheel 4001860-01 to pinion using a press where necessary.
- (h) Fit end cap 4001930-01.

Second Item: 3rd Reduction Shaft Assembly;

- (a) Put bearings on Induction heater after setting up for bearing setting at 110°C.
- (b) Put gear wheel in oven or similar, and heat to 100°C.
- (c) Fit bearing 23034 CC/C3 when up to temperature.
- (d) As in part (c) fit second bearing 23034 CC/C3.
- (e) Fit spacer 7070359-01.
- (f) Fit keys, 5090017-01 to pinion.
- (g) Fit wheel 7070351-01, to pinion using press or similar where necessary.
- (h) Fit end cap 2060090-01.

Fourth Item: Output Shaft Assembly;

- (a) Put bearings on Induction heater after setting up for bearing setting at 110°C.
- (b) Fit bearing 23032 CC/C3 when up to temperature.
- (c) Fit spacer 7070215-01.
- (d) Fit wheel 7070353-01 to pinion using press where necessary.
- (e) Fit spacer 7070214-01.
- (f) Fit second bearing 23028 CC/C3.
- (g) Fit end cap 1773024-01.
- (h) Fit 'O' Ring RM 1893-57 to seal path 1787023-01.
- (i) To output shaft fit distance piece 7070211-01.
- (j) Fit seals 032000080 to seal housing 7070238-01.
- (k) Fit seal housing 7070238-01 to output shaft.

Input Pinion Assembly;

- (a) Put bearings on Induction heater.
- (b) When to temperature, fit bearing NJ 2311 ECML C3.
- (c) Fit seal 032000741 to seal housing 7070421-01.
- (d) Fit 'O' Ring 032000589 to seal path, and slide over Input Shaft.
- (e) Fit seal housing 7070421-01 to shaft 7070419-01.

Assemble the Gear Trains in the bottom half of gearcase in the following way:

- (a) Firstly, place 2nd Reduction assembly in case.
- (b) Then fit the input shaft assembly.
Check gear alignment with Engineers Blue, to BS436: Part 1: Grade 8.
At least 40% of the working depth for 35% of the length and at last 20% of the working depth for a further 35% of the length.
- (c) Fit 3rd Reduction Assembly.
- (d) Lastly, the output shaft assembly.

NOTE: Now apply oil into all bearings before fitting top case.

Put Loctite Super Fast 573 sealant, or equivalent on all flanges before fitting top case.

Position side dowel in groove in bottom case and then lower top case down over gears. Locating with second dowel when down, ensuring correct alignment. Fit bolts (M24 x 80) and tighten until they are just nipped.

Check now that all the assemblies are seated correctly.

Tap input shaft in to make sure that it is up to stop. Same on 2nd and 3rd Reduction Shafts. Check from ends with a Vernier Calliper or Depth Micrometer that bearings are square.

Fit all bolts as per list.

Tightening of bolts.

All bolts are to be nipped up prior to torque setting of bolts.

NOTE: Torque setting for bolts is T056. Start to tighten bolts from middle working outwards in a balanced manner. All the time of tightening check the free running of the gears.

Fit cover plates 7070209-01, 7070210-01 and cover plate with filler breather 023301600.

Tighten oil seal housing into gearcase on output shaft assembly.

Tighten oil seal housing into gearcase on input shaft assembly.

Fill with oil. (See Maintenance Schedule for oil Specification, approx. 55 litres.)

Set up and run up for a minimum of 4 hours doing regular temperature checks. Maximum temperature rise in Input shaft bearing of 90°F (50°C). If this temperature is reached, switch off and let gearbox cool down. Re-start and if the maximum temperature is exceeded again, stop and investigate.

The packing dimensions of the gearbox are 1175 mm long x 1075 mm wide and 750 mm high.

The actual weight of the gearbox is 1,650kg (this is full with oil).

MMD GEARBOX PREVENTATIVE MAINTENANCE SCHEDULE

The oil level must be checked daily, as a minimum. Overfilling is known to have serious detrimental effects and is as important as underfilling. An oil level dipstick is provided on the gearbox for checking the oil level. This is carried out by removing the dipstick and wiping with a cloth. Re-insert the dipstick and remove. The level of oil will be visible on the dipstick, and it must be within the machined portion of the dipstick, preferably in the middle of this portion.

Always top up the oil level with the correct specification lubricant.

All leaks must be traced, and rectified immediately. Always establish the cause and rectify. The Input Shaft Seals should be checked every 2,000 operational hours. The output shaft seals should be checked every 6,000 operational hours. When checking the input shaft seals ensure the seal housing is fitted perfectly clean and free from burrs. Correctly torque up all fasteners where applicable.

For optimum utilisation of oil we recommend that the oil change period should be determined by analysis. The maximum analysis period must not exceed 250 operating hours. If analysis of the oil samples is not carried out then the oil must be changed every 1,500 operating hours, or at a 6 month period at a maximum.

The fluid coupling protects the gearbox from motor inertia and shock loads. It must never be overfilled, and always use the correct fusible plugs. If a fault is suspected with the fluid coupling it must be rectified immediately. More detailed information on the coupling is supplied with the machine manual.

From I.C.P metals analysis results any readings outside one or more of the following parameters must result in an oil change:-

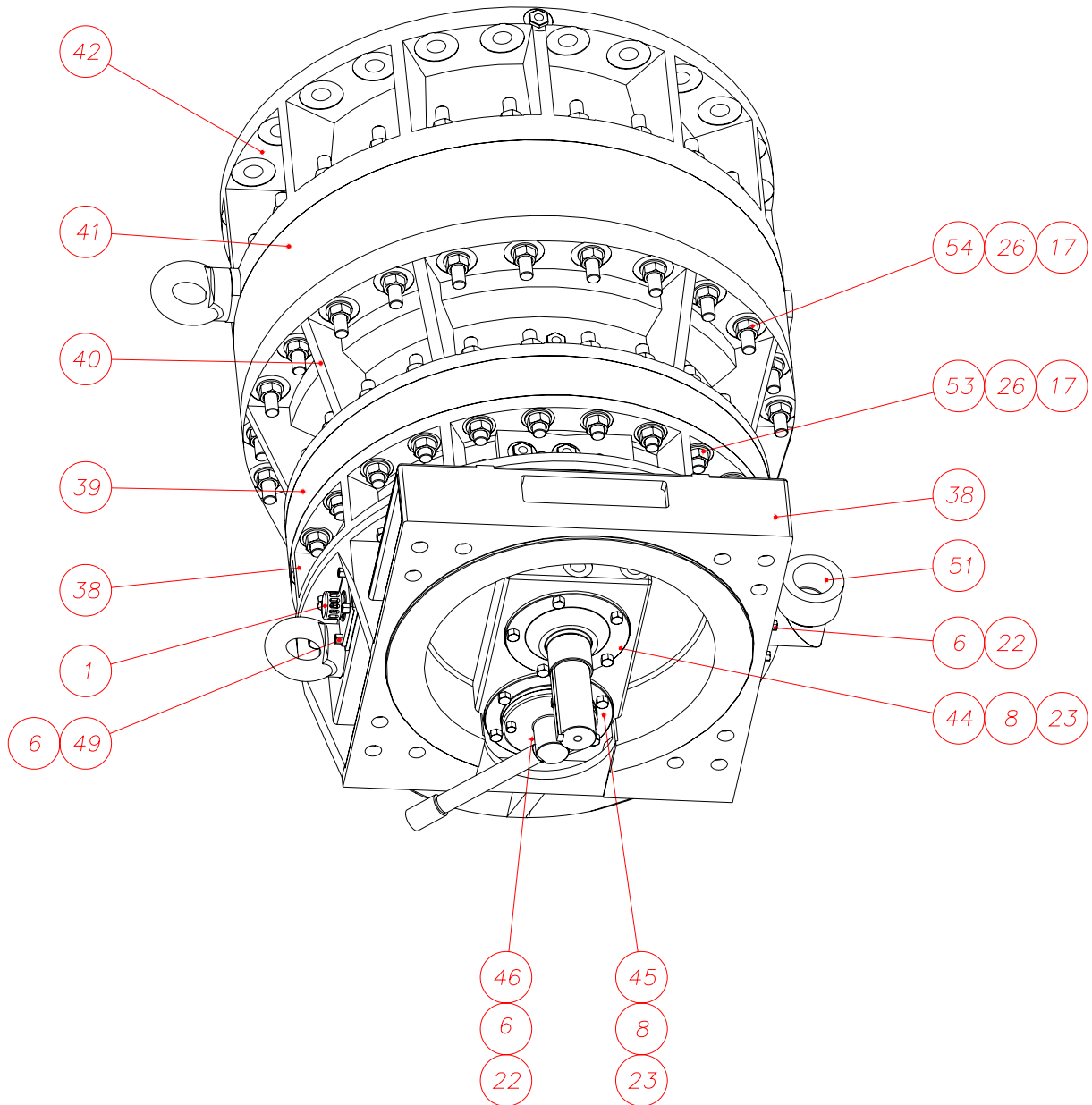
- 1) Change in viscosity (from nominal), + 6% to 10%.
- 2) Emulsified water 15,000 PPM (1.5%) maximum.
- 3) Free water 350 PPM (0.035%) maximum.
- 4) Total solids ingress (non metallic) 5,000 PPM (0.5%) maximum.
- 5) Silica 100 PPM (0.01%) maximum.
- 6) Aluminium (Al.), from Aluminium Silicate from environment 100 PPM (0.01%) maximum.
- 7) Iron (Fe) 100 PPM (0.01%) maximum.
- 8) Copper (Cu) 30 PPM (0.003%) maximum.
- 9) Zinc (Zn) 30 PPM (0.003%) maximum.
- 10) Chrome (Cr), Nickel (Ni), Manganese (Mn) 3 PPM (0.0003%).

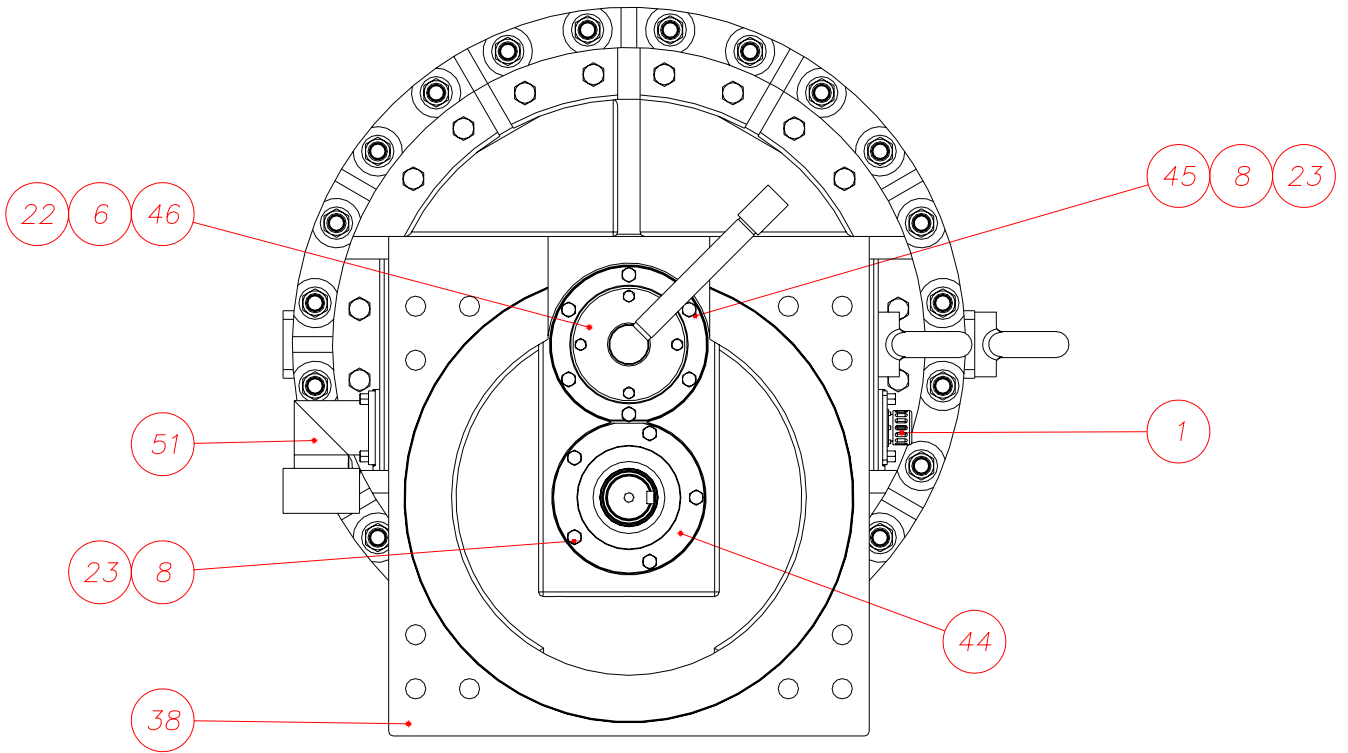
If after an oil change, symptoms repeat in decreasing time spans then an in depth inspection must commence. It is recommended to plot the iron content graphically against a time base to allow assessment of the gearbox condition. We would suggest specialist condition monitoring such as the “Pennine 4C condition monitoring program”.

The lubricant specification is specified as per MMD Procedure TO138a.



ALWAYS OBTAIN THE LUBRICANT FROM A REPUTABLE SUPPLIER. IT SHOULD BE BORNE IN MIND THAT IT IS NOT UNKNOWN FOR NEW BARRELS OF OIL TO CONTAIN WATER, WHICH CAN HAVE A CATASTROPHIC EFFECT ON THE INTERNAL PARTS OF THE GEARBOX.





MMD MINING MACHINERY DEVELOPMENTS LIMITED				
PLANETARY GEARBOX 80:1 RATIO(VOITH)				
Part Number : 241791000				

Item	Part Number	Description	Unit Mass	Qty
1	023301600	FILLER BREATHER	1.00	1
2	030330100	M30 X 100 HEX BOLT EN24014 GR8.8	0.82	20
3	030336100	M36 X 100 HEX BOLT EN24014 GR8.8	1.25	8
4	030336150	M36 X 150 HEX BOLT EN24014 GR8.8	1.65	8
5	031312035	M12 X 35 HEX SET SCREW BS4168 GR8.8	0.05	12
6	031316035	M16 X 35 HEX SET SCREW BS4168 GR8.8	0.09	12
7	031316045	M16 X 45 HEX SET SCREW BS4168 GR8.8	0.11	4
8	031320045	M20 X 45 HEX SET SCREW BS4168 GR8.8	0.19	11
9	031320050	M20 X 50 HEX SET SCREW BS4168 GR8.8	0.20	1
10	031324055	M24 X 55 HEX SET SCREW BS4168 GR8.8	0.33	11
11	032000562	RM2493-57 O RING BS4518	0.01	1
12	032000592	RM1693-57 O RING BS4518	0.01	1
13	032000597	125X150X15 R1 VITON DIN 3760	0.10	2
14	032000600	70X50X10 R21 VITON SEAL DIN 3760	0.10	2
15	032000602	480X440X20 R21 VITON SEAL DIN 3760	1.10	2
16	032000668	RM2593-57 O RING BS4518	0.01	1
17	032736000	M36 HEX NUT 1XD THK EN24014 GR8.8	0.40	80
18	033430000	M30 PHILIDAS NUT DIN980	0.27	20
19	033664000	M64 COLLARED EYEBOLT BS4278	18.00	2
20	035000480	6084/C4 DEEP GROOVE BALL BEARING	0.00	1
21	035612000	M12 HV WASHER SPECIFICATION DIN 6916	0.01	12
22	035616000	M16 HV WASHER SPECIFICATION DIN 6916	0.01	8
23	035620000	M20 HV WASHER SPECIFICATION DIN 6916	0.02	1
24	035624000	M24 HV WASHER SPECIFICATION DIN 6916	0.04	11
25	035630000	M30 HV WASHER SPECIFICATION DIN 6916	0.06	20
26	035636000	M36 HV WASHER SPECIFICATION DIN 6916	0.10	96
27	036000576	SUCTION HOSE ASS-4"BORE STR/STR 730MM LONG	0.00	1
28	036000577	3/4" BSP M/M ADAPTOR	0.00	38
29	036000578	1" BSP M/M ADAPTOR	0.00	6
30	036000579	1" X 1 1/2" BSP M/M ADAPTOR	0.00	4
31	036000580	1 1/4" BONDED SEAL	0.00	6
32	036000583	1 1/4" BSP BLANKING PLUG	0.00	6
33	036000707	3/4" BSP MALE-FEMALE 90 DEGREE ELBOW	0.00	1
34	141791008	MMD 80:1 PRIMARY PLANET CARRIER ASSEMBLY	0.00	1
35	141791010	MMD 80:1 PRIMARY SUN GEAR ASSEMBLY	0.00	1
36	141791011	MMD 80:1 SECONDARY PLANET CARRIER ASSEMBLY	0.00	1
37	141791014	MMD 37/80:1 INPUT SHAFT ASSEMBLY	117.81	1
38	1791003-06	GEARCASE STAGES 1&2 PLANETARY 80:1	1,975.00	1
39	1791004-01	PRIMARY ANNULUS	650.00	1
40	1791005-06	GEARCASE STAGE 4 PLANETARY 80:1	1,245.00	1
41	1791006-01	SECONDARY ANNULUS	1,325.00	1
42	1791007-06	GEARCASE STAGE 6 PLANETARY 80:1	1,710.00	1

MMD MINING MACHINERY DEVELOPMENTS LIMITED
PLANETARY GEARBOX 80:1 RATIO(VOITH)
Part Number : 241791000

MMD MINING MACHINERY DEVELOPMENTS LIMITED
PLANETARY GEARBOX 80:1 RATIO(VOITH)
Part Number : 241791000

MMD MINING MACHINERY DEVELOPMENTS LIMITED
PLANETARY GEARBOX 80:1 RATIO(VOITH)
Part Number : 241791000

43	1791013-01	SECONDARY PLANET SUN GEAR	485.00	1
44	1791031-01	INPUT SEAL HOUSING	15.00	1
45	1791033-01	PRIMARY SUN GEAR SEAL HOUSING	24.00	1
46	1791034-01	PRIMARY LUBRICATION INLET END PLATE	16.20	1
47	1791035-01	SEAL PATH OUTPUT SHAFT	20.00	1
48	1791036-01	OUTPUT SEAL HOUSING	45.00	1
49	1791037-01	COVER PLATE OLI BREATHER	1.70	1
50	1791038-01	LUBRICATION INJECTOR ADAPTOR	0.60	8
51	1791039-01	LUBRICATION GRAVITY FEED CONNECTOR	18.00	1
52	1791040-01	PRIMARY LUBRICATION INLET ADAPTOR	1.20	1
53	1791045-01	M36 X 360 STUD	2.60	24
54	1791046-01	M36 X 625 STUD	4.90	24
55	1791047-01	INPUT LUBRICATION TUBE	9.90	1
56	1791048-01	LUBRICATION MODULE	0.00	1
		Total Mass :-	7,979.74 Kg	

INPUT SHAFT ASSEMBLY

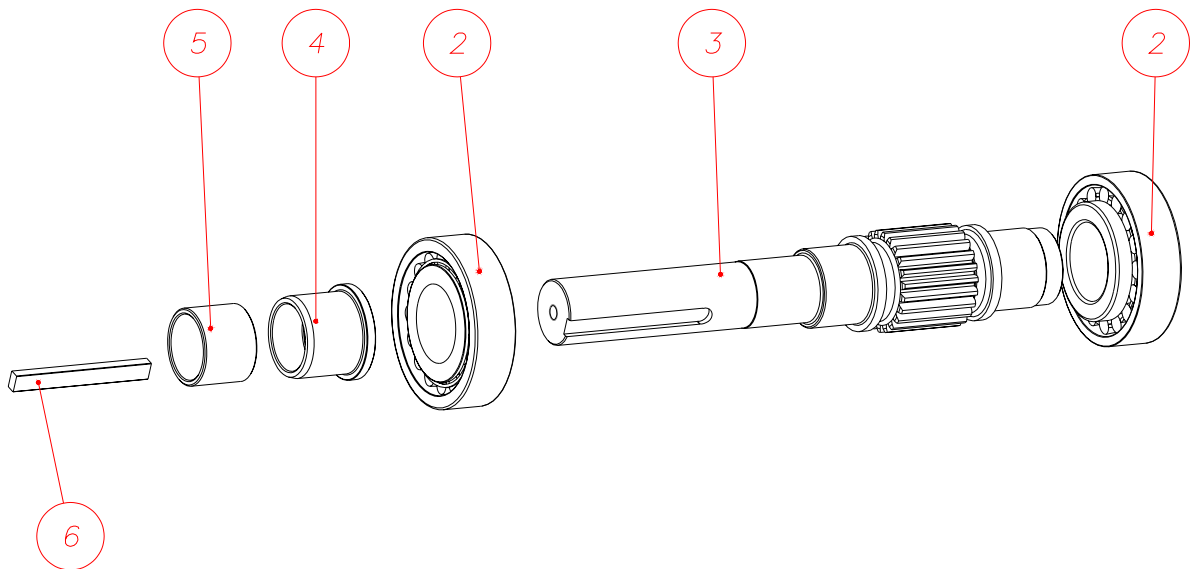
PART NUMBER - 141791014

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	31 - 01 - 05

MMD MINING MACHINERY DEVELOPMENTS LIMITED

MMD 37/80:1 INPUT SHAFT ASSEMBLY

Part Number : 141791014



Item	Part Number	Description	Unit Mass	Qty
1	032000688	RM0993-57 O RING BS4518	0.01	1
2	035000474	32324 J2 TAPER ROLLER BEARING	21.50	2
3	1791014-01	INPUT SHAFT 750TV FLUID COUPLING	68.00	1
4	1791029-01	SEAL PATH INPUT PINION	4.00	1
5	1791030-01	SPACER INPUT SHAFT	2.00	1
6	5090104-01	KEY	0.80	1
		Total Mass :-	117.81 Kg	

