INSTALLATION, OPERATION, SPARE PARTS, AND MAINTENANCE MANUAL

MMD 154 SERIES TWIN SHAFT SIZER 500MM CENTRES

S154-1102*

Standard Height x Standard Length

CUSTOMER:

JCE CO. LTD

*** 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 154 SERIES
TWIN-SHAFT MINERAL SIZER
500MM SHAFT CENTRES

CUSTOMER:

JCE CO. LTD

MMD JOB NUMBER	**70967**
MACHINE SERIAL NUMBER	**S154-1102**
VOITH COUPLING 487TV SERIAL NUMBER	**7565418**
GEARBOX SERIAL NUMBER	**S7070435-166**
MOTOR SPECIFICATION	**150kW, 460V, 60HZ. TOSHIBA**
G.A. DRAWING NUMBER	**S154-1102**

DATE COMPLETED:- **16 - 05 - 12**

COMPILED BY:- **JAMES GODDARD**

MMD 154 SERIES TWIN-SHAFT MINERAL SIZER

MACHINE CASE ASSEMBLY

TYPE	**STANDARD HEIGHT/ STANDARD LENGTH**
PART NUMBER	**341563057**

BREAKER SHAFT ASSEMBLIES

TYPE	**3 TOOTH X 8 RING.**
PART NUMBER (LEFT)	**241564163**
PART NUMBER (RIGHT)	**241564164**
SHAFT ROTATION	**INWARDS**
SCROLL DIRECTION	**TOWARD GEARBOX END**

GEARBOX ASSEMBLY

TYPE	**R200, 30:1 RATIO**
PART NUMBER	**247070435**

FLUID COUPLING / DRIVE ASSEMBLY

TYPE	**VOITH 487TV EEK E**
PART NUMBER	**141564162**

UNDERSPEED SENSING ASSEMBLY

TYPE	**CARLO GAVAZZI**
PART NUMBER	**143210033**

GREASING ASSEMBLY

TYPE	**CENTRALUBE**
PART NUMBER	**023060300/023060302 15154-1102**

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.

Cotes Park Lane,
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E-Mail: james.goddard@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 at the above address.
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. Upon ordering any spare parts, the item description; together with the machine serial number must be quoted to ensure the correct items are supplied for each individual machine.

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.

CONTENTS

MMD 154 SERIES
TWIN SHAFT MINERAL SIZER
GENERAL ARRANGEMENT

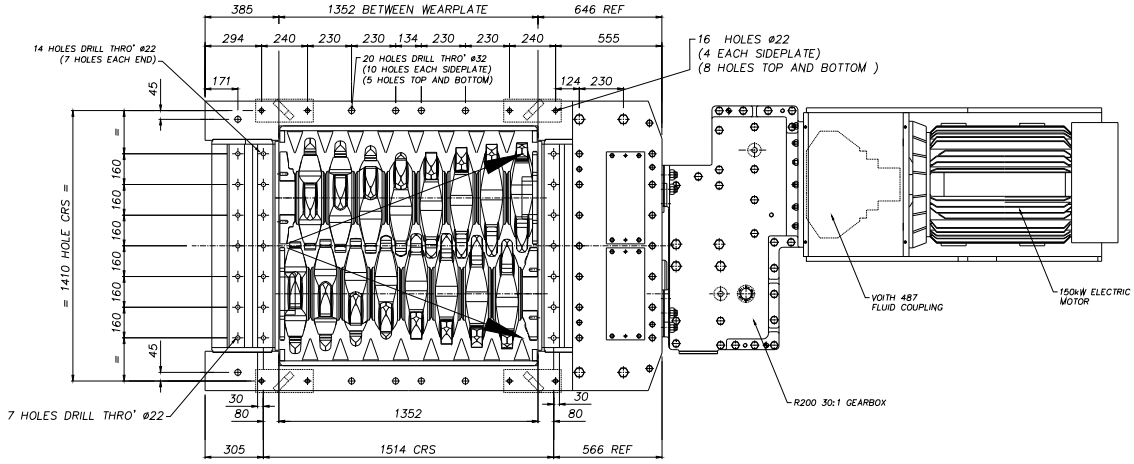
DRAWING NUMBER - S154-1102

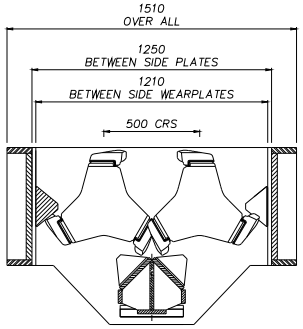
REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

DO NOT SCALE THIS DRAWING. IF IN DOUBT – ASK

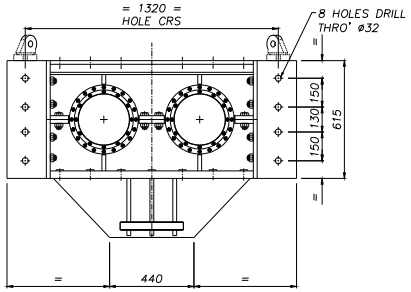
PROJECTION UNLESS OTHERWISE STATED

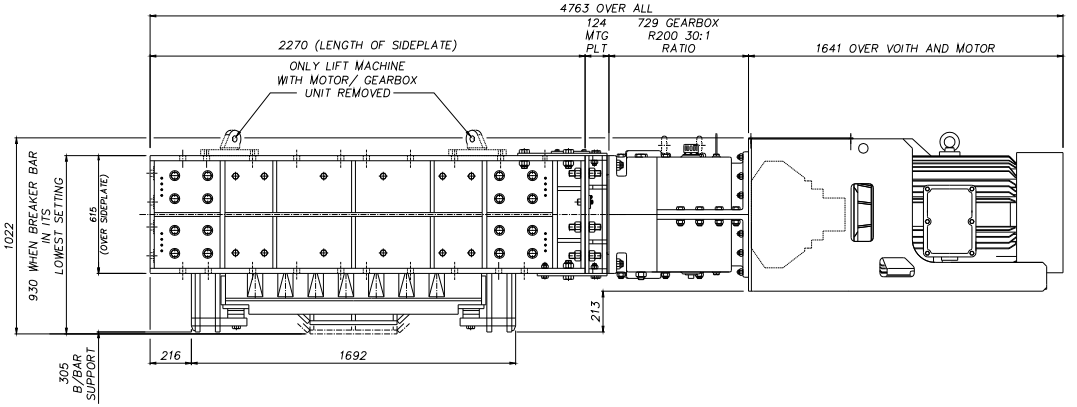
SCROLL DIRECTION →