**PRIMARY PLANET CARRIER
ASSEMBLY**

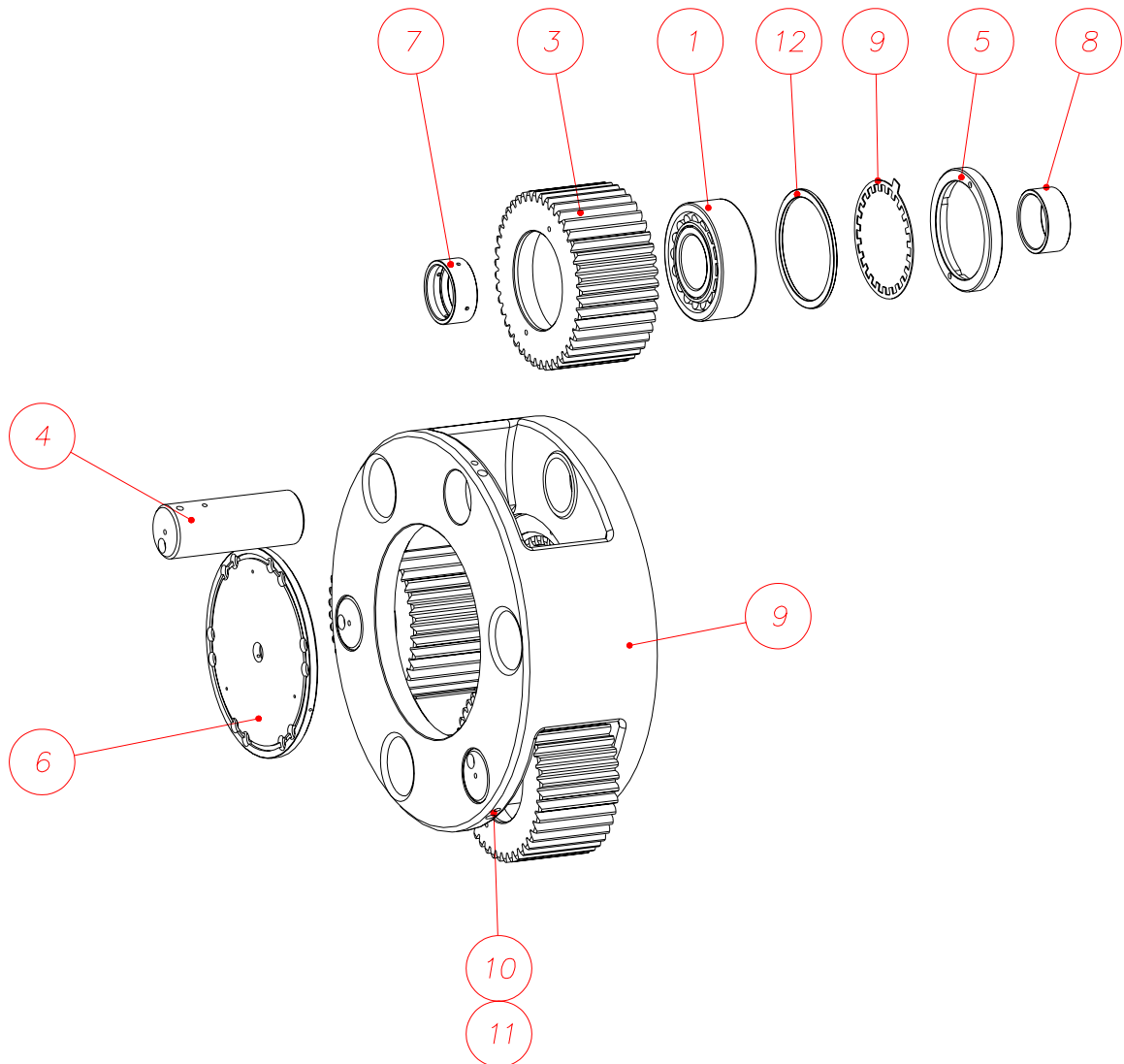
PART NUMBER - 141791008

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	31 - 01 - 06

MMD MINING MACHINERY DEVELOPMENTS LIMITED

MMD 80:1 PRIMARY PLANET CARRIER ASSEMBLY

Part Number : 141791008



Item	Part Number	Description	Unit Mass	Qty
1	035000477	22322 E C3 SPHERICAL ROLLER BEARING	18.00	3
2	1791008-06	PRIMARY PLANET CARRIER	480.00	1
3	1791009-01	PRIMARY PLANET GEAR	75.00	3
4	1791016-01	BEARING PIN-PRIMARY PLANET GEAR	23.00	3
5	1791018-01	M250 LOCKNUT(PRIMARY PLANET GEAR)	3.00	3
6	1791021-01	END PLATE(PRIMARY PLANET CARRIER)	21.00	1
7	1791026-01	SPACER(PRIMARY BEARING PIN)	1.10	3
8	1791027-01	SPACER(PRIMARY BEARING PIN)	1.50	3
9	1791041-01	M250 TAB WASHER(PRIMARY PLANET GEAR)	0.30	3
10	1791043-01	TAB WASHER(PRIMARY BEARING PIN)	0.00	3
11	1791063-01	M16 LOCATING BOLT	0.05	3
12	1791065-01	SPACER-PRIMARY PLANET GEAR	0.00	3
		Total Mass :-	866.85 Kg	

**PRIMARY SUN GEAR
ASSEMBLY**

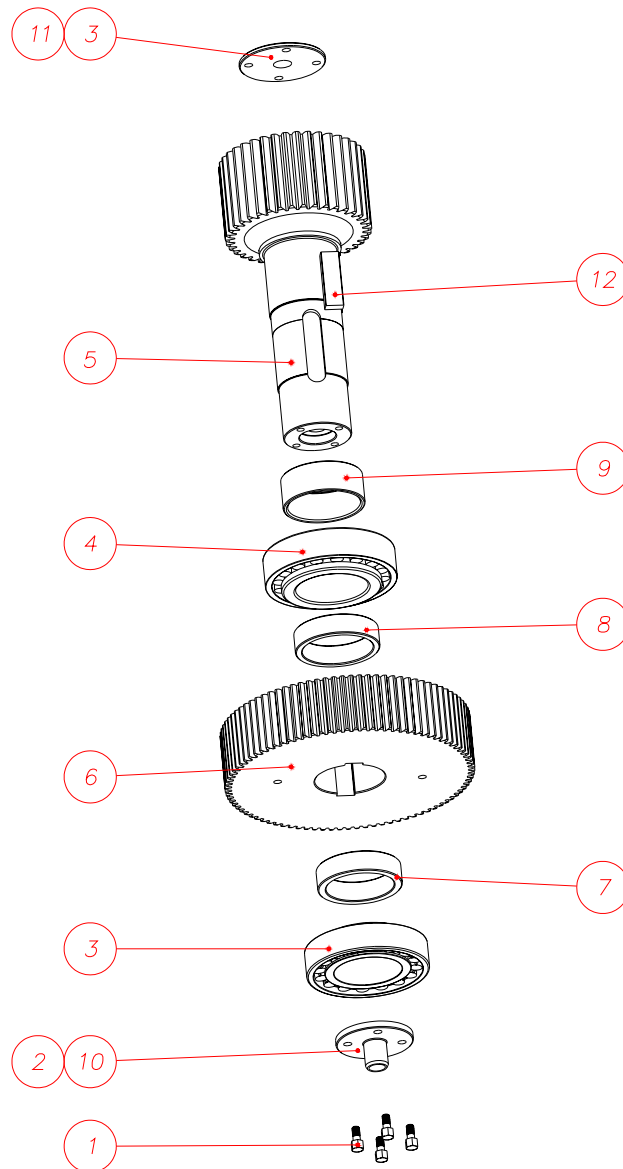
PART NUMBER - 141791010

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	31 - 01 - 06

MMD MINING MACHINERY DEVELOPMENTS LIMITED

MMD 80:1 PRIMARY SUN GEAR ASSEMBLY

Part Number : 141791010



Item	Part Number	Description	Unit Mass	Qty
1	031316035	M16 X 35 HEX SET SCREW BS4168 GR8.8	0.09	8
2	032000707	RM0693-57 O RING	0.00	1
3	035000475	32230 J2 TAPER ROLLER BEARING	17.50	1
4	035000476	32232 TAPER ROLLER BEARING	25.50	1
5	1791010-01	PRIMARY PLANET SUN GEAR	168.00	1
6	1791015-01	1ST REDUCTION WHEEL-PLANETARY 90:1 G/BOX	210.00	1
7	1791023-01	SPACER(PRIMARY SUN GEAR)	3.50	1
8	1791024-01	SPACER(PRIMARY SUN GEAR)	3.00	1
9	1791025-01	SPACER(PRIMARY SUN GEAR)	3.00	1
10	1791032-01	END CAP PRIMARY SUN GEAR	3.40	1
11	1791059-01	THRUST PLATE	0.00	2
12	5090103-01	KEY (40X22X129-SS)PLANETARY GEARBOX	1.00	2
		Total Mass :-	436.62 Kg	

**SECONDARY PLANET CARRIER
ASSEMBLY**

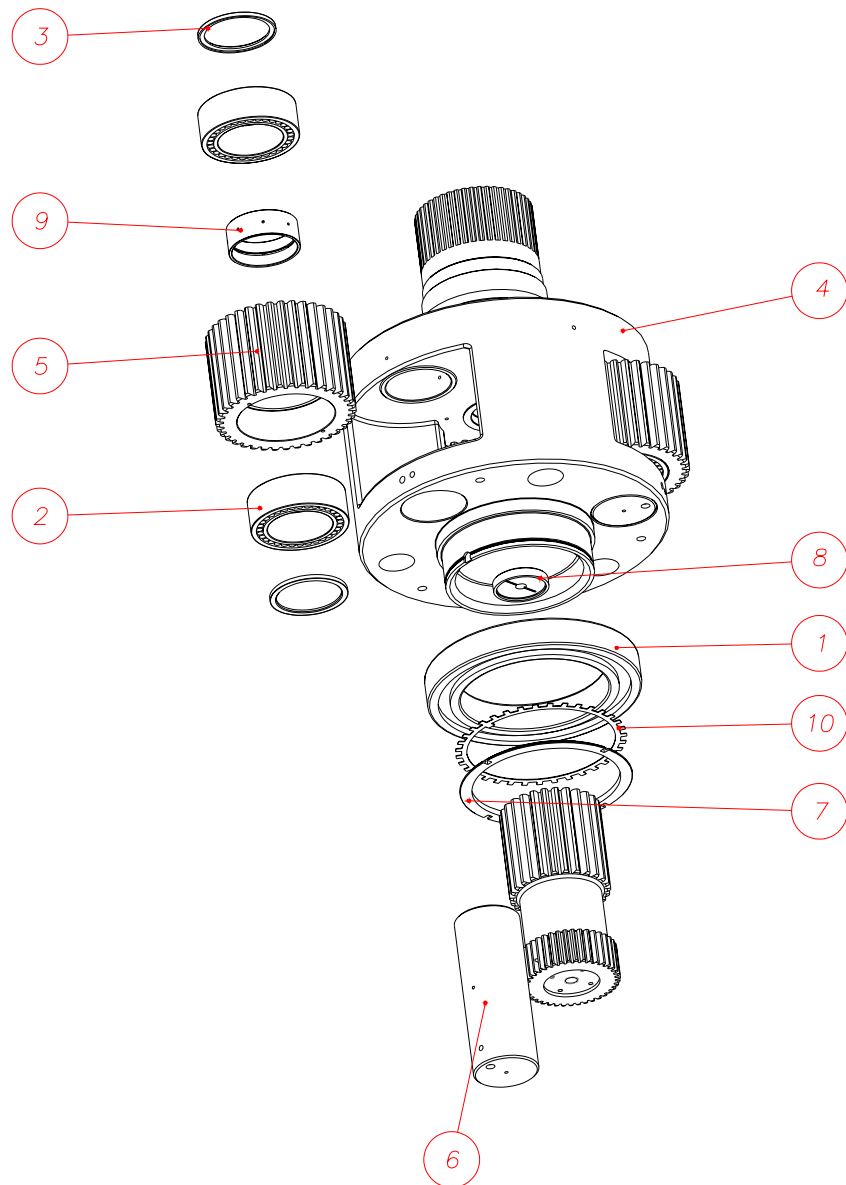
PART NUMBER - 141791011

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	31 - 01 - 06

MMD MINING MACHINERY DEVELOPMENTS LIMITED

MMD 80:1 SECONDARY PLANET CARRIER ASSEMBLY

Part Number : 141791011



Item	Part Number	Description	Unit Mass	Qty
1	035000478	60/500/C4 DEEP GROOVE BALL BEARING	135.00	1
2	035000479	314889/VJ202 FOUR ROW CYL ROLLER BRG	70.00	3
3	035000481	RA 314889/VJ202 ANGLE RING	91.50	6
4	1791011-01	SECONDARY PLANET CARRIER	2,590.00	1
5	1791012-01	SECONDARY PLANET GEAR	185.00	3
6	1791017-01	BEARING PIN-SECONDARY PLANET GEAR	170.00	3
7	1791019-01	M500 LOCKNUT(SECONDARY PLANET CARRIER)	7.60	1
8	1791020-01	THRUST PLATE(SECONDARY PLANET CARRIER)	4.80	1
9	1791028-01	SPACER(SECONDARY BEARING PIN)	4.75	3
10	1791042-01	M500 TAB WASHER(SECONDARY PLANET GEAR)	1.40	1
11	1791044-01	TAB WASHER(SECONDARY BEARING PIN)	0.00	3
12	1791064-01	M24 LOCATING BOLT	0.10	3
		Total Mass :-	4,577.35 Kg	

**MMD 2:1 RATIO
INTERMEDIATE
GEARBOX ASSEMBLY**

PART NUMBER - 241799020

SERIAL NUMBER - S1799020-001 L/H

SERIAL NUMBER - S1799020-002 R/H

OIL CAPACITY - 75LTRS (WORKING LEVEL)

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	00 - 00 - 00

MMD 2:1 RATIO INTERMEDIATE GEARBOX ASSEMBLY

KEYED INPUT PINION

GEARBOX DISMANTLEMENT PROCEDURE

PROCEDURE FOR REMOVAL AND RE-FITTING BEARING ASSEMBLIES ON GEAR TRAIN ASSEMBLIES



IMPORTANT NOTE: IF THE GEARBOX IS TO BE RE-HANDED, ENSURE PLUGS 1786222 AND 030516015 ARE FITTED IN THEIR CORRECT GEARCASE HALF.

REMOVAL

- Split gear coupling and remove gearbox from machine.
- Completely drain oil from gearbox.
- Remove end plates and seal housings, care to be taken not to damage seals.
- Split gearbox case halves, care to be taken not to damage machined faces.
- All assemblies exposed, which can be stripped and rebuilt in the normal way. Standard extractors and press tools can be used for all of these gear trains, but attention should be given to assembly procedure.

ASSEMBLY SCHEDULE FOR 2:1 RATIO SINGLE SPLIT GEARBOX

- Split gearcase and clean all inside surfaces.
- Check for any transportation damage on machined faces and clean up as necessary.
Note: Ensure inside un-machined surfaces have been painted. Check the internal lubrication channels and drillings are perfectly clean and clear.
- Collect pre-selected gears, pinions, bearings and bolts etc., from stores. Fit drain and filler plugs.
Note: All wheels and pinions to be cleaned with a degreasant prior to starting to assemble.
- Using available G.A's and Parts Lists proceed to assembly gear train assemblies.
Note: All items where practicable to be lifted with eye bolts in holes provided especially wheels and final assemblies.

○ **First Item: Input Pinion Assembly**

- (a) Fit keys 5090247 to pinion 1799023.
- (b) Heat bearings 035000669 to 110°C and fit to pinion 1799023.
- (c) Fit 'O' ring 03200757 to seal path 1799025.

○ **Second Item: Output Shaft Assembly.**

- (a) Fit keys 5090237 to pinion 1799024.
- (b) Heat bearings 035000423 to 110°C and fit to output shaft 1799024..
- (c) Fit 'O' ring 03200892 to seal path 1799008.
- (d) Heat seal path 1799008 to 100°C and fit to output shaft 1799024.

NOTE: DO NOT fit Part No 1799008 to shaft 1799024 before the shaft assembly is in position in the gearbox and Part No.1799027 with seals 032000872 are located in the gearcase.

○ **Assemble the Gear Trains in the bottom half of gearcase in the following way:**

- (a) Place input shaft assembly 141799023 and output shaft assembly 141799024 in case.
- b) On new assemblies only, check gear alignment with Engineers Blue to normal criteria BS436: Part 1: Grade 6.
- (c) Now apply oil into all bearings before fitting TOP case.

○ Ensure plugs 1786222, and 032000150 are fitted in the LOWER gearcase half.

○ Ensure plugs 030516015 with 032000150 are fitted in the TOP gearcase half.

○ Put Loctite 573 sealant on all flanges before fitting top case.

○ Position top gearcase and then lower down over gears. Locating with dowels when down, ensuring correct alignment.

○ Check now that all the assemblies are seated correctly. Check from ends with a Vernier Calliper or Depth Micrometer that the bearings are square and if not, adjust accordingly.

○ Fit all bolts as per list and torque to requirements listed below.

○ Rotate the input shaft by hand to ensure free running of all the gear assemblies.

○ Tightening of Bolts.

All bolts are to be nipped up prior to torque setting of bolts.

Note: Tighten to 85% proof load - hydraulic tensioner necessary for this operation
Start to tighten bolts from middle working outwards in a balanced manner.
All the time of tightening check the free running of the gears.
MMD specification T056 must be adhered to.

○ Fit cover plates 1799007. Torque all bolts to 85% Proof Stress.

○ Fit oil seal 032000667 into input seal housing 1799026, then fit 032000872 into output seal housing 1799027, then fit to gear case.

○ Fit 'O' ring 032000855 into input seal housing 1799026 and fit to input shaft 1799023, then fit 'O' Ring 032000774 to output seal housing 1799027 and fit to output shaft 1799024.

.○ INPUT SHAFT ADJUSTMENT.

- (a) Fit seals 032000667 to seal housing 1799026.
- (b) Fit seal housing 1799026 in case and tighten bolts to 10 kg/m.
- (c) Using a Dial Test Indicator and bearing setting tool (141781093) carefully and accurately measure the clearance in the shaft assembly. (See procedure TO114)
- (d) If necessary, remove the seal housing and add or remove shims to give a clearance in the input shaft assembly of 0.35-0.40mm at 1500 rpm, 0.38-0.43mm at 1800 rpm. Repeat bearing clearance measurement procedure and stamp the exact clearance on a label secured on the gearcase near the input shaft
- (e) Fit retaining plate 1799007 onto the case and key 5090247 into the input shaft.
- (f) Fit 'O' ring 032000855 around seal housing 1799026 after final setting.

.○ OUTPUT SHAFT ADJUSTMENT.

- (a) Fit seals 032000872 to seal housing 1799027.
- (b) Fit seal housing 1799027 in case and tighten bolts to 10 kg/m.
- (c) Using a Dial Test Indicator and bearing setting tool (141781093) carefully and accurately measure the clearance in the shaft assembly. (See procedure TO114)
- (d) If necessary, remove the seal housing and add or remove shims to give a clearance in the input shaft assembly of 0.30-0.35 mm at 1500 rpm, 0.38-0.43mm at 1800 rpm.
Repeat bearing clearance measurement procedure and stamp the exact clearance on a label secured on the gearcase near the input shaft
- (e) Fit retaining plate 1799007 onto the case and key 5090237 into the output shaft.
- (f) Fit 'O' ring 032000774 around seal housing 1799027 after final setting.



NOTE:- ALWAYS ENSURE MATING SURFACES ARE CLEAN AND FREE FROM BURRS ETC. IF AT ANY TIME YOU ARE UNSURE, CONSULT MMD. IT IS RECOMMENDED THAT EXPERIENCED PERSONNEL SET THE INPUT SHAFT CLEARANCE.

- Fill with Lubricant.
See below for the recommended oil specification.
- Fit filler breather and protective cover.
- On all new assemblies, set up and run up for a minimum of 8 hours doing regular temperature and vibration checks, having first checked the oil level is correct.
Maximum temperature of bulk oil or any bearing position should not exceed 80°C. If this temperature is reached, switch off and let gearbox cool down.
Re-start and if the maximum temperature is exceeded again, establish the cause and rectify.
- After the first 40 hours of running under load drain the gearbox oil and re-fill with new oil to the correct level.



NOTE:- IF THE GEARBOX IS EVER RE-HANDED, ENSURE PLUGS 1786222, AND 030516015 ARE REMOVED AND FITTED INTO THE RELEVANT CASE HALF.

MMD GEARBOX PREVENTATIVE MAINTENANCE SCHEDULE

- The oil level must be checked daily, as a minimum. Overfilling is known to have serious detrimental effects and is as important as underfilling. An oil level dipstick is provided on the gearbox for checking the oil level. This is carried out by removing the dipstick and wiping with a cloth. Re-insert the dipstick and remove. The level of oil will be visible on the dipstick, and it must be within the machined portion of the dipstick, preferably in the middle of this portion. Always top up the oil level with the correct specification lubricant.
- All leaks must be traced, and rectified immediately. Always establish the cause and rectify. The input shaft seals should be checked every 5,000 operational hours. The output shaft seals should be checked every 10,000 operational hours. When checking the input shaft seals ensure the seal housing is fitted perfectly clean and free from burrs. Correctly torque up all fasteners where applicable.
- For optimum utilisation of oil we recommend that the oil change period should be determined by analysis. The maximum analysis period must not exceed 250 operating hours. If analysis of the oil samples is not carried out then the oil must be changed every 1,500 operating hours, or at a 6 month period at a maximum.

From I.C.P metals analysis results any readings outside one or more of the following parameters must result in an oil change:-

- 1) Change in viscosity (from nominal), + 6% to 10%.
- 2) Emulsified water 15,000 PPM (1.5%) maximum.
- 3) Free water 350 PPM (0.035%) maximum.
- 4) Total solids ingress (non metallic) 5,000 PPM (0.5%) maximum.
- 5) Silica 100 PPM (0.01%) maximum.
- 6) Aluminium (Al.), from Aluminium Silicate from environment 100 PPM (0.01%) maximum.
- 7) Iron (Fe) 100 PPM (0.01%) maximum.
- 8) Copper (Cu) 30 PPM (0.003%) maximum.
- 9) Zinc (Zn) 30 PPM (0.003%) maximum.
- 10) Chrome (Cr), Nickel (Ni), Manganese (Mn) 3 PPM (0.0003%).

If after an oil change, symptoms repeat in decreasing time spans then an in depth inspection must commence. It is recommended to plot the iron content graphically against a time base to allow assessment of the gearbox condition. We would suggest specialist condition monitoring such as the "Pennine 4C condition monitoring program".

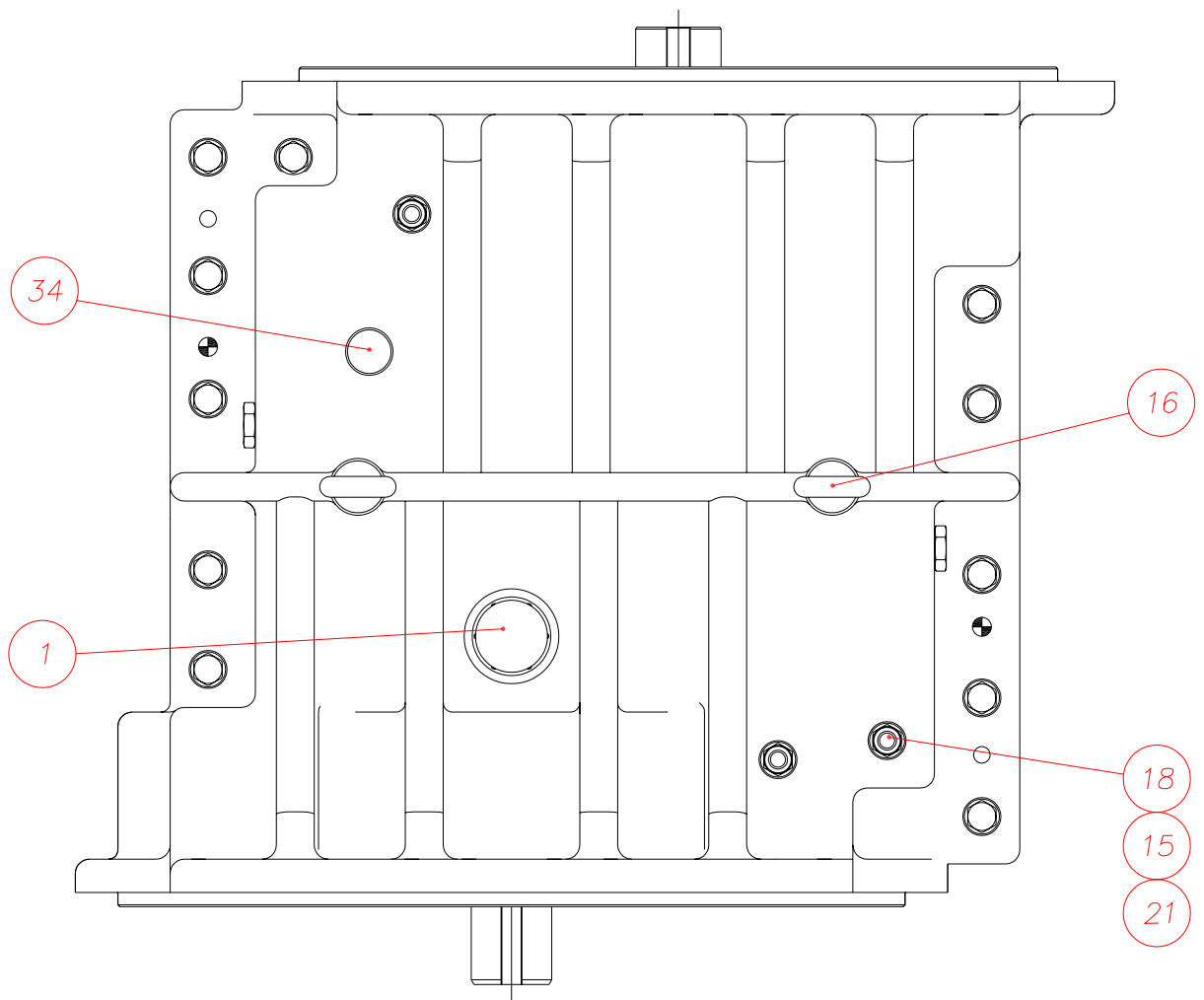
The lubricant specification is:-

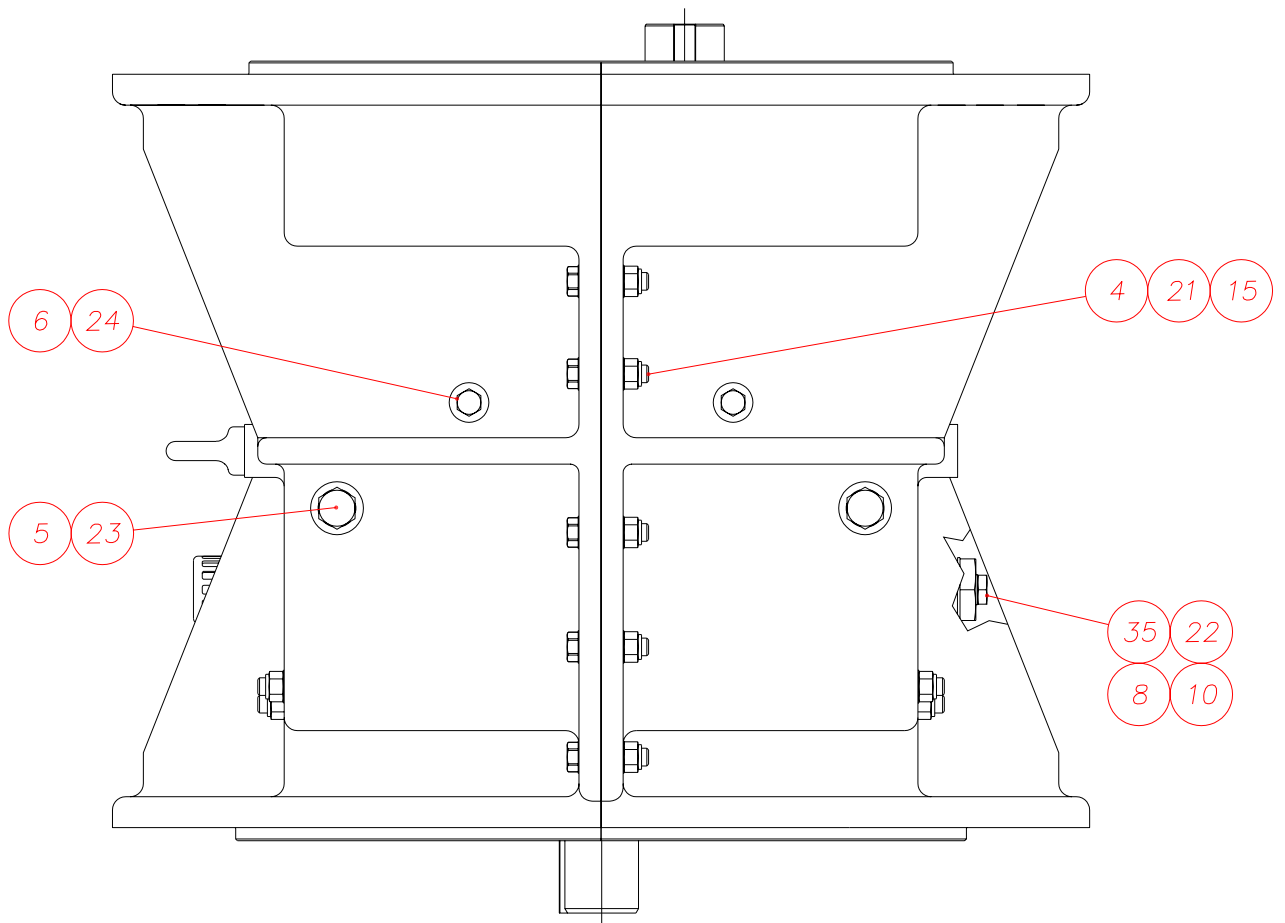
ISO VG 320 Premium quality, Heavy Duty, Sulphur Phosphorous EP Gear Lubricant, 320 centistokes viscosity at 40°C. Viscosity index IP 226 85 to 95. The lubricant should have good water shedding properties (minimum FZG load stage 12).

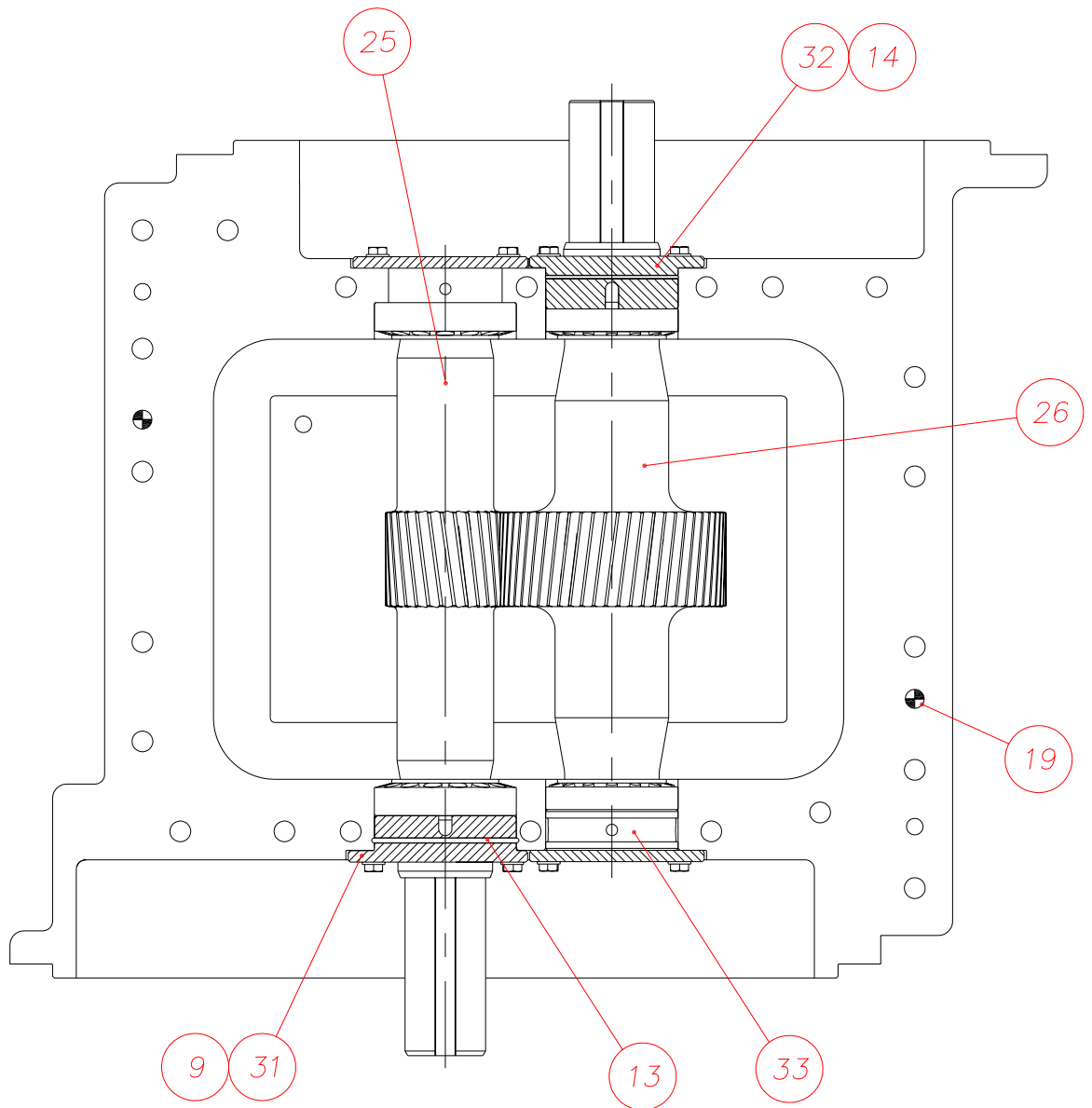


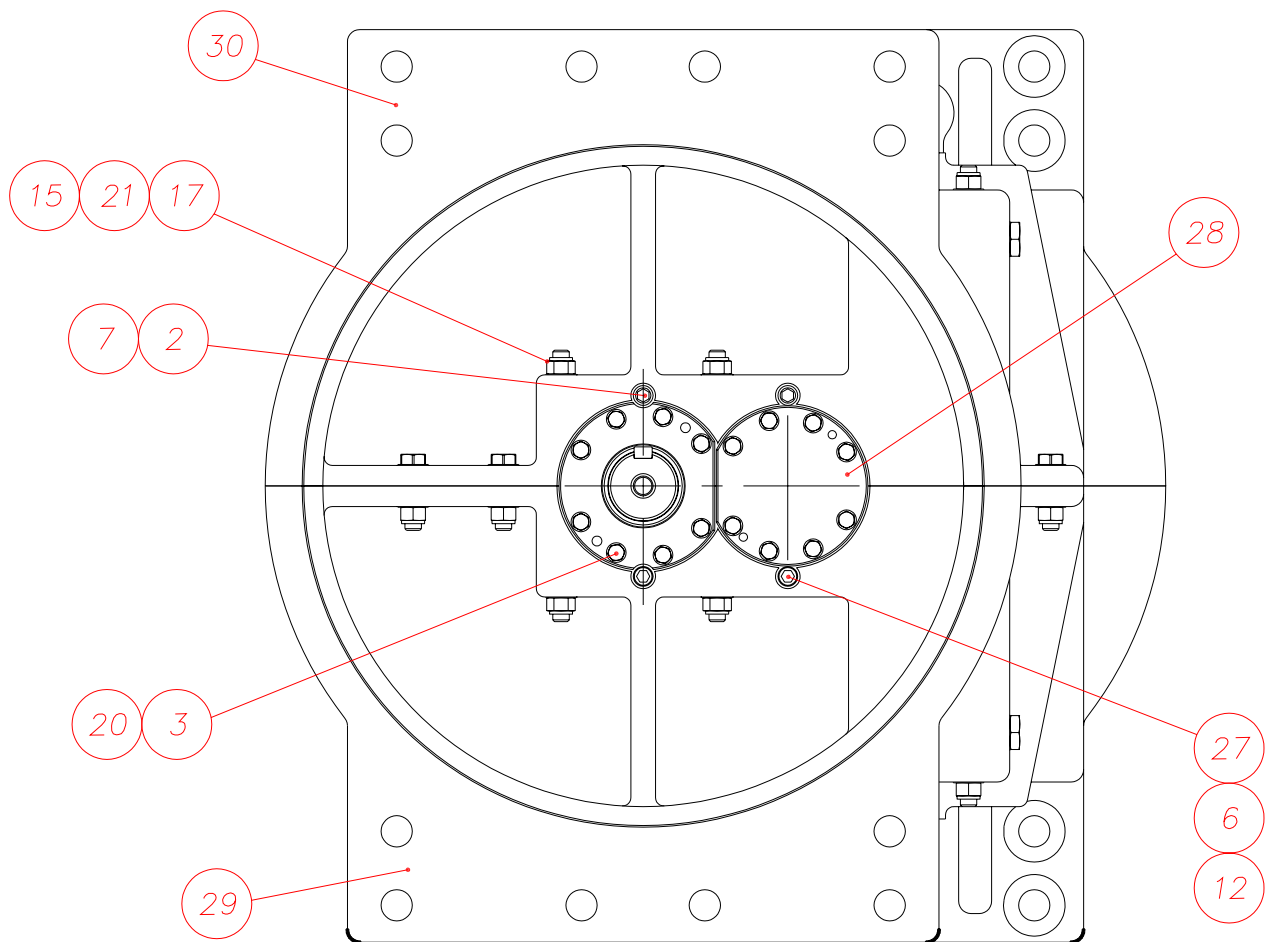
NOTE ALWAYS OBTAIN THE LUBRICANT FROM A REPUTABLE SUPPLIER. IT SHOULD BE BORNE IN MIND THAT IT IS NOT UNKNOWN FOR NEW BARRELS OF OIL TO CONTAIN WATER, WHICH CAN HAVE A CATASTROPHIC EFFECT ON THE INTERNAL PARTS OF THE GEARBOX.

- The fluid coupling protects the gearbox from motor inertia and shock loads. It must never be overfilled, and always use the correct fusible plugs. If a fault is suspected with the fluid coupling it must be rectified immediately. More detailed information on the coupling is supplied with the machine manual.





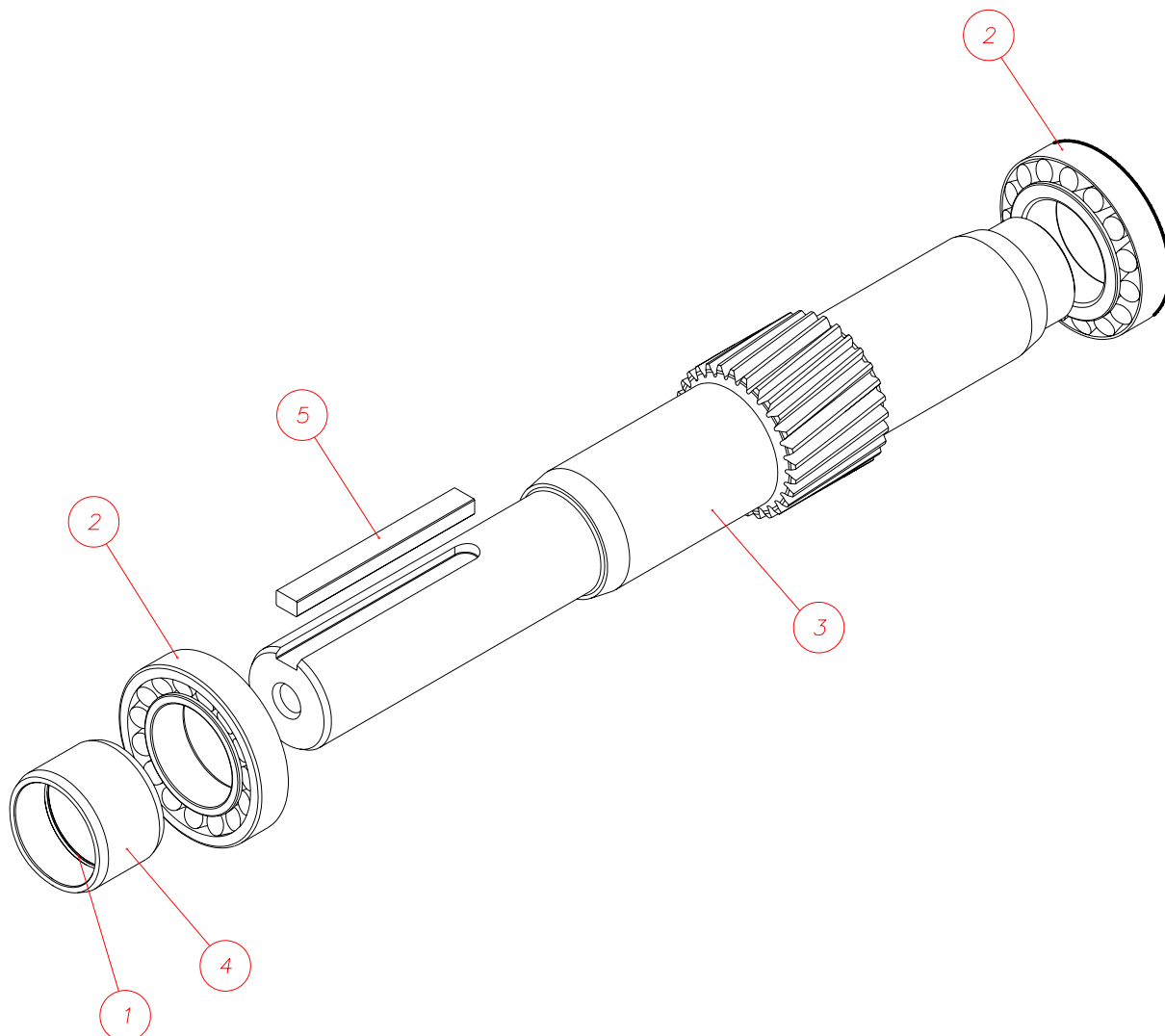




Part Number : 241799020

Gearbox Assembly, Page 13 of 15

MMD MINING MACHINERY DEVELOPMENTS LIMITED
INPUT SHAFT ASSEMBLY
Part Number : 141799023

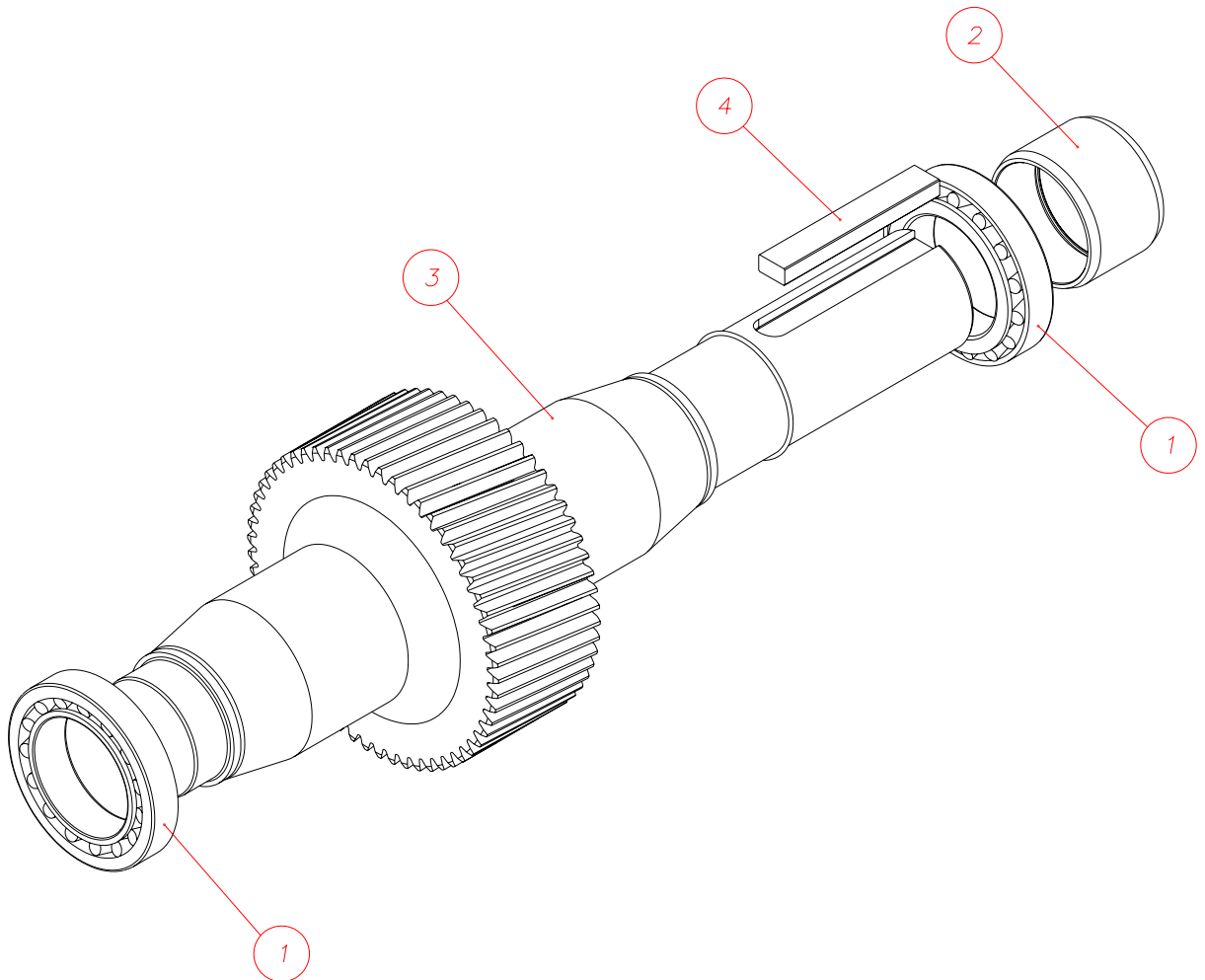


Item	Part Number	Description	Unit Mass	Qty
1	032000757	RM0845-30 O RING	0.10	1
2	035000669	32217 J2/Q TAPER BEARING	5.00	2
3	1799023-01	INPUT PINION	45.90	1
4	1799025-01	SEAL PATH	1.10	1
5	5090247-01	KEY	0.50	1
		Total Mass :-	57.60 Kg	

MMD MINING MACHINERY DEVELOPMENTS LIMITED

OUTPUT SHAFT ASSEMBLY

Part Number : 141799024



Item	Part Number	Description	Unit Mass	Qty
1	035000423	32018 XQ BEARING	1.75	2
2	1799008-01	SEAL PATH	0.90	1
3	1799024-01	OUTPUT PINION	78.20	1
4	5090237-01	KEY	0.40	1
		Total Mass :-	83.00 Kg	

**VOITH 650 TVSC
FLUID COUPLING HOUSING
ASSEMBLY**

PART NUMBER - 141501520 (AS DRAWN)

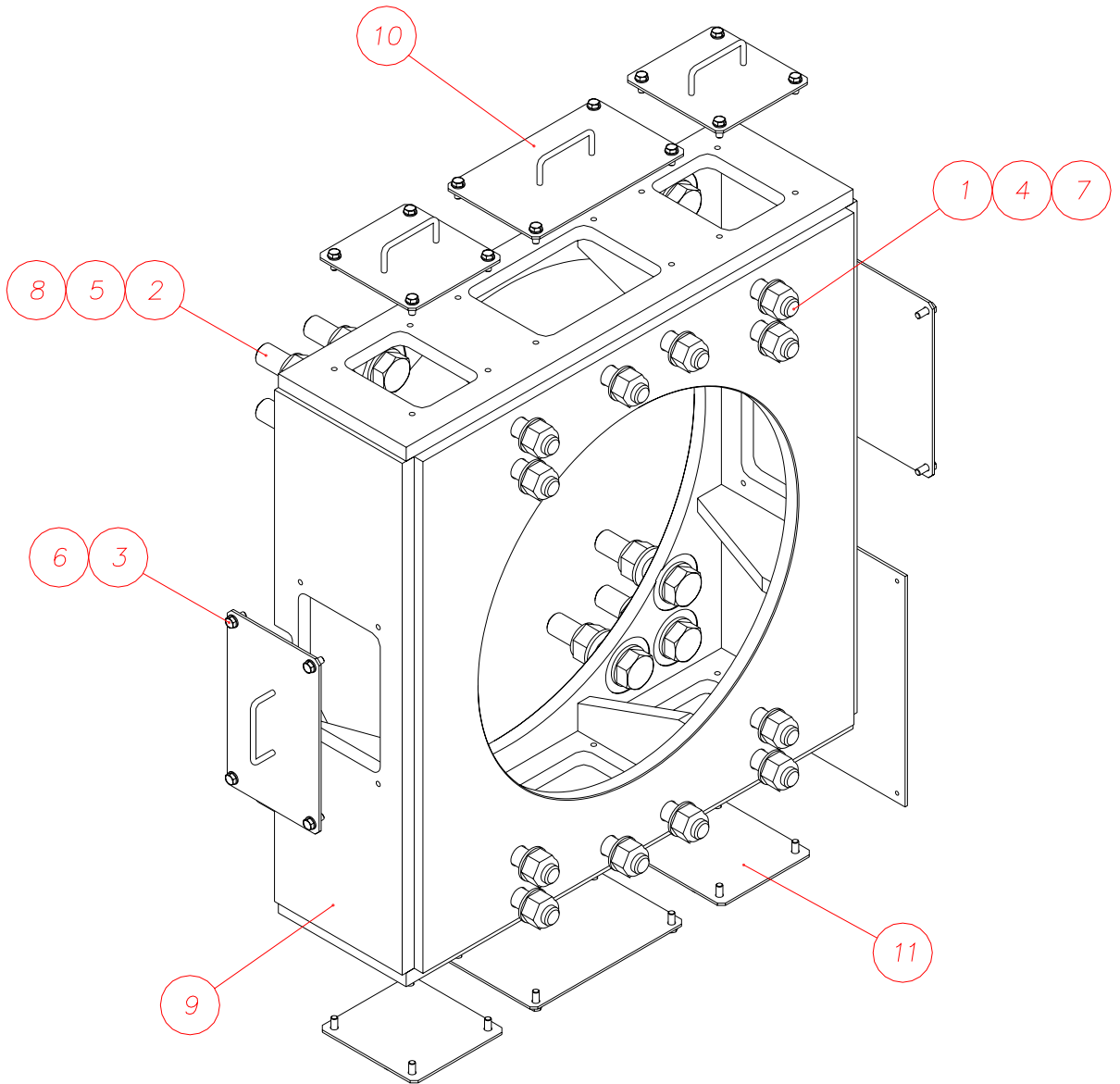
PART NUMBER - 141501521 (OPP. HAND)

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	29 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FLUID COUPLING HOUSING ASSEMBLY

Part Number : 141501520



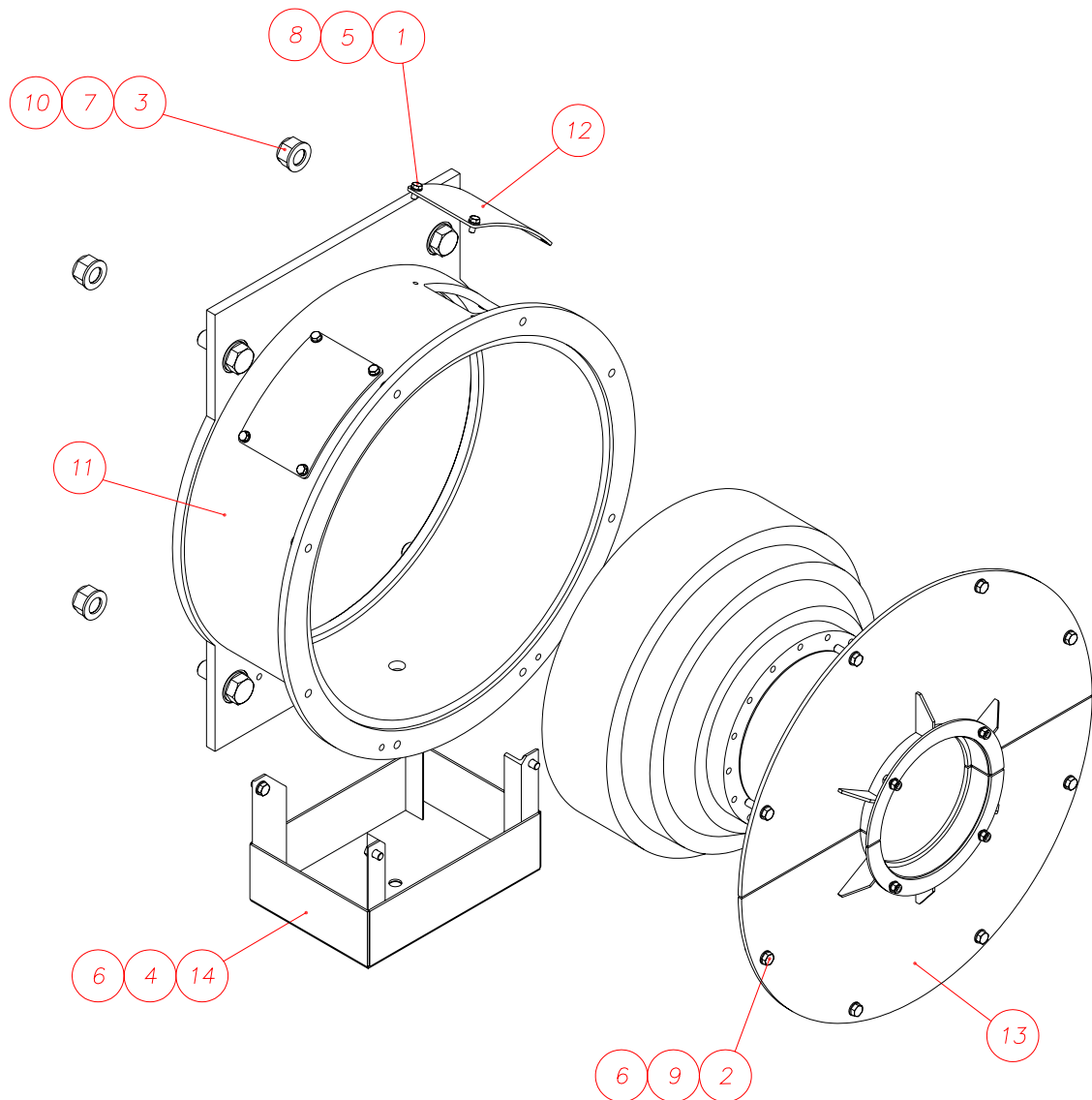
Item	Part Number	Description	Unit Mass	Qty
1	030336120	M36 X 120 HEX BOLT EN24014 GR8.8	1.41	12
2	030342130	M42 X 130 HEX BOLT EN24014 GR8.8	0.00	12
3	031312030	M12 X 30 HEX SET SCREW BS4168 GR8.8	0.04	32
4	031436000	M36 NYLOC NUT BS4929	0.36	12
5	031442000	M42 NYLOC NUT BS4929	0.62	12
6	035612000	M12 HV WASHER SPECIFICATION DIN 6916	0.01	32
7	035636000	M36 HV WASHER SPECIFICATION DIN 6916	0.10	24
8	035642000	M42 HV WASHER SPECIFICATION DIN 6916	0.16	24
9	1501520-85	COUPLING HOUSING	640.90	1
10	1501528-84	COVER PLATE	3.50	4
11	1501529-84	SMALL COVER PLATE	2.30	4
		Total Mass :-	700.62 Kg	

**VOITH 650 TVSC
FLUID COUPLING HOUSING
ASSEMBLY**

PART NUMBER - 141501523

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	29 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED
COUPLING HOUSING ASSEMBLY
Part Number : 141501523



Item	Part Number	Description	Unit Mass	Qty
1	030312025	M12 X 25 HEX BOLT EN24014 GR8.8	0.04	12
2	030316050	M16 X 50 HEX BOLT EN24014 GR8.8	0.12	8
3	030336070	M36 X 70 HEX BOLT EN24014 GR8.8	0.00	4
4	031316025	M16 X 25 HEX SET SCREW BS4168 GR8.8	0.08	4
5	031412000	M12 NYLOC NUT BS4929	0.02	4
6	031416000	M16 NYLOC NUT BS4929	0.03	8
7	031436000	M36 NYLOC NUT BS4929	0.36	4
8	035612000	M12 HV WASHER SPECIFICATION DIN 6916	0.01	8
9	035616000	M16 HV WASHER SPECIFICATION DIN 6916	0.01	20
10	035636000	M36 HV WASHER SPECIFICATION DIN 6916	0.10	8
11	1501523-01	COUPLING HOUSING	236.20	1
12	1501524-01	COVER PLATE	2.70	2
13	1501525-01	PROP SHAFT COVER SUPPORT	32.50	2
14	1501527-01	OIL CATCHER TRAY	20.70	1
		Total Mass :-	311.20 Kg	

**PROP SHAFT COVER
ASSEMBLY**

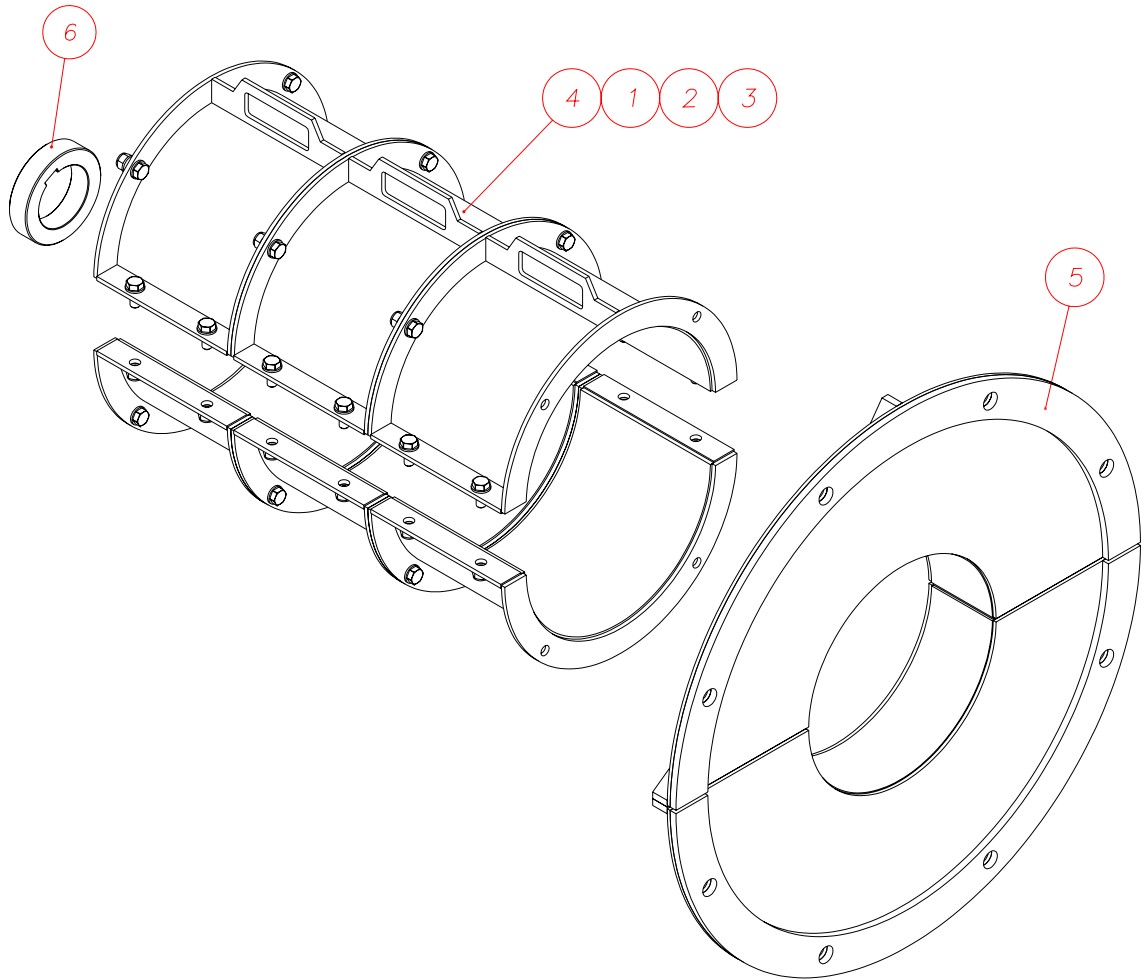
PART NUMBER - 141501526

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED

PROP SHAFT COVER ASSEMBLY

Part Number : 141501526

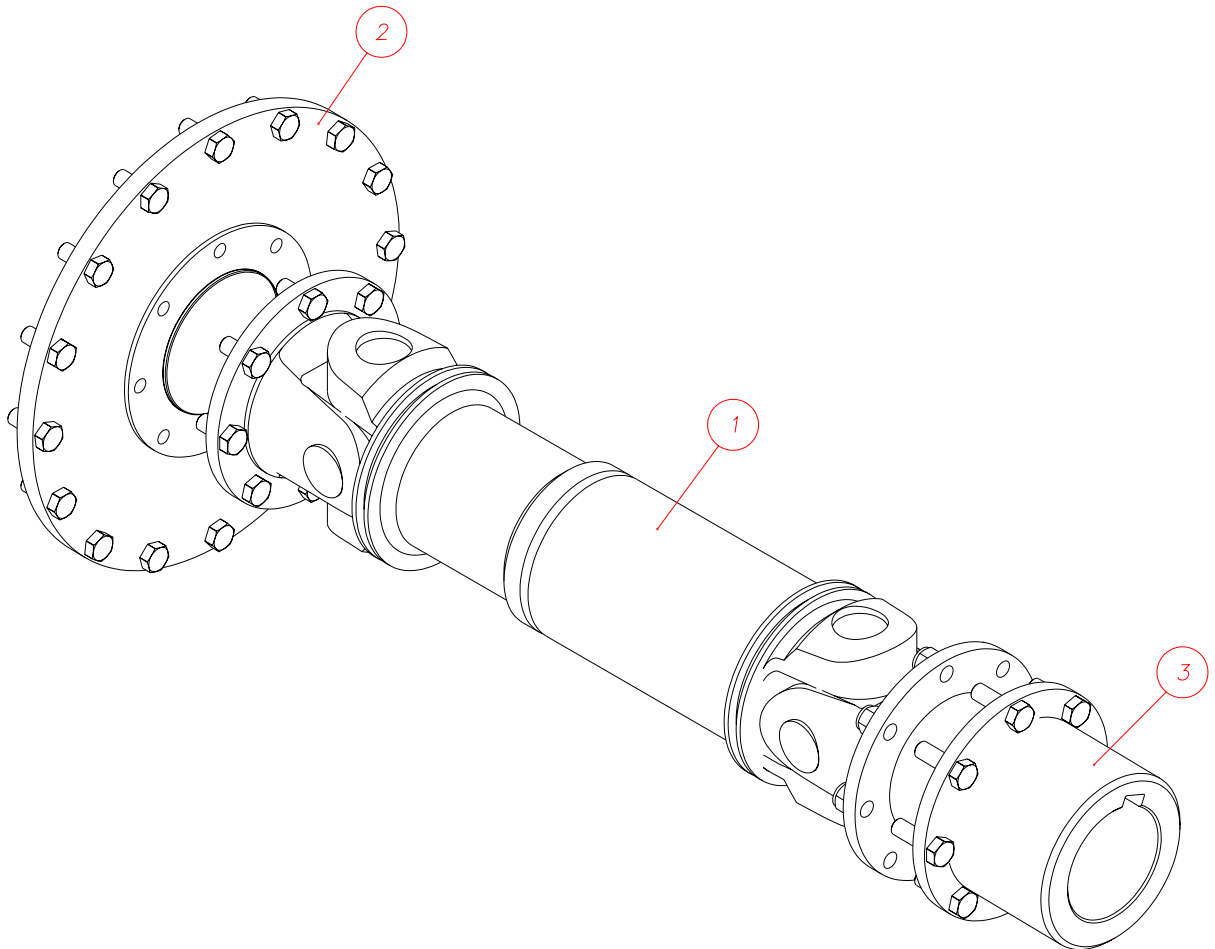


Item	Part Number	Description	Unit Mass	Qty
1	030312030	M12 X 30 HEX BOLT EN24014 GR8.8	0.04	28
2	031412000	M12 NYLOC NUT BS4929	0.02	28
3	035612000	M12 HV WASHER SPECIFICATION DIN 6916	0.01	56
4	1501526-85	PROP SHAFT COVER	8.40	12
5	1501534-84	MOTOR PROP SHAFT COVER	19.60	4
6	1501539-01	MOTOR SHAFT SPACER	1.80	2
		Total Mass :-	31.04 Kg	

**VOITH CARDEN SHAFT DRIVE
SHAFT ASSEMBLY**

PART NUMBER - 241791103

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED**VOITH CARDEN SHAFT MT 225.8 DRIVE ASSEMBLY****Part Number : 241791103**

Item	Part Number	Description	Unit Mass	Qty
1	023300393	VOITH CARDAN SHAFT TYPE MT225.8	160.00	1
2	023300396	ADAPTOR FLANGE FOR 650 TVSC COUPLING		1
3	023300397	VOITH COMPANION FLANGE 24.0008.10		1
		Total Mass :-	160.00 Kg	

WHEEL CARRIAGE ASSEMBLIES

PART NUMBER - 145040591 - FRONT (AS DRAWN)

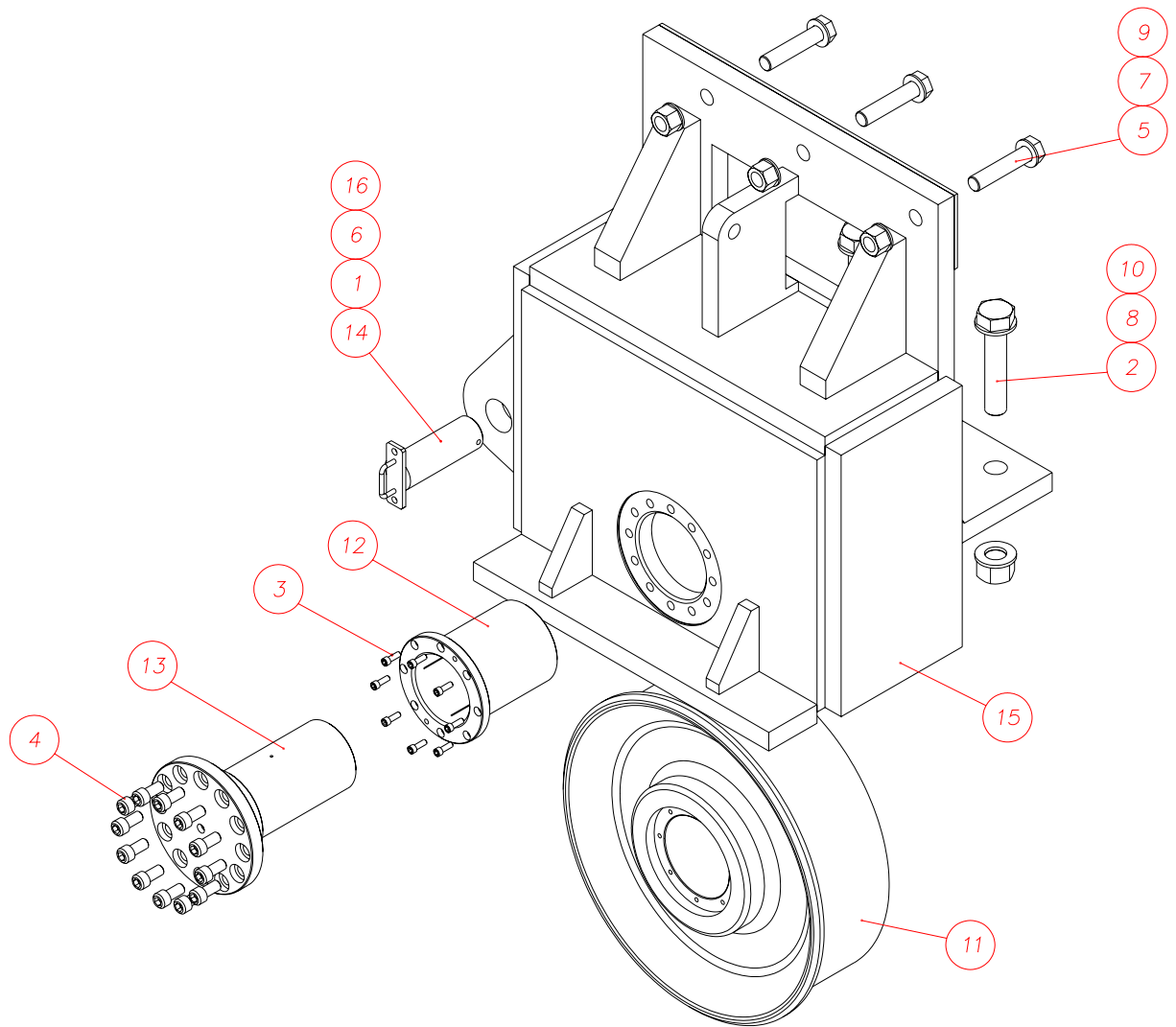
PART NUMBER - 145040592 - FRONT (OPP. HAND)

PART NUMBER - 145040589 - REAR (AS DRAWN)

PART NUMBER - 145040590 - REAR (OPP. HAND)

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	09 - 12 - 05
2.0	SECTION REVISED & CORRECTED	27 - 06 - 07

Part Number : 145040591

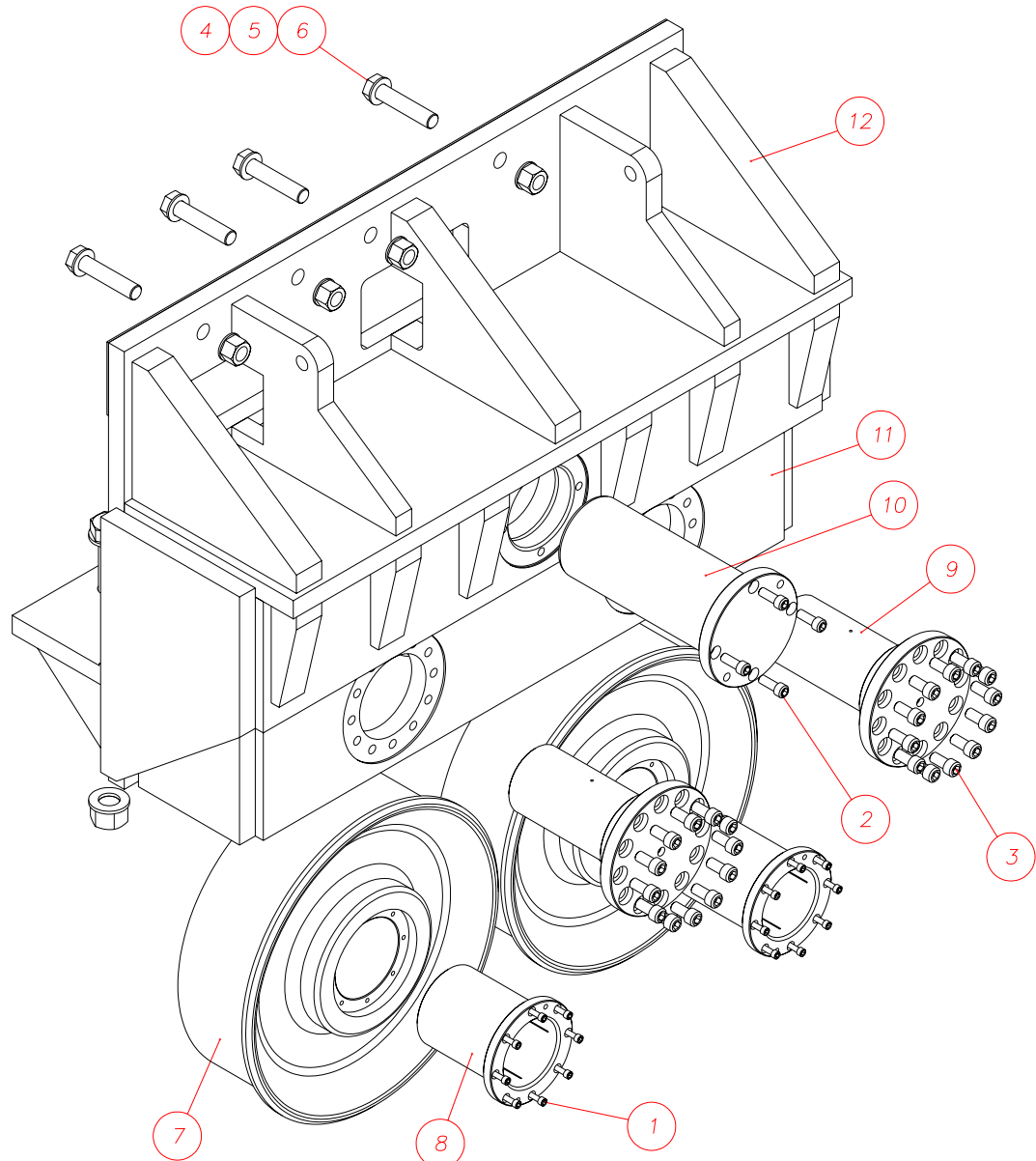


Item	Part Number	Description	Unit Mass	Qty
1	030310140	M10 X 140 HEX BOLT EN24014 GR8.8	0.70	1
2	030348240	M48 X 240 HEX BOLT EN24014 GR8.8	4.20	2
3	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	8
4	030524050	M24 X 50 SKT CAP SCREW BS4168	0.30	12
5	030836170	M36 X 170 HEX HD BOLT GR10.9	2.60	3
6	031410000	M10 NYLOC NUT BS4929	0.02	1
7	032736000	M36 HEX NUT 1XD THK EN24014 GR8.8	0.40	3
8	032748000	M48 HEX NUT 1XD THK BS EN 24032 GR8.8	1.00	2
9	035636000	M36 HV WASHER SPECIFICATION DIN 6916	0.10	6
10	035648000	M48 HV WASHER SPECIFICATION DIN 6916	0.28	4
11	1501096-85	WHEEL	590.00	1
12	1501097-01	BUSH	25.00	1
13	1501098-01	PIN FOR CAST WHEEL	88.00	1
14	5020206-01	PIN	15.00	1
15	5040591-85	CORNER WHEEL CARRIAGE	1,325.80	1
16	5040667-01	COLLAR	3.00	1
		Total Mass :-	2,072.64 Kg	

MMD MINING MACHINERY DEVELOPMENTS LIMITED

REAR CORNER WHEEL CARRIAGE ASSEMBLY

Part Number : 145040589



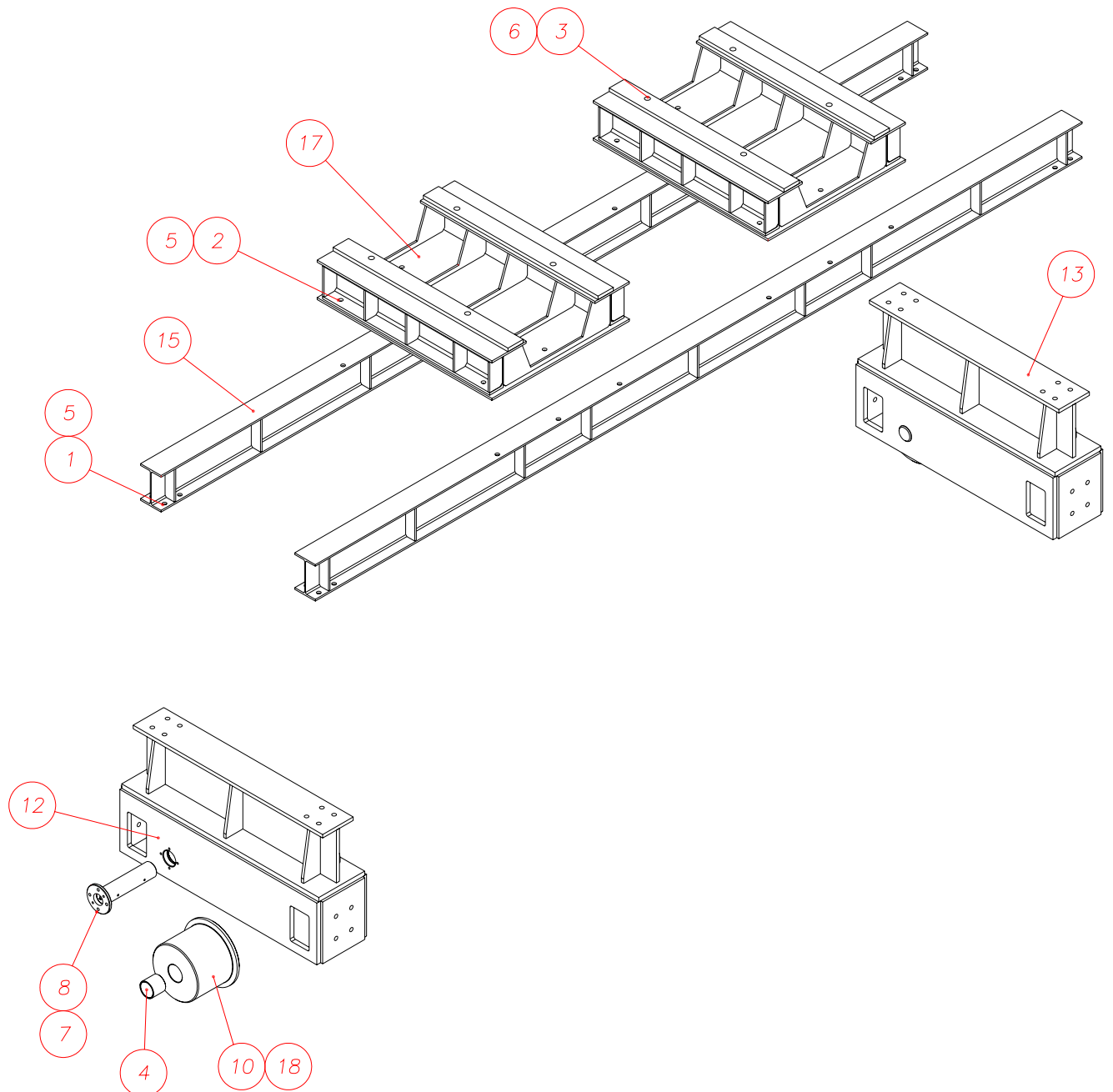
Item	Part Number	Description	Unit Mass	Qty
1	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	16
2	030520055	M20 X 55 SKT CAP SCREW BS4168	0.18	4
3	030524050	M24 X 50 SKT CAP SCREW BS4168	0.30	24
4	030836170	M36 X 170 HEX HD BOLT GR10.9	0.00	4
5	031436000	M36 NYLOC NUT BS4929	0.36	4
6	035636000	M36 HV WASHER SPECIFICATION DIN 6916	0.10	8
7	1501096-85	CAST WHEEL	590.00	2
8	1501097-01	BUSH	25.00	4
9	1501098-01	PIN FOR CAST WHEEL	88.00	2
10	1501113-01	PIVOT PIN	140.00	1
11	1501275-85	WHEEL CARRIAGE	1,025.00	1
12	5040589-85	CORNER WHEEL CARRIAGE	2,247.50	1
		Total Mass :-	4,889.86 Kg	

**ELECTRIC MOTOR SUPPORT
WHEEL CARRIAGE ASSEMBLY**

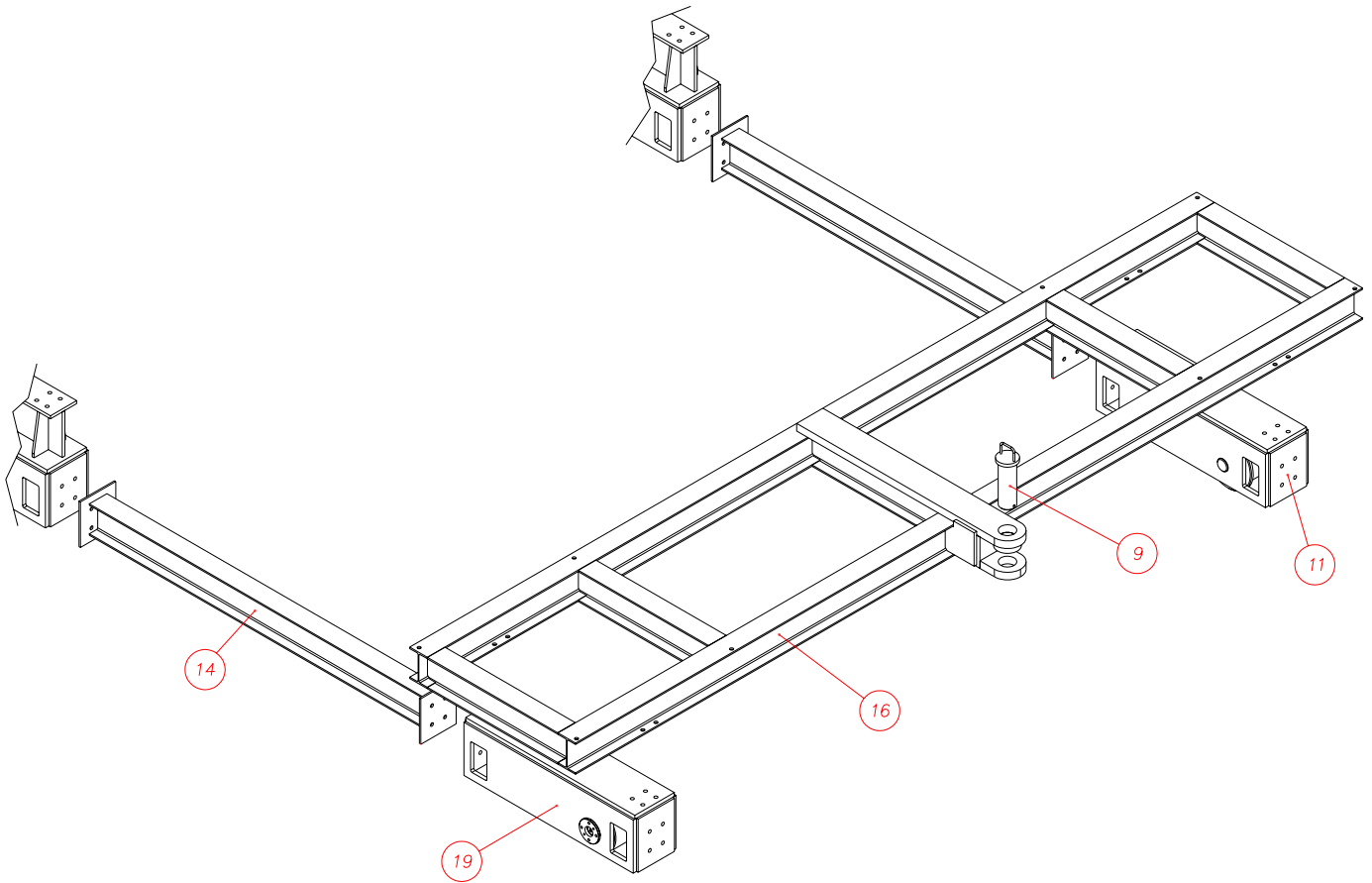
PART NUMBER - 145040607

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	28 - 06 - 07

MMD MINING MACHINERY DEVELOPMENTS LIMITED
ELECTRIC MOTOR SUPPORT WHEEL CARRIAGE ASSEMBLY
Part Number : 145040607



MMD MINING MACHINERY DEVELOPMENTS LIMITED
ELECTRIC MOTOR SUPPORT WHEEL CARRIAGE ASSEMBLY
Part Number : 145040607



Item	Part Number	Description	Unit Mass	Qty
1	030320065	M20 X 65 HEX BOLT EN24014 GR8.8	0.24	16
2	030320070	M20 X 70 HEX BOLT EN24014 GR8.8	0.25	16
3	030324065	M24 X 65 HEX BOLT EN24014 GR8.8	0.36	12
4	035000671	PWM 80 90 80 BRASS BUSH	0.00	8
5	035620000	M20 HV WASHER SPECIFICATION DIN 6916	0.02	96
6	035624000	M24 HV WASHER SPECIFICATION DIN 6916	0.04	24
7	036000604	1/4 BSP GREASE NIPPLE	0.01	4
8	5020177-01	WHEEL PIN	14.30	4
9	5020183-01	PIN – GEARBOX MOUNTING PLATE TO CARRIAGE	20.40	1
10	5040593-01	CAST WHEEL	130.90	4
11	5040607-85	CORNER WHEEL CARRIAGE	268.30	1
12	5040608-85	CORNER WHEEL CARRIAGE	384.90	1
13	5040609-85	CORNER WHEEL CARRIAGE	384.90	1
14	5040610-84	INTERMEDIATE JOINING BEAM	90.00	2
15	5040611-84	MOTOR SUPPORT TIE BEAM	165.90	2
16	5040612-84	COOLER SUPPORT FRAME WITH TOWING BRACKET	681.50	1
17	5040613-85	MOTOR CRADLE	283.30	2
18	5040618-01	WHEEL WASHER	2.70	8
19	5040620-85	CORNER WHEEL CARRIAGE	268.30	1
		Total Mass :-	3,704.18 Kg	

**MMD 150 SERIES TWIN
SHAFT MINERAL SIZER**

**PRINCIPLES OF OPERATION &
MAINTENANCE SCHEDULE**

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	21 - 06 - 05

MMD TWIN SHAFT MINERAL SIZER

Principles Of Operation

The MMD Mineral SIZER accepts the product in through the top of the SIZER, delivery being from any angle. The two rotating shafts have attached the appropriate sizing teeth which pass the total product, undersize and oversize, down through the SIZER.

The undersized product is passed through the rotating teeth without further degradation, whilst the oversized product is presented to the teeth in such a manner that the weakness of the material in tension is exploited to the advantage. The size of the broken product can be controlled in all three planes, giving an accurately sized product, which is then passed to the underside of the SIZER.

The SIZER is made of extremely robust construction and of adequate strength to withstand continuous heavy duty operation.

The machined sideframes are of ribbed construction fabricated from structural steel with easily replaceable steel wearplates covering all the inside area of the sizing chamber. Suitable drillings readily accept the fitting of hopper and chute work.

The main shafts are machined from high strength alloy steel bar which are supported by self aligning double row spherical roller bearings which are situated in heavy duty housings. The bearings are lubricated by grease at both ends of the SIZER and are protected by heavy duty lip seals which are further protected by a grease filled double labyrinth to prevent the ingress of water, dirt, etc.

The actual sizing elements are manufactured to MMD's own specification, various specialist materials have been developed to suit particular requirements.

Important Note On Operation

Running machines without load for extended periods is known to have serious detrimental effects. This can cause damage to the bearings. It must therefore be part of the operating procedure that when the machine is not being fed material for an extended period it must be shut down.

SIZER Lifting Procedure

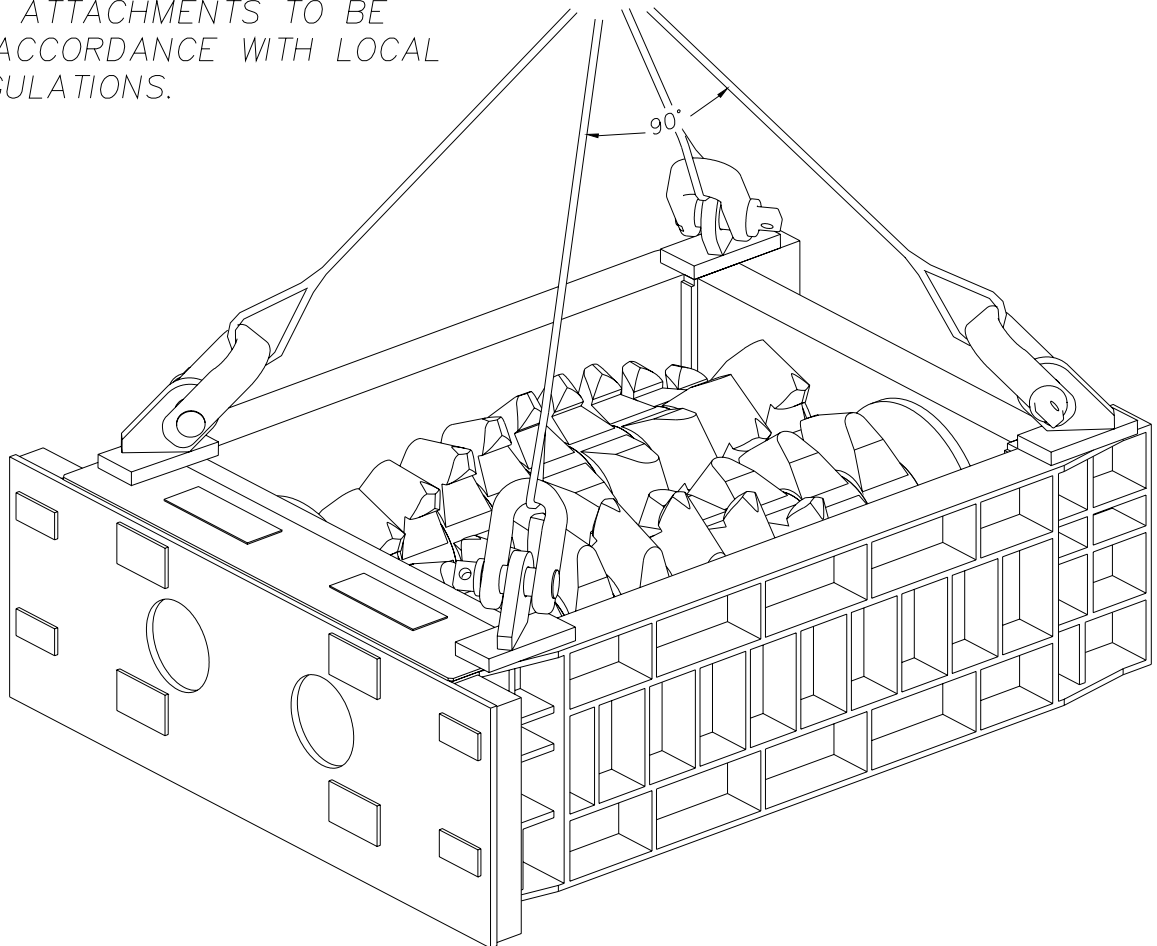
The MMD SIZER comes supplied with lifting lugs which are fixed to the top of the machine side plates to allow for relevant lifting attachments to move and site the SIZER.

Note:- All local regulations must be adhered to and the correct safety regulations enforced whilst lifting the equipment.

Once the SIZER has been correctly mounted in position, the lifting equipment can then be released and the lifting lugs removed and stored in a safe place for future use.

SIZER LIFTING DIAGRAM

ALL ATTACHMENTS TO BE
IN ACCORDANCE WITH LOCAL
REGULATIONS.



NOTE. LIFTING BRACKETS PROVIDED BY MMD FOR LIFTING MACHINES ARE INTENDED FOR LIFTING THE MACHINE BLOCK ASSEMBLY ONLY. DO NOT ATTEMPT TO LIFT THE MACHINE WITH THE LIFT BRACKETS WHILST GEARBOXES & MOTORS ARE BOLTED TO THE MACHINE FRAME.

Safe Operating Procedure

BEFORE ANY WORK IS CARRIED OUT ON THE SIZER OR ANY OF ITS ANCILLIARIES, ISOLATE THE POWER SUPPLY, AND REMOVE THE CABLE FROM THE SIZER DRIVE ELECTRIC MOTOR. UNLESS THE ABOVE OPERATION IS CARRIED OUT, NO PERSON OR PERSONS SHALL STAND ON THE MACHINE.

- O Installation of safety guards and hand rails shall be the responsibility of the customer at the time of commissioning.
- O During operation of the machine, no person or persons should violate the safety guards and hand rails in its vicinity.
- O Unless otherwise stated, MMD will not be responsible for the safe siting of the machine, and/or any requirements appertaining to operating codes of practice.
- O MMD will not be responsible for the use or operation of the machine for any purpose other than the specified / accepted operation requirement in the official order.
- O It is understood any maintenance carried out in accordance with this manual shall be by a person or persons qualified to carry out such practice in compliance with the safety requirements of the operating company.

NOTE: FAILURE TO COMPLY WITH ANY OF THE ABOVE PROCEDURES IS DONE SO AT THE OPERATOR'S OWN RISK.

Commissioning Procedure

If the SIZER is removed from the working position for major overhauls or modifications, it will also be necessary to re-commission it prior to re-starting.

- O Carry out a full check of all items against manual parts list and drawings to ensure that everything is installed correctly. This is a visual check only.
- O Carry out a stall test to adjust the level in the fluid coupling, refer to the *SIZER Stall Test* section.
- O For the recommended lubricant specifications/quantities, see the *Maintenance Schedule*.
- O Run the machine under zero-load conditions for four (4) hours. Check for excessive noise, vibration, and temperature. The normal operating temperature of the gearbox ranges between 55°C and 80°C. If any adverse effects are evident, refer to the *Trouble Shooting* guide. Rectify as necessary.
- O Run the machine under full-load conditions for eight (8) hours. Again check for any excessive noise, vibration and temperature as before.

Pre-Start Check List

- O Ensure visually that the machine is fully engaged in the working position.
- O Check thoroughly to ensure that no person or persons can be injured when the machine starts.
- O Check drive components for signs of obvious damage, leaks, etc.
- O Check all oil levels, (gearbox & spur gears if fitted), check that the bearings are charged with grease.
- O Check autolube system is set to run (if fitted).

SIZER Start-Up Procedure

- O Carry out the specified pre-start checks.
- O The machine can now start. If the motor starts, but the shafts do not rotate, then the machine is either stalled, or a fusible plug has melted in one or both of the fluid couplings.
- O Refer to the *Stall Procedure*.

MMD Equipment Storage Instructions

All MMD equipment is delivered in a stored condition, and is suitable to be stored inside or outside, in normal temperatures for a period of approximately 12 months.

The cases supplied have a waterproof lining. On departure from MMD, the gearboxes are filled with lubricant (for the lubricant specification, see the gearbox maintenance schedule). The input and output shafts of the gearbox are wrapped in protective 'Denso' tape.

The containers supplied are covered in a Tarpaulin sheet with a slight apex incorporated to aid drainage, and roped down accordingly around the base of the container. This must be checked periodically for rips or tears.

All exposed machined faces, such as the gearbox mounting plate are coated in 'Tectil' corrosion inhibitor.

THE SUPPLIED CONTAINERS, CASES, ETC. MUST NOT BE OPENED UNTIL MMD ARE NOTIFIED.

SIZER Stall Test

After every operating stall, and after any major overhaul, the fluid coupling must be reset to give optimum performance. This is achieved by carrying out the following;

- **Isolate the machine, by removing the cable from the electric motor. Use lockout procedures.**
- Physically block the breaker shafts, so that they cannot rotate.
- Re-connect the power cable to the electric motor.
- The next operation requires and a tachometer, and is carried out as follows.
 - i Select the start position on the control switch, and run the motor until a steady speed reading is obtained on the tachometer. It is imperative that running time is kept to a minimum to avoid a build of thermal energy in the coupling.
 - ii Stop the motor.
 - iii The objective is to obtain a steady reading of approximately 94% of synchronous motor speed.
i.e,
50Hz = 1410 RPM
60Hz= 1700 RPM
 - iv Add or remove a small amount of fluid as required
 - v Allow sufficient time for the coupling to cool before repeating the test.
- If the tachometer reading is below the desired speed, release fluid from the fluid coupling. If synchronous speed is reached add fluid to the coupling. Repeat this process until a steady reading is achieved for the motor of 94% synchronous speed.
- Remove the obstruction from between the SIZER shafts.

Trouble Shooting Guide

It is recommended that a daily check be made for any excessive noise, vibration, lubricant leaks, or obvious damage. The following hints should help in determining the source of any unusual feature;

NOISE – When an unusual noise is heard, it is important to determine quickly what is causing the noise, so that action can be taken. There are basically two noises to consider.

- i High speed end (Electric Motor)
- ii Low speed ends (Breaker Shafts)

The first step is to determine the frequency of the noise. It will be a regular noise in either the machine aperture or the drive train. If it is a slow rhythmic noise, it is likely to come from the shafts. This could indicate that there is a broken or loose bolt. Fully check the machine, the machine aperture, (with no material passing through), to determine the cause.

If the noise is high frequency, it is possibly coming from the drive train. Starting from the motor, work along the transmission to determine the cause of the noise. The obvious causes would be; faulty bearings in the motor, fluid coupling, or gearbox; lack of lubricant or ingress of dust into rotating parts.

VIBRATION – A similar check list is used as when tracking down an unusual noise, however, most excessive vibration is caused either by faulty main shaft bearings or faulty gearbox bearings. These items should be checked first by checking the temperature on the frame of the machine adjacent to the shaft bearings and on the casing of the gearbox.

LUBRICANT LEAKS – It is essential that all lubricants are corrected and replenished in accordance with the service manual recommendations. If any leak is found, action must be taken immediately to correct it, i.e find the source of the leak, determine the cause of the leak by reference to the spare parts manual, and identify the parts required to rectify the leak. When this has been done, the machine must be stopped at the first opportunity so that the work carried out.

OBVIOUS DAMAGE – 99% of the obvious damage occurring on MMD machines inside the machine aperture is caused by tramp iron. Broken or cracked caps/segments and bolts are the most common form of obvious damage. A visual inspection will determine the cause.

Underspeed Sensing Device

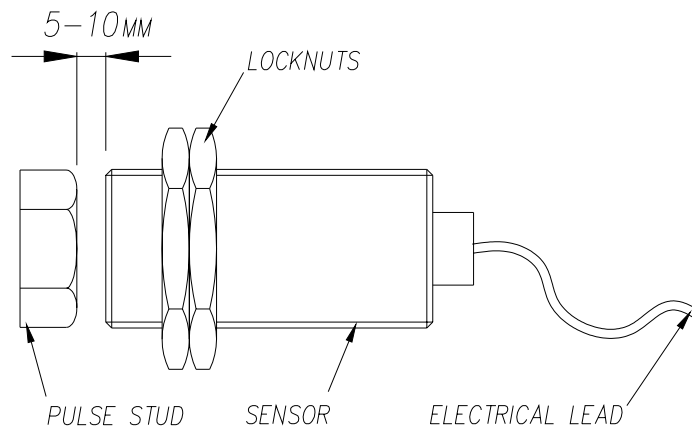
- O Fitted at the non drive end of the SIZER™, is an underspeed sensing device. The purpose of the underspeed sensing device is to isolate power to the main SIZER™ motor(s) and upstream supply systems when the rotors have lost speed. This is achieved by a pulse stud on the breaker shaft(s) passing through the magnetic field of a close proximity sensor, therefore inducing an electrical impulse to the monitoring system. Should the breaker shafts stop rotating, the monitoring systems should be connected to ensure they trip the electric motor(s) after seven seconds.

The Power supply to the electric motor(s) must be isolated
and a manual inspection can be carried out to identify the fault.

Replacing The Underspeed Sensor

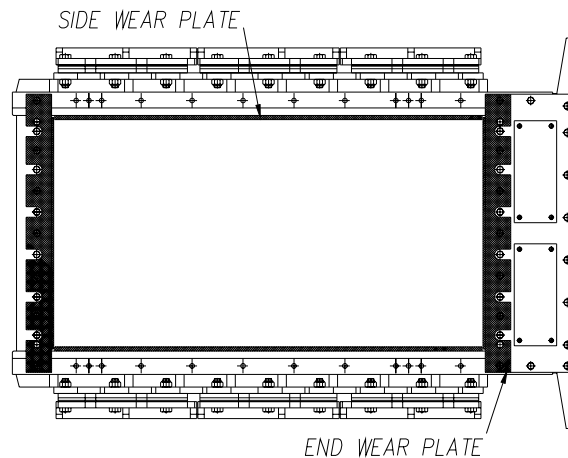
Should the underspeed sensor become inoperative, it will be necessary to replace it. To do this the machine must be isolated electrically together with any upstream supply systems, so that they cannot be started accidentally whilst work is being carried out.

- i Isolate power supply.
- ii Disconnect electric leads.
- iii Loosen the lock nuts, and unscrew the detector head.
- iv Refitting is the reverse of the above procedure. However, care must be taken to ensure that the sensor head is within 5 to 10mm of the stud in the end of the breaker shaft, which provides a pulse every revolution.



Wear Plates - Replacing

The MMD SIZER™ has wear plates on the inside of the machine aperture to protect the side plates and bearing housings. These wear plates must be replaced when excessive wear has been detected. Clearance of rotating teeth on the side wear plates should be a minimum of 10mm. This clearance should be checked when side wear plates have been replaced before starting the machine.



To remove wearplates, the following procedures must be followed;

Side Wear Plates:

- O Where the machine has pyramids/side combs which are bolted through the side wear plate, it will be necessary to remove them prior to attempting to remove the wear plate.
- O Weld two temporary lifting lugs to each wear plate, (on smaller machines this procedure may not be necessary).
- O Remove the bolts retaining the side wear plates and pyramids to the side plates, and discard them.
- O Attach lifting equipment to the lifting lugs.
- O Remove the bolts retaining the side wear plates and discard them.
- O Remove the wear plate.
- O Thoroughly clean the inside of the machine where the new wear plate is to be fitted to ensure correct seating of the new wear plate.
- O Weld temporary lifting lugs to the new side wear plate.
- O Lift the new wear plate into position, and line up with fixing holes.
- O Bolt the new wear plate into position, using new bolts. MMD do not recommend the re-use of wearplate bolts due to the wearing of the bolt tops.
- O Tighten the bolts to the torque specified on MMD procedure T056.
- O Remove the temporary lifting lugs and discard them.
- O Check the clearance between tooth caps/segments and wear plates. Clearance should be a minimum of 10mm.

End Wear Plates:

- O Thoroughly clean the top of the machine to expose the holes for the lifting eye bolts.
- O Remove the fixings from the end wear plates, which attach the wear plate to the bearing housing. These fixings are fitted into drilled and tapped holes.
- O Fit lifting eye bolts into the top of the wear plates, and lift out.
- O Thoroughly clean all faces to which the new wear plates fit, to ensure correct seating of the new wear plate. Protect tapped fixing holes before cleaning.
- O Attach lifting eye bolts to the new wear plate, and lift it into position.
- O Bolt the wear plate into position using the existing set screws.
- O Remove the lifting eyes.
- O Tighten the bolts to the torque rating specified in MMD procedure T056. (Included at the back of this manual).

Gearbox Fitting & Removal

Gearbox Fitting Procedure:

- O Clean the output shaft of the gearbox and the gear coupling.
- O Slide the coupling half onto the output shaft.
- O Fit the end cap onto the output shaft. Threadlock should be applied to the bolts prior to fitting.
- O Lift the gearbox into position, ensuring that the spigot on the gearbox mates with the recess on the gearbox mounting plate. Fit the studs/bolts connecting the gearbox to the gearbox mounting plate, and torque to the amount specified in MMD procedure T056.
- O Align the teeth on the coupling half, with the teeth on the coupling sleeve, and slide the coupling sleeve into position.
- O Ensure 'O' rings are correctly seated on the coupling sleeve, and fit the two split clamping rings around the coupling. Tighten bolts in accordance with MMD procedure T056.
- O Fill the gearbox with the correct lubricant to the designated level. (See Maintenance Schedule for Specification).
- O Fill the gear coupling with grease. (See Maintenance Schedule for Specification).

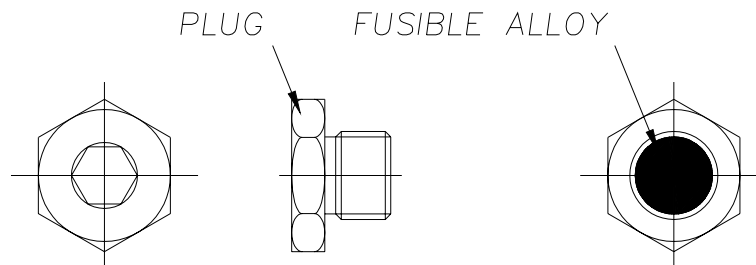
Removal:

- O Remove the motor (See Heading 'Motor Removal')
- O Remove the fluid coupling. (See Heading 'Fluid Coupling Replacement').
- O Note, that if fitted Oil cooler modules must have their pipes disconnected.
- O Note, that when fitted the Gearbox Temperature Monitoring System must be removed from the gearbox
- O Remove the motor mounting bracket or coupling housing from the gearbox.
- O Remove the top cover plate to expose the gear coupling.
- O Split the two clamping rings from the gear coupling, taking care not to damage the 'O' ring.
- O Slide the coupling sleeve towards the gearbox.
- O Attach lifting equipment to the gearbox lifting eyes.
- O Remove the studs/bolts connecting the gearbox to the gearbox mounting plate.
- O Slide the gearbox away from the mounting plate, until the gear coupling is clear of the mounting plate. The gearbox can now be lifted out of position.

(Voith Turbo Fluid Coupling)

Description

- O Mechanical overload protection is given by use of a fluid coupling, mounted on the input shaft of the gearbox and the drive shaft motor.
- O The fluid coupling is protected against excessively high operating temperatures by built-in fusible plugs, which melt on thermal overloading, and allow the fluid to discharge, thereby interrupting the transmission of torque and preventing damage.
- O After a fusible plug failure, the fault must be corrected. The peripheral bolts must be re-torqued, (see fluid coupling manual), new fusible plugs fitted, and the fluid coupling refilled with clean fluid in accordance with the fluid coupling manual.
- O There are three types of fusible plug ranging in different operating temperatures from 140/160/180°C. Under normal operating conditions the 160°C type fusible plug should be used.



Preparation for Removal:

- O Remove the motor (see heading 'Motor Removal')
- O Where fitted, disconnect power supply to Voith MTS temperature monitoring device.
- O Where fitted, remove the Voith MTS sensor bracket, complete with sensor.

Removal:

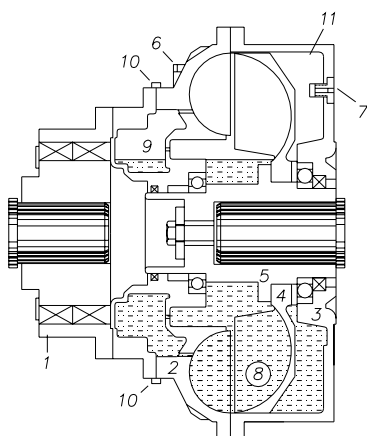
- O The Voith fluid coupling may now be removed. See Voith installation and operating manual before removing the coupling.

Installation:

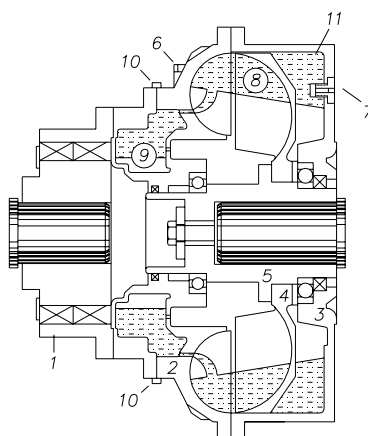
- O Clean gearbox input shaft and fit key.
- O Fit Voith coupling, in accordance with Voith's installation and operating manual using the proper tools.
- O Where fitted, re-fit the Voith sensor bracket and sensor to the motor mounting bracket.
- O Where fitted, connect power supply to Voith MTS temperature monitoring device.
- O Refit the motor (See heading 'Motor Installation')

Voith Fluid Coupling Design Type: TVSC

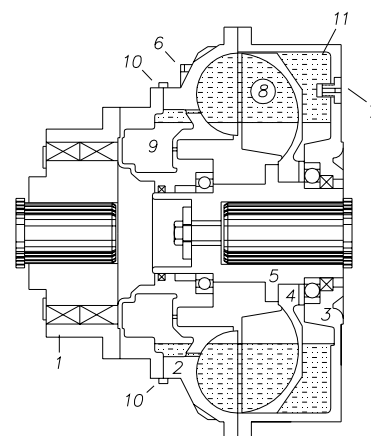
Coupling At **Stand-Still**



Coupling At **Start-Up**



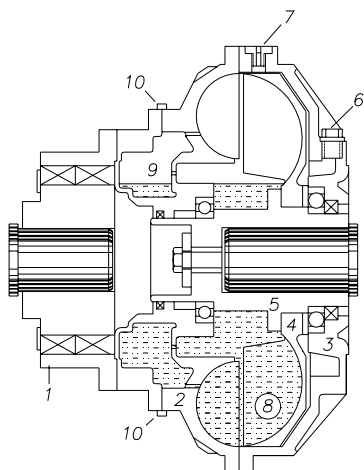
Coupling **Running**



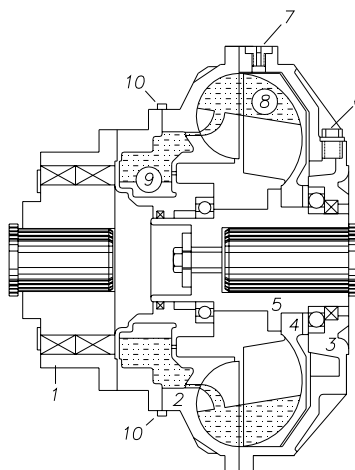
VOITH DESIGN TYPE: TVSC		6	Filler Plug
1	Flexible Connecting Cpl'g	7	Fusible Plug
2	Outer Wheel	8	Operating Fluid
3	Coupling Shell	9	Delayed Filling Chamber
4	Inner Wheel	10	Delay Chamber
5	Coupling Hub	11	'SC' Chamber

Voith Fluid Coupling Design Type: TV

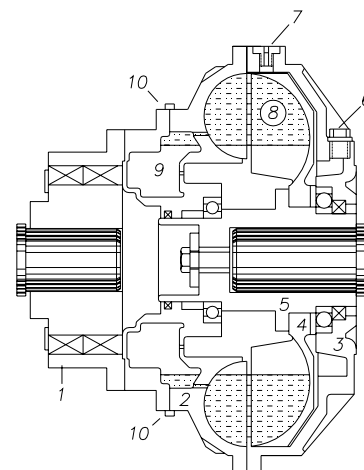
Coupling At **Stand-Still**



Coupling At **Start-Up**



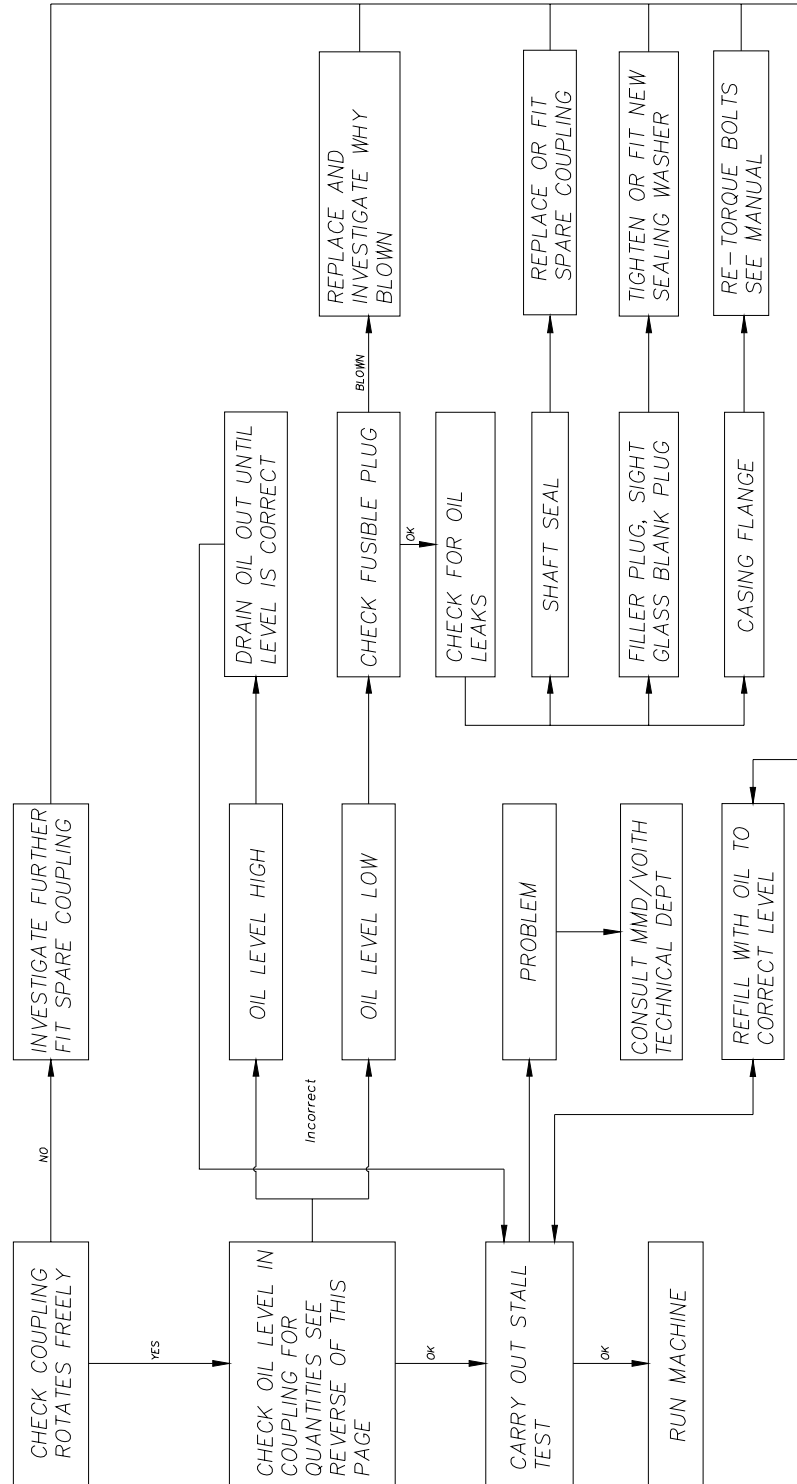
Coupling **Running**



VOITH DESIGN TYPE: TV			
1	Flexible Connecting Cpl'g	6	Filler Plug
2	Outer Wheel	7	Fusible Plug
3	Coupling Shell	8	Operating Fluid
4	Inner Wheel	9	Delayed Filling Chamber
5	Coupling Hub	10	Delay Nozzle

TROUBLESHOOTING GUIDE FOR VOITH TURBO COUPLING

NOTE: Before working on the fluid coupling, ensure that motor is electrically isolated.
Use this guide in conjunction with our maintenance manual 3.626-011000



Oil Fill For Voith Turbo Couplings

Note: When ever possible use the oil fill quantity on the front cover of the voith installation and Operating Manual 3.626-011000 for the specif fluid coupling in question.
However, if this information is not available the following approxima values may be used.

TYPE 487 TV COUPLING				
MOTOR SPEED 1470/1500 RPM			MOTOR SPEED 17660/1800 RPM	
OIL FILL IN LITRES	BOLTS FROM TDC	MOTOR POWER IN kW	OIL FILL IN LITRES	BOLTS FROM TDC
11.6	12.5	55	---	---
13.2	11.5	75	10.5	13
14.3	11	90	11.3	12.5
15.9	10	110	12.3	12
18.0	9	132	13.3	11.5
---	---	160	14.4	11
---	---	200	16.3	10

TYPE 562 TV COUPLING				
MOTOR SPEED 1470/1500 RPM			MOTOR SPEED 1760/1800RPM	
OIL FILL IN LITRES	BOLTS FROM TDC	MOTOR POWER IN kW	OIL FILL IN LITRES	BOLTS FROM TDC
19.2	13.5	132	16.3	15
20.6	13	160	17.2	14.5
22.8	12	200	18.3	14
26.2	10	250	19.8	13.5
----		315	21.7	12.5
----	----	400	24.8	11

TYPE 650 TVSC COUPLING				
MOTOR SPEED 1470/1500 RPM			MOTOR SPEED 1760/1800 RPM	
OIL FILL IN LITRES	BOLTS FROM TDC	MOTOR POWER IN kW	OIL FILL IN LITRES	BOLTS FROM TDC
43	10.5	250	---	---
46	10	315	40	11
53	9	400	46	10
---	---	500	53	9

Breaker Shafts

- O Move the SIZER into the maintenance position, if fitted onto wheels.
- O Thoroughly clean the SIZER of all extraneous material, grease, oil, etc.
- O Remove the end wearplates, and side combs (where fitted) from the machine. (See Heading 'Wear Plates - Replacing').
- O Remove the top cover plate from the machine. This is bolted to the machine side plates, the top bearing housing and the gearbox mounting plate.
- O Remove the clamping rings from the gear couplings and slide back the sleeve towards the gearbox. This action disconnects the drive train from the breaker shafts. Care should be taken so as not to damage any 'O' Ring seals.
- O Remove the shaft end cap, along with its fixings, and slide the remaining coupling hub off the shaft. Where fitted, the spur gear can now be slid along the shaft, until it no longer meshes with the spur gear on the driven shaft, care to be taken support its mass at all times.
- O Where the bearings are flange mounted, remove the bolts securing the bearing capsule to the bearing housing.
- O Remove the bolts from the top bearing housing on each end of the machine.
- O Using two appropriately sized eye bolts, lift out the top bearing housings. The shaft assemblies are now exposed.
- O The damaged shaft can now be lifted out by means of nylon webs slung at either end.
- O Once the shaft is removed, the bearing assemblies, and labyrinth seals, can be removed, (refer to the bearing removal sections).
- O Replacement is a reversal of the above procedure.

Breaker Shaft Centres Adjustment Procedure

- O Move the SIZER into the maintenance position, if fitted onto wheels.
- O Thoroughly clean the SIZER of all extraneous material, grease, oil, etc.
- O Where applicable loosen the fixings connecting the wheel carriage unit with the slotted holes to the side plate.
- O Loosen the M48 nuts (6 off) to expose approximately 50mm of the adjusting bar on one side of the sizer case (if wheel carriages are fitted this is to be the side previously worked on).
- O Using appropriate jacks slide the free case half away from the fixed case half until the approximate desired gap is created between the bearing housings of each shaft.
- O Remove the uppermost adjusting bar on both the drive end and non-drive end of the SIZER case (2 in total).
- O In the gap created between the bearing housings, place the correct amount of packers to achieve the desired shaft centres taking care to place the slot of the packers over the top of the remaining adjusting bars.
- O Replace the two adjusting bars with the nuts and washers in to the SIZER case, taking care to pass the bar through the locating hole of each packer, re-attach the relevant washers/nuts.
- O All M48 nuts should be tightened up equally (6 in total) until the gap in the centre of the SIZER has closed up and all packers have seated correctly.
- O Re-tighten wheel carriage fixings where applicable.
- O Ref. T056 for all relevant torques.

Shaft Re-Timing Procedure

Where the machine is fitted with spur gears, the timing of the shafts can be altered as follows;

Spur Gears At Drive End:

- O **Isolate the machine electrically by removing the cable from the SIZER drive electric motor.**
- O Undo the bolts securing the top cover plate to the side plates, gearbox mounting plate, and top bearing housing.
- O Remove the top cover plate, along with the end wear plate, if still attached to the cover plate. (There is no need to drain the oil).
- O Remove the end cap from the driven (non-drive) shaft by unscrewing the fixings which secure it.
- O Remove the shaft spacers.
- O Slide the spur gear along the breaker shaft splines until it is clear of the spur gear on the drive shaft (until it no longer meshes), taking care to support its mass.
- O Rotate the driven shaft to the desired position.
- O Move the spur gear back along the splines, and into position, so that it meshes with the other spur gear.
- O Replace the spacers and end cap then replace the fixings using a threadlock.
- O Refit the top cover plate and where applicable, the end wear plate, and refit the bolts which secure it to the case.

Spur Gears At Non-Drive End:

- O **Isolate the machine electrically by removing the cable from the SIZER™ drive electric motor.**
- O Undo the bolts securing the top cover plate to the side plates, end cover and the top bearing housing.
- O If desired drain the gear oil.
- O Remove the top cover plate. (There is no need to drain the oil).
- O Remove the end cap from the driven (non-drive) shaft by unscrewing the fixings which secure it.
- O Slide the spur gear along the breaker shaft splines until it is clear of the spur gear on the drive shaft (until it no longer meshes), taking care to support its mass.
- O Rotate the driven shaft to the desired position.
- O Move the spur gear back along the splines, and into position, so that it meshes with the other spur gear.
- O Replace the shaft end cap, and replace the fixings, using a threadlock.
- O Refit the top cover plate after applying sealant and refit the bolts which secure it.

Main Shaft Bearings

(Flange Located Type)

To replace a worn or damaged bearing, the following procedure must be followed:

- O Follow the procedure for removing the shafts, see shaft removal.
- O Using a bearing puller or similar device, plus a hydraulic jack, the complete bearing assembly must be pulled from the end of the shaft, after first removing the end cap.
- O This will leave the old labyrinth still attached to the shaft. It must be checked visually for excess wear. See *Things To Check*.
- O The damaged bearing assembly may now be dismantled as follows:
 - i Remove the retaining plate, complete with the two outer seals.
 - ii Remove the damaged bearing from the capsule.

Things to Check

- O LABYRINTH - Check for wear grooves on the seal surface. Also, check for any significant wear on the labyrinth shoulders. If there is any grooving on the seal surface, then the labyrinth must be replaced.
- O SEALS - Check the condition of all lip seals. If there is any sign of damage, the seals must be replaced. As company policy MMD recommend that all seals be replaced if they are removed for any reason.
- O SEAL SPACER - If there is any grooving on the outside diameter of this spacer, it must be replaced.
- O BEARING CAPSULE - If there is any obvious damage or any sign that the bearing has been turning in the capsule, then it should be replaced.

Re-Assembly (Flange Located Type)

Should every item need replacing, the following procedure should be followed;

- Remove old labyrinth from the breaker shaft using oxy-acetylene cutting equipment to heat the labyrinth to assist removal. Care must be taken to ensure that no damage is done to the shaft.
- Assemble the parts in the following order:-
 - i Labyrinth
 - ii Capsule
 - iii Seals
 - iv Bearing
 - v Seal Plate
 - vi Spacer
 - vii 'O' Rings

- Warm the labyrinth in an oil bath or similar to 110°C. Remove from the oil bath and push onto the shaft immediately. The labyrinth will stop at the raised shoulder.
- Fit the inner seals into the bearing capsule. Ensure the seals are seated correctly, (see the drawing in the appropriate section).
- Coat the inside of the capsule sparingly with a light oil.
- Warm the bearing and capsule in an oil bath or similar to 110°C. Remove from the oil bath and immediately push onto the shaft. Care must be taken as the seals engage the labyrinth spacer and the assembly must be 'eased' into position. The assembly will seat fully home once engaged onto the seal surface of the labyrinth spacer as the furthest extremity of the labyrinth locates against the inner race of the bearing.
- Warm the spacer in an oil bath and heat to 110°C. When up to temperature remove and immediately push onto the shaft.
- Re-assemble the machine in reverse sequence.

Main Shaft Bearings

(Dowel Located Type)

To replace a worn or damaged bearing, the following procedure should be followed;

- Follow the procedure for removing the shafts until the shafts are fully exposed, see shaft removal.
- Using a bearing puller or similar, plus a hydraulic jack, the complete bearing assembly must be pulled from the end of the shaft, after first removing the end plate.
- This will leave the old labyrinth still attached to the shaft. It must be checked visually for excess wear.
- The damaged bearing assembly may now be dismantled as follows:
 - i Remove the retaining plate. This automatically removes the two outer seals, and the seal spacer.
 - ii Support the bearing capsule around the periphery, 200mm off floor level.
 - iii Apply heat to the outside of the bearing capsule.
 - iv The damaged bearing should fall out of the capsule.

Things to Check

- LABYRINTH - Check for wear grooves on the seal surface. Also, check for any significant wear on the labyrinth shoulders. If there is any wear on the seal surface, then the labyrinth must be replaced.
- SEALS - Check the condition of all lip seals. If there is any sign of damage, the seals must be replaced. As company policy MMD recommend that all seals be replaced if they are removed for any reason.
- SEAL SPACER - If there is any wear grooves on the outside diameter of this spacer, it must be replaced.

- BEARING CAPSULE - If there is any obvious damage or any sign that the bearing has been turning in the capsule, then it should be replaced.
- DOWEL - Check for any signs of damage on the sides of the dowel. If the capsule has been trying to turn, there will be indentations approximately half way up its length. If these are evident, then the dowel must be replaced.
- Assemble all the parts required in the following order:-
 - i Labyrinth
 - ii Capsule
 - iii Seals
 - iv Bearing
 - v Dowel & Seal
 - vi Seal Retaining Plate
 - vii Spacer

Re-Assembly (Dowel Located Type)

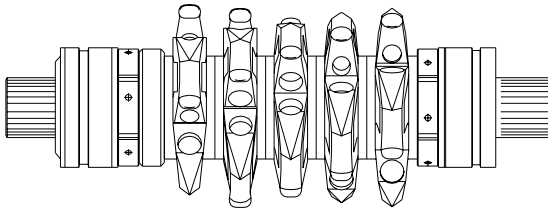
Should every item need replacing, the following procedure should be followed;

- Remove the old labyrinth from the breaker shaft using oxy-acetylene equipment to apply heat to the labyrinth to assist removal. Care must be taken to ensure that no damage is done to the shaft.
- Warm the labyrinth in an oil bath to 110°C. Remove from the oil bath and push onto the shaft immediately. Place up to the abutment.
- Fit the inner seals into the bearing capsule. Ensure they are seated correctly, (see the drawing in the appropriate section).
- Coat the inside of the capsule sparingly with a light oil.
- Fit the bearing into the capsule. This is a toleranced fit and a soft drift should be used.
- Warm the bearing and capsule in an oil bath or similar to 110°C. Remove from the oil bath and immediately push onto the shaft. Care must be taken as the seals engage the labyrinth spacer and the assembly must be 'eased' into position. The assembly will seat fully home once engaged onto the seal surface of the labyrinth spacer as the furthest extremity of the labyrinth locates against the inner race of the bearing.
- Fit one of the bonded seals into the dowel location hole on the capsule and hold in with thick grease, ensuring the remaining bonded seal is in the dowel location hole on the bottom bearing housing. Then place the dowel to the bottom bearing housing.
- Warm the spacer in an oil bath and heat to 110°C. When up to temperature remove and immediately push onto the shaft.
- Fit the two outer seals into the seal retaining plate ensuring that the seals are seated correctly as shown in the appropriate section.
- Push the seal retaining plate into the capsule. Fit the retaining bolts and torque to the required amount as specified in T056.
- Re-assemble the machine in reverse sequence.

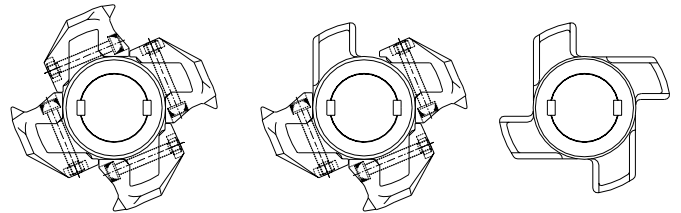
Procedure For The Removal Of Tooth Rings

It is very rare that tooth rings become damaged due to their robust construction, but in the event that damage does occur to the tooth rings the following procedure must be followed.

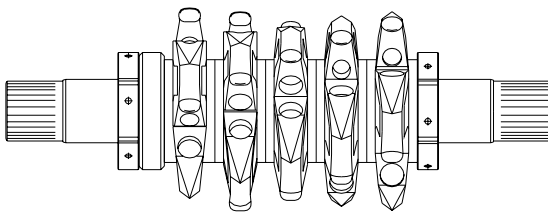
- Follow the procedure for removing the breaker shaft from the machine case.
- Remove both the fixed and floating bearing assemblies from the shaft. (Refer to the section on bearing removal).
- Before attempting to remove the tooth ring, the breaker caps will have to be removed from the tooth ring. Clean out any extraneous dirt which may have gathered around the tooth cap bolt and untighten the nut. Carefully remove the tooth cap bolt and remove the tooth cap from the ring. Repeat for the other 3 tooth caps on the ring.
- The tooth rings are welded together, in order to proceed further the weld should be either machined out by the use of an appropriate machine tool or carefully burned out by the use of oxy-acetylene cutting equipment.
- Remove the screwed collar(s) from the breaker shaft. Apply force to the screwed collar with hammer strikes, this should loosen the collar on the mating thread. The breaker shafts have left and right hand threads where the screwed collars mount, be sure to strike the collar around so that it slackens on the thread and not strike it in the opposed direction.
- Once the weld has been removed from between the tooth rings the shaft should be placed so that the tooth rings can be removed from the shaft. The use of a suitable hydraulic press or puller will be needed in order to apply enough pressure to remove the tooth ring.
- Care must be taken when the tooth ring is being removed.
- Repeat these steps for any other rings which are to be replaced.
- To fit a new tooth ring, clean up around the exposed breaker shaft and the mating face of the existing tooth ring. Using an oil bath or similar appliance, apply sufficient heat to warm the tooth ring which will aid in fitting onto the shaft. (Refer to MMD Procedure T072 as a guide). Supporting its mass, align the new ring with the shaft key making sure it is scrolling in the correct direction, and slide the new ring onto the shaft until it is flush with the mating face of the existing tooth ring.
- Weld the new tooth ring to the mating tooth. Weld around the weld prep on the tooth caps to form a butt weld. (This is normally done by submerged arc welding process).
- Repeat the previous two steps for any more tooth rings to be replaced.
- Once the ring(s) have been replaced, the tooth caps can then be re-fitted.
- The breaker shaft can then be built up and re-fitted within the machine case. (See previous sections on how to re-fit bearings and shafts).



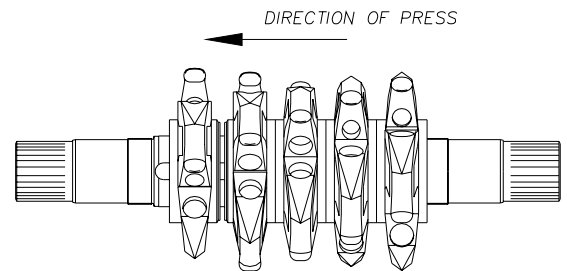
REMOVE THE SPUR GEAR AND GEAR COUPLING HUB TO LIFT THE SHAFT FROM THE MACHINE CASE



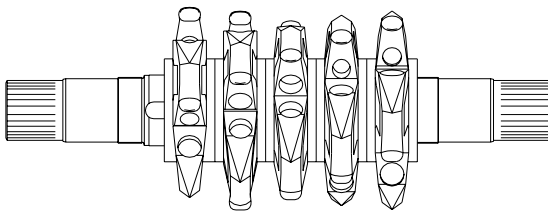
REMOVE THE TOOTH CAPS FROM THE DAMAGED RING



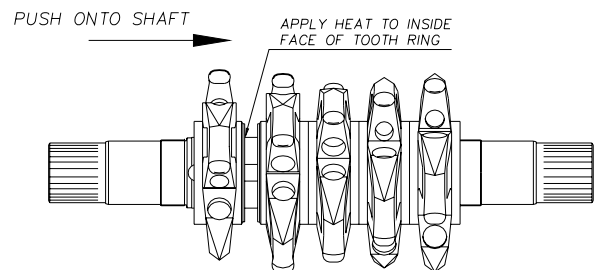
WITH THE SHAFT OUT OF THE MACHINE CASE, PROCEED TO REMOVE BOTH THE BEARING ASSEMBLIES



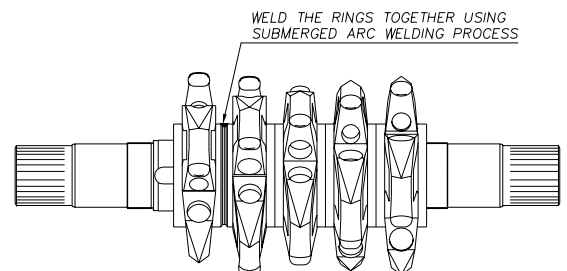
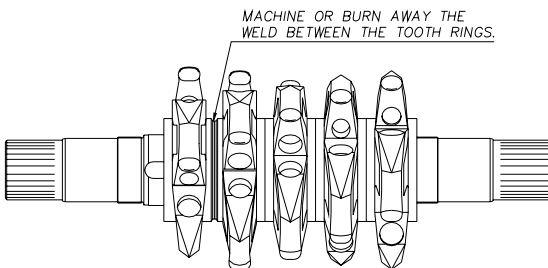
WITH THE WELD DETAIL REMOVED, A SUITABLE HYDRAULIC PRESS OR PULLER SHOULD BE EMPLOYED TO PRODUCE ENOUGH FORCE TO MOVE THE RING FROM THE SHAFT

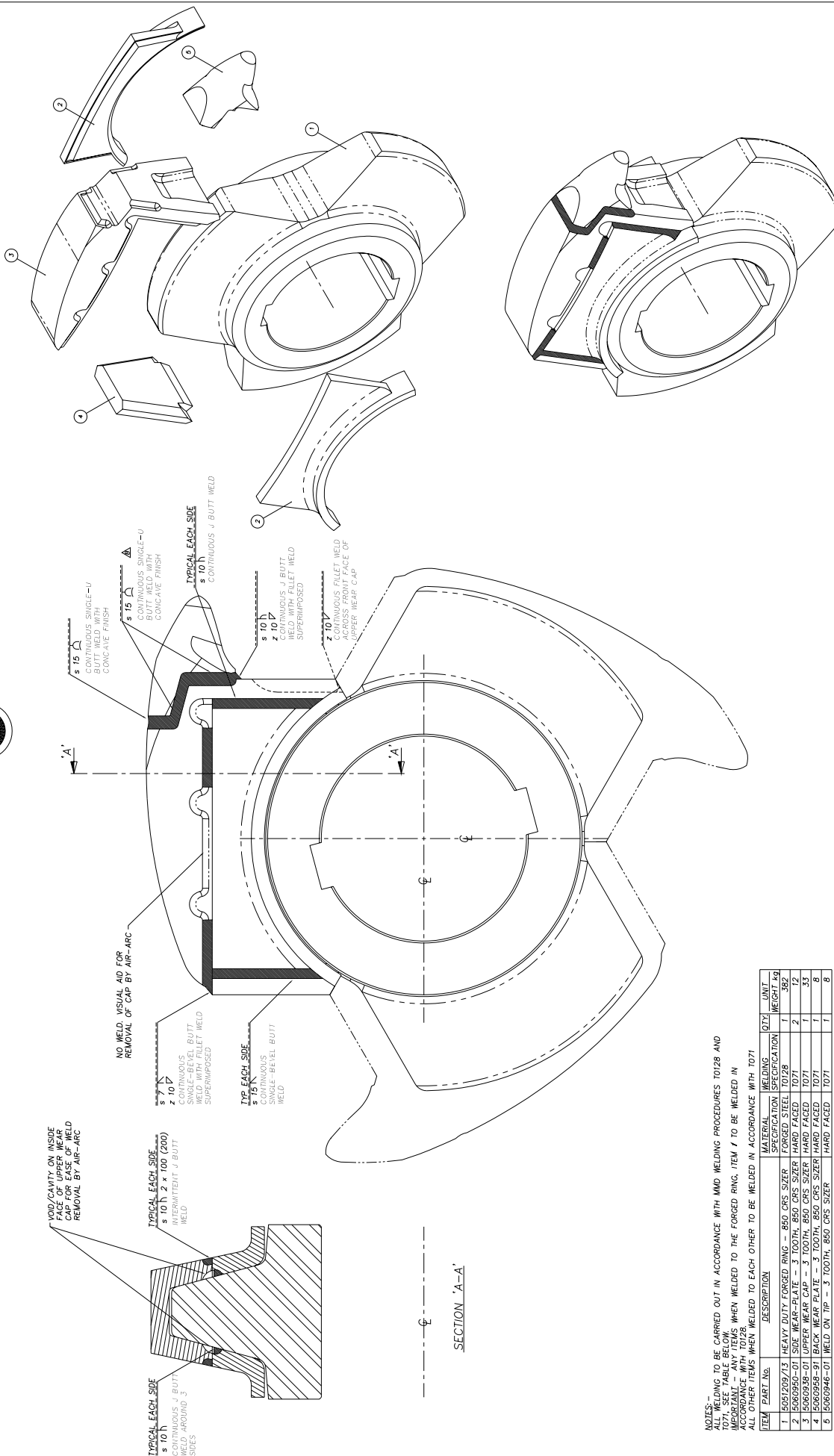


NEXT REMOVE THE SCREWED COLLARS AND SPACER



AFTER HEATING THE TOOTH RING TO 120°C, ALIGN THE NEW RING WITH THE SHAFT KEY AND PUSH ONTO THE SHAFT





NOTES: -
ALL WELDING TO BE CARRIED OUT IN ACCORDANCE WITH MMD WELDING PROCEDURES T0128 AND T0171, SEE TABLE BELOW.
IMPORTANT - ANY ITEMS WHEN WELDED TO THE FORGED RING, ITEM 1 TO BE WELDED IN ACCORDANCE WITH T0128.

ITEM	PART NO.	DESCRIPTION	MATERIAL SPECIFICATION	WELDING POSITION	QTY	UNIT
1	5051209/3	HEAVY DUTY FORGED RING - 850 CRS SIZER	FORGED STEEL	T0128	1	kg2
2	5060950-01	UPPER WEAR-PLATE - 3 TOOTH, 850 CRS SIZER	HARD FACED	T071	2	12
3	5060938-01	SIDDER WEAR-PLATE - 3 TOOTH, 850 CRS SIZER	HARD FACED	T071	1	33
4	5060958-91	BACK WEAR PLATE - 3 TOOTH, 850 CRS SIZER	HARD FACED	T071	1	8
5	5060946-01	W/O TOP - 3 TOOTH, 850 CRS SIZER	HARD FACED	T071	1	8

WELDING ASSEMBLY: -
ITEM 3 SIDE WEAR-PLATE WELD TO ITEM 1 HEAVY DUTY FORGED RING
ITEM 2 UPPER WEAR CAP AND ITEM 4 BACK WEAR PLATE WELDED TO ITEM 2 SIDE WEAR PLATE
ITEM 5 UPPER WEAR CAP AND 4 BACK WEAR PLATE WELDED TO EACH OTHER
ITEM 6 WELD ON TIP WHEN FIRST SUPPLIED PRE-WELDED TO ITEM 3 UPPER WEAR CAP

Breaker Bar Adjustment

Adjustment of the breaker bar should be carried out as follows;

- O Remove the bolts securing the breaker bar to the machine.
- O Using the jacking screws, raise the breaker bar to the desired height.
- O Adjust the breaker bar by removal/insertion of packers as required.
- O When the height is satisfactory, refit the bolts, and tighten in accordance with MMD procedure T056.

Breaker Bar Cap Replacement

Breaker bar caps can only be replaced from the underside of the machine. They must be replaced when showing signs of excessive wear. Replace the breaker bar caps immediately, or damage to the breaker bar will result.

Removal:

- O Clean the area around the cap which is to be replaced.
- O Remove the bolts securing the cap to the breaker bar.
- O Remove the cap from the breaker bar.

Replacement:

- O Clean the top surface of the breaker bar.
- O Position the cap onto the breaker bar. Ensure that the cap is fitted in the correct orientation, as shown on the drawing.
- O Bolt the cap to the breaker bar using new bolts. All bolts must be tightened in accordance with MMD procedure T056.

When carrying out any work on the breaker bar be sure to follow the safety procedures in practice. The machine must be isolated electrically and mechanically, use lifting gear where required and wear the appropriate protective clothing and eye wear.

Cleaning Comb Adjustment

Standard Type:

Where specified, on larger machines, adjustable cleaning combs may be fitted to minimise build-up of material between the tooth rings, and to prevent recirculation of any product attached to the shafts. These cleaning combs will need periodic adjustment to compensate for wear. This is achieved by removing packers as follows;

- O Check the actual cleaning comb clearance.
- O Remove the cleaning combs. Each cleaning comb is secured to the side plate by two/four bolts. Remove these bolts and withdraw the cleaning comb from the side plate.
- O Remove necessary packers to give specified cleaning comb clearance. Thickness of packers to be removed is the difference between actual cleaning comb clearance and the specified cleaning comb clearance.
- O Refit the cleaning combs into the side plates and move the packers from the 'inside' of the pyramid to the 'outside' and bolt into position using existing bolts. These bolts must then be re-torqued.

Motor Installation

(Foot & Flange Mounted Type):

The electric motor cradle is designed such that foot mounting can be utilised, but still allowing the motor to oscillate with the machine. Thus the problem which would be encountered with mounting to a separate base would be avoided. The flange spigot is used to assist in gaining accurate concentricity and squareness.

- O The motor should initially be sat on jacking screws, in the tapped holes through the cradle foot packs.
- O Adjust until the motor spigot is engaged in the cradle spigot bore and then fit flange bolts and lightly hand tighten.
- O With a dial test indicator on the motor shaft, check that the total indicated runout of the motor cradle machined mounting face does not exceed 0.2mm.
- O The packer height required under each foot must be measured individually. Packer sets must then be made up or machined.
- O Fit the packers under the correct feet and lower the jacking screws. Reference mark packs to their position.
- O The foot bolts should then be added, and all bolts tightened to the amount specified in MMD procedure T056.

Motor Removal

(Foot & Flange Mounted Type):

The motor can sometimes be removed on the cradle to allow fluid coupling removal. This prevents disturbance of the motor alignment.

Should just the motor need removing, the following procedure should be followed;

- O Disconnect all electrical connections from the motor.
- O Remove the cover plate(s) from the motor mounting frame.
- O Remove the bolts connecting the motor flange and bolts connecting the motor feet to the mounting bracket.
- O The motor can now be removed. Carefully slide the motor out of the motor mounting bracket until the drive boss on the motor shaft is clear of the motor mounting bracket. The motor can now be safely lifted out of position.
- O Remove the coupling half and spacer (where fitted) from the motor shaft.
- O Remove the shims from the foot mountings, after identification to position.

Motor Installation

(Flange Mounted Type):

In this arrangement alignment is achieved automatically.

- O Fit the motor spacer (if applicable).
- O Fit the coupling and engage the drive boss.
- O Lift the motor into position, fit the flange bolts and tighten to the amount specified in MMD

Motor Removal

(Flange Mounted Type):

Should the fluid coupling need removing or replacing, the motor must be removed, the procedure for this is as follows;

- O Disconnect all electrical connections from the motor.
- O Attaching lifting equipment to the motor.
- O Remove the bolts connecting the motor flange.
- O The motor can now be removed. Carefully slide the motor out of position, until the motor shaft is clear of the coupling housing. The motor can now be safely lifted out of position.

Grease Lubrication:

MMD machines are fitted with the facility to allow bearing greasing. Grease can be pumped to the labyrinth seals to prevent contamination. The bearing lubrication points can be served by either an automatic lubrication pump or by the use of a grease gun or similar appliance. The quantity of grease for the bearings is specified in MMD procedure T0132 to each bearing each week.

Lubricant is pumped from the reservoir into a distribution block, this distribution block ensures that each bearing receives an equal amount of grease. The distribution block also includes an indicator pin to provide a visual check that lubricant is being circulated. To ensure correct lubrication it is important that this indicator pin is checked on a regular basis, i.e. weekly.

To check that the labyrinth seals are clear, and that the greasing system is functioning normally, grease will be visible at the labyrinths.

Regular and correct greasing will increase the life of the bearings and help prevent damage to the bearing casings.

NOTE: WHERE FITTED, THE AUTOMATIC CENTRALISED GREASING SYSTEM MUST BE RUN WHENEVER THE MACHINE IS RUNNING. IT IS ALSO STRONGLY RECOMMENDED TO RUN THE GREASE FEED FOR 2 HOURS AFTER EACH RUNNING PERIOD. FOR FURTHER INFORMATION REFER TO THE AUTOLUBE SUPPLIER MANUAL.

Maintenance Schedule

Maintenance of the SIZER™ and its ancillaries is most important, and must be carried out in accordance with this manual. Failure to do so could result in a reduction of operational efficiency, or even a machine breakdown. Warranty maybe affected by improper maintenance.

Where the machine is fitted with breaker segments, after the first 24 hours of operation, check the segment fixing bolts, and re-torque to the amount specified in MMD Procedure T056. then after 7 days operation, check the segment fixing bolts again, and re-torque to the amount stated.

NOTE: Before any work is carried out on this machine, isolate the power supply, and remove the cable from the electric motor.

Spur Gear Oil:

On SIZERSTM fitted with spur gears, MMD recommend that the spur gear oil should be renewed at approximately every 4000 hours. Drainage is achieved by removing the drain plug which is fitted to the bottom cover plate. Once this plug has been removed the oil can then be drained into the suitable catch tray or other suitable containers. To replace the spur gear oil remove the inspection cover(s) and fill to the required quantity through the top cover plate. Re-seal the top cover plate on refitting. Fill to the level stick notch. The oil specification grade is listed in MMD procedure T0138.

Light Load Running:

When it is expected that the SIZER™ will not have any feed of material for a period of 4 hours, the SIZER™ motors should be shut down. The reason for this, is that the transmissions are designed to carry high loads, and when loads are removed, the possibility of roller slip in the bearings exists, which could result in long term damage.

Daily Maintenance:

Visual and audible examination for excessive vibration or noise.

Weekly Maintenance:

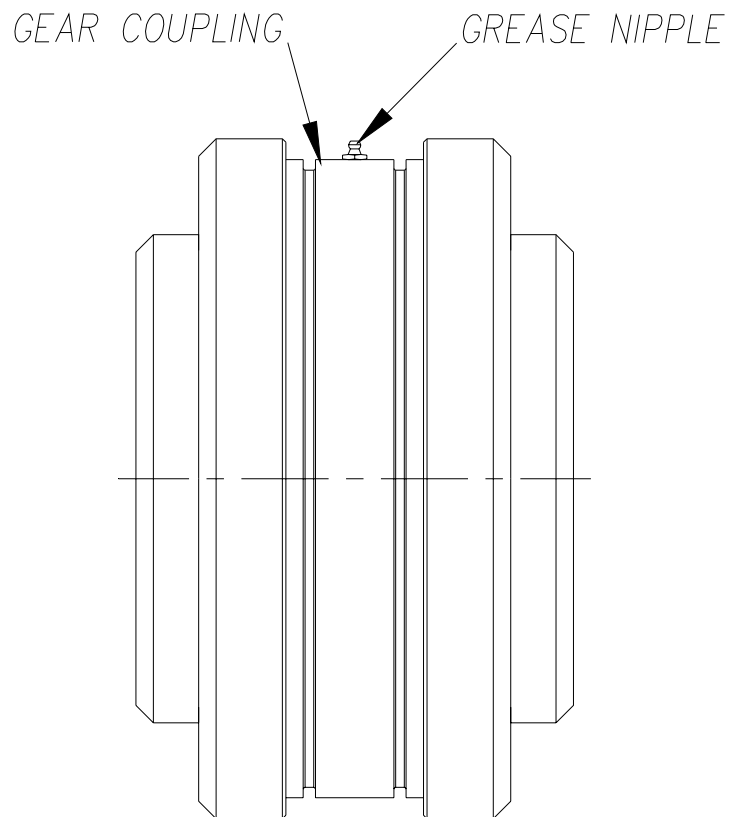
Where fitted, check the centralised greasing unit reservoir grease level, and top-up if required with the recommended lubricant. Visually check for leaks.

Ensure (where fitted) the Autolube is functioning correctly. The distribution block indicator pin should move up and down on a regular basis, (Speed is dependent on delivery volume).

Check the spur gear oil level, and top up as required, with the correct specification lubricant. Refer to MMD procedure T0138a.

Three Monthly Maintenance:

Grease the gear coupling at the ¼" BSPT grease nipple. Specification as per breaker shaft bearings. Where fitted, check that the shut-down alarms are effective.



Annual Maintenance:

All bolts must be checked for tightness, and re-torqued to the amount specified in the (MMD Procedure T056) if necessary.

Where fitted, grease the wheel carriage units at their respective grease points.

GEARBOXES FITTED WITH COOLER FILTERS

The purpose of the unit is to filter and cool the oil. The cooler filter modules must run whilst ever the machine is running.

Maintenance Required

Daily

- Check to see if the basket filters require cleaning.
- Look around the module for leaks, rectify if necessary.

Weekly

- Check the cooler radiator is not blocked.
- Check the pump gland packing seals, tighten if necessary.

Six Monthly

- If the radiator fan motor is operated with a thermostat, the operation of the thermostat must be checked.
- Thoroughly clean the unit.
- If the unit is fitted with a thermostat to control the fan motor, check the thermostat on and off. Setpoints are between 50 & 60°C. The 'on' setting should be higher than the off setting.

TECHNICAL SPECIFICATIONS



BOLT TORQUES - For approximately 85% proof stress in unlubricated coarse pitch bolts.

	8.8 GRADE	10.9 GRADE	12.9 GRADE
Size	Nm	Nm	Nm
M6	12	16	19
M8	29	39	47
M10	57	77	92
M12	99	134	161
M16	244	333	399
M20	476	649	779
M24	822	1121	1345
M30	1633	2227	2672
M36	2854	3891	4670
M42	4567	6227	7475
M48	6858	9351	11223
M56	11020	15025	18032
M64	16590	22620	27150
M72	24110	32873	39450

Nm x 0.74 = lb.ft

For EP2 Grease x 0.65

For cap bolts with EP2 Grease x 0.75

NUT AND BOLT COMBINATIONS

Bolt Grade	8.8	10.9	12.9
Nut Grade	8	12	12

Hydraulic tool pressure settings (PSI), applies HTD hydraulic tensioners:

	M30 (8.8)	M36 (8.8)	M42 (8.8)	M48 (8.8)	M48 (10.9)
Small jack (XL07)	12300	18000	--	--	--
Large Jack (XL09)	--	--	16500	21700	22000

Consult suppliers recommendations regarding pressure settings to achieve particular torque requirements. The torque procedure as above, but excluding cover plates, and wear plates. Non critical structural, and location bolts, tighten these using electric nut runner or hand tools. If in any doubt, consult the design department.

Prepared By.: R. McGinn

Approved By.: R. P. Barber

Procedure.: T056

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JACKET TYPE TIP ASSEMBLIES WITH SHANK IN 150M19 MATERIAL IN 'R' CONDITON TORQUE

Size	DRY
	Nm
M24	712
M30	1413
M36	2470
M42	3953
M48	5935
M56	9536
M64	14360
M72	20860

* Applied on thread, and between rotating faces. Where possible, torque up bolts dry.

Whenissuing any bolts or stud we **must** always specify a minimum thread length required, this applies to all bolts of all sizes.

If a bolt requires thread all the way along its length then this becoems a set screw.

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MACHINERY GREASE REQUIREMENTS

Scope

This specification covers quantities of grease to be fed to sizer and feeder bearings via automatic lubrication system. Also types of grease.

Grease Types

For normal applications use

NLGI EP2

Lithium Complex, extreme pressure grease. (e.g., Shell Calithia EPT2)

If for a period of the year, the potential for ambient temperatures to be below -10°C exists, for that period use.

NLGI EP1 (eg., Shell Sterak 1)

If the temperature is likely to drop below -30°C pipe heating may be required.

Sizer Grease Quantities

Feeds to each bearing when the labyrinth seal is not greased separately		Feed to each labyrinth seal if applicable		Feeds to each bearing when the labyrinth seal is greased separately	
m/c ctrs (m)	cc/Hour	m/c ctrs (m)	cc/Hour	m/c ctrs (m)	cc/Hour
0.5	30	0.5	30	0.5	7
0.625	40	0.625	40	0.625	10
0.75	50	0.75	50	0.75	12
1.0	75	1.0	75	1.0	19
1.15	90	1.15	90	1.15	22
1.25	100	1.25	100	1.25	25
1.3	110	1.3	110	1.3	28
1.4	120	1.4	120	1.4	30
1.5	130	1.5	130	1.5	32

When sizer bearings are greased by hand 200cc should be applied to each bearing each week.

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Procedure: T0132

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Feeder	cc/hour
D4	10
D7	20
D9	50

Notes

When grease is fed by an autolube system, the grease must be fed continuously whenever the machinery runs. It is also strongly recommended to run the grease feed for 2 hours after each running period.

Information for setting pumps

Required cc/Hour	Turns out for Setscrew on Pump Element (Centralube)
30	3 1/4
40	3
50	2 1/2
75	2
100	1
100 - 130	Fully in

Do not exceed 4 turns or element may stop pumping

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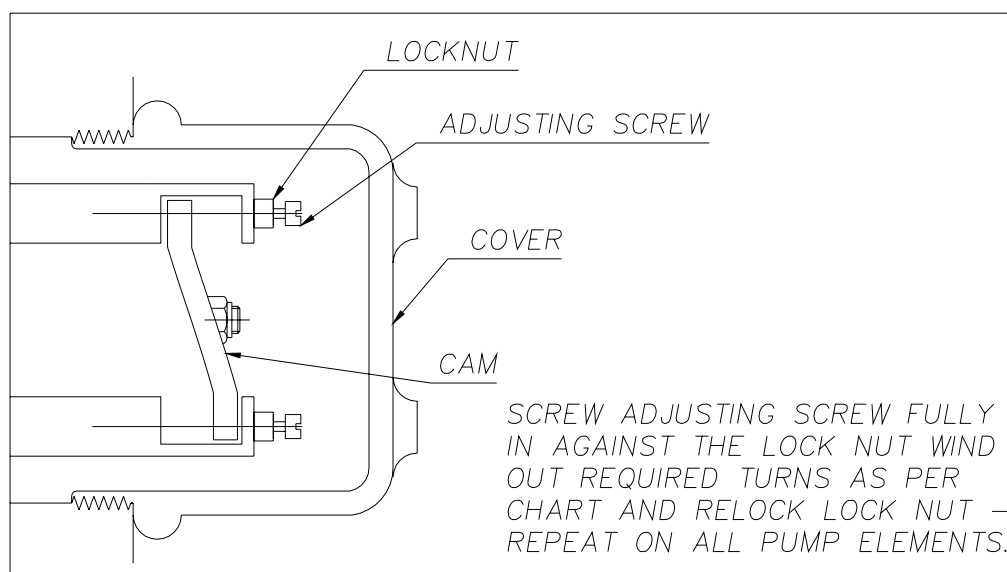
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When separate feeds are required for labyrinth and bearings a fifth pump element must be fitted and set to same setting as other 4 elements. This outlet must be piped to a splitter valve and then to bearings. The other 4 elements are to be piped individually to the labyrinths.



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Procedure: T0132

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MMD LUBRICANTS LIST

GEAR OIL

Ambient temperature -10°C and above

ISO VG 320 premium quality, heavy duty, Sulphur Phosphorous EP Gear Lubricant, 320 centistokes viscosity at 40°C, viscosity index IP226 85 to 95. The lubricant should have good water shedding (minimum FZG load stage 12).
e.g. SHELL OMALA 320

Ambient temperature 20°C to -20°C

ISO VG 220 premium quality, heavy duty, Sulphur Phosphorous EP Gear Lubricant, 220 centistokes viscosity at 40°C viscosity index IP226 85 to 95. The lubricant should have good water shedding (minimum FZG load stage 12).
e.g. SHELL OMALA 220

Ambient temperature 20°C to -50°C with heating

SAE 80W/140		SAE ASX 75W-90		SAE HD 320 Synthetic
Viscosity @ 40°C 210 cSt		Viscosity @ 40°C 115 cSt		Viscosity @ 40°C 320 cSt
Viscosity index 150	or	Viscosity index 140	or	Viscosity index 161
Pour point -29°C		Pour Point -42°C		Pour Point -45°C
Flash Point 210°C		Flash Point 210°C		Flash Point 268°C
		e.g. SHELL ASX 75W-90		

GREASE

Ambient temperature -15°C to 40°C

Lithium Complex EP NLGI No. 2
Mineral Base Oil Viscosity 160 cSt @ 40°C
Timken (ASTM D2509) OK Load 45lbs

Ambient temperature 20°C to -10°C or 20°C to -50°C with heating

Lithium EP NLGI No. 1
Mineral base oil viscosity 120 cSt @ 40°C
Timken (ASTM D2509) OK Load 45lbs

} Change grease type
seasonally as necessary
If in doubt use NLGI
No. 1 when supplying
new machines

FLUID COUPLING OIL

Ambient temperature -15°C and above

Hydraulic Oil
ISO VG32 (32 cSt @ 40°C) or ISO VG22 (22 cSt 40°C)
Pour Point < -24°C
Flash Point >175°C

Ambient temperature 0°C to -50°C

Hydraulic Oil
12 - 25cSt viscosity @ 40°C
Pour Point , -54°C
Flashpoint >155°C

General

Lubricants to be compatible with flouorocarbon and nitrile rubber.

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Approved By: G.R.Nowell

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PROCEDURE FOR SETTING AXIAL FLOAT ON INPUT SHAFTS.

- 1) Assuming gearbox is already assembled and with input shaft fitted, smear mating surface of input shaft end plate "A" with sealant and fit end plate to gearbox, then fit and torque up studs "B" to 98 nm. Fit spacer "C" and end plate "D" without O ring "E" and seals "F".

These are to be fitted upon completion, then fit and torque up studs "G" also to 98 nm.

- 2) Assemble setting frame "H" to gearbox around the input shaft "L" and not forgetting input shaft end plate "J", then tighten lock nut "M" with the gauge "I" taking a reading from end plate "J" turn input shaft to find area on end plate "J" where movement of gauge needle is at a minimum and then mark this area on the end plate "J". Slack off the outer nut "P" on load screw "K" and tighten the inner nut "N", tapping the end of the load screw "K" lightly with a hammer and periodically turning the input shaft "L" 360° back to the previously marked area on end plate "J" continue to tighten nut "N" until the needle on the gauge will move no more. Then zero the gauge, slack off the inner nut "N" on load screw, and again turning the input shaft "L" periodically has you tighten nut "P" until gauge needle will move no more. This will then give you the amount of float you have on the input shaft, and you will probably find that the spacer is oversize by approximately 1.75 to 2.00 mm.

- 3) Whatever the amount of float is found to be, remove gauge "I" then slack off nuts "P", "M" and "N", screw out load screw "K" and remove end plate "J", then remove studs "G" and end plate "D" along with spacer "C". It may be necessary at this point to partially remove the setting frame to allow removal of end plate "D" and spacer "C" depending on length of load screw "K". Machine 1 mm off the face of spacer "C" do not have anymore than 1 mm machined off the spacer at the first attempt. After machining spacer fit back into gearbox along with end plate "D" and studs "G" not forgetting to torque them back upto 98 nm, re-assemble setting frame "H" and take another axial float reading following the same procedure as before. What you have to achieve is a reading as below.

Total axial float for face to face taper roller bearing shaft assemblies.

Refer to drawings, manuals or technical department. If this is not possible then use the approximate formula below to obtain mm's clearance.

$$a = \frac{D1 + D2}{2}$$

D1 and D2 = Outer Diameter of bearings 1 and 2

$$b = (a \times 4) + (\text{Length} \times 2)$$

Length = Distance Between Centre of each Bearing (See drawing)

$$\text{Minimum Clearance} = b \times 0.00024$$

$$\text{Maximum Clearance} = \text{Minimum Clearance} + 0.05$$

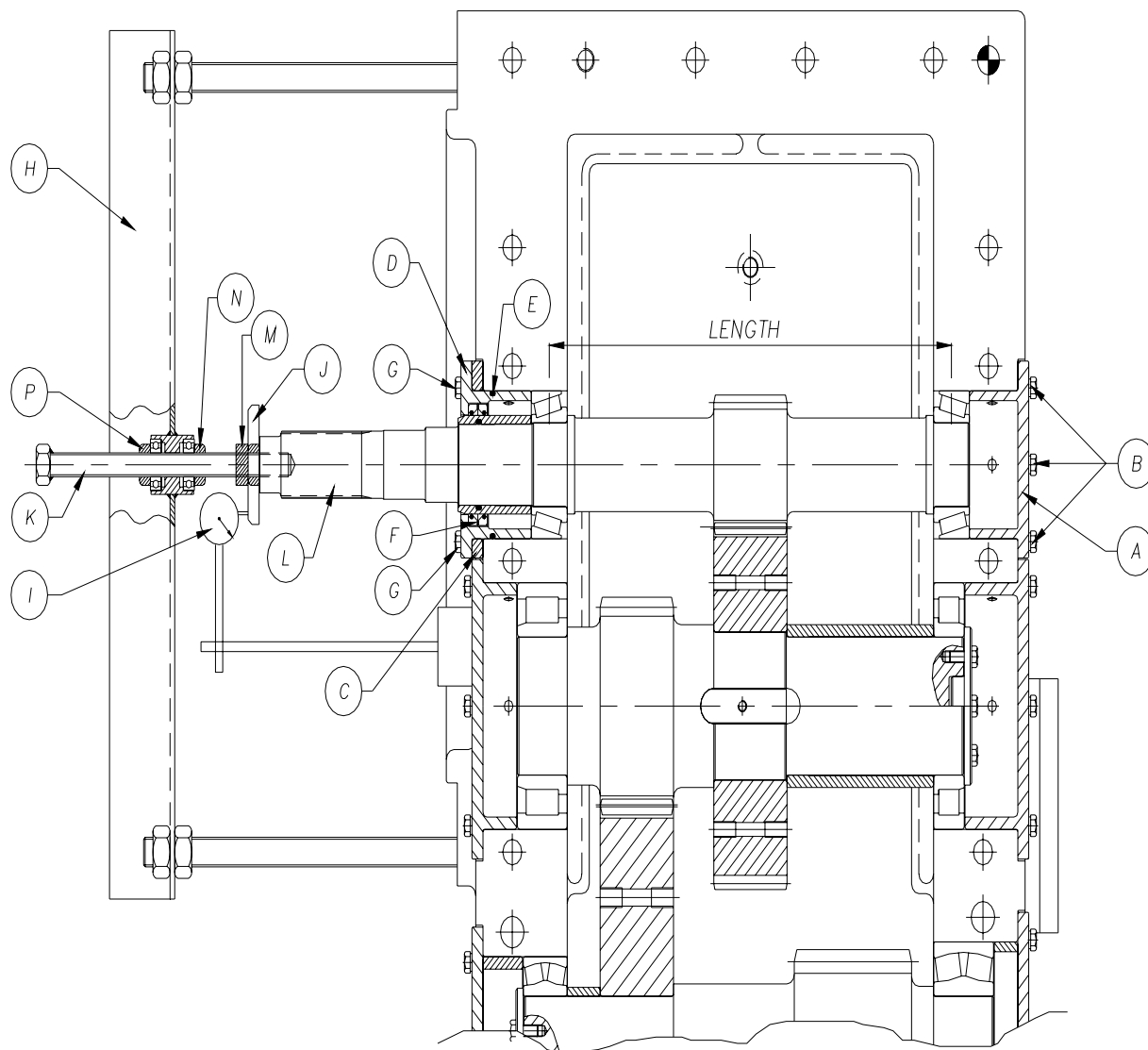
- 4) Whatever the reading is, the spacer will have to be removed for a second time for the remaining amount to be machined off spacer "C" to give you the relevant reading for your particular

Prepared By.: M. Bunce		Approved By.: R.P.Barber	
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gearbox. When this has been completed, spacer “C” and end plate “D” will have to be refitted to gearbox, not forgetting to torque up studs “G” again to 98 nm. Take another axial float reading and if it is within the readings given for your gearbox the setting device can then be completely removed.

- 5) End plate “D” and spacer “C” will have to be removed once more to have O ring “E” and seals “F” fitted into end plate “D”. Smear the faces with grease on both the end plate and spacer before refitting them for the last time to the gearbox and torque studs “G” upto 98 nm.



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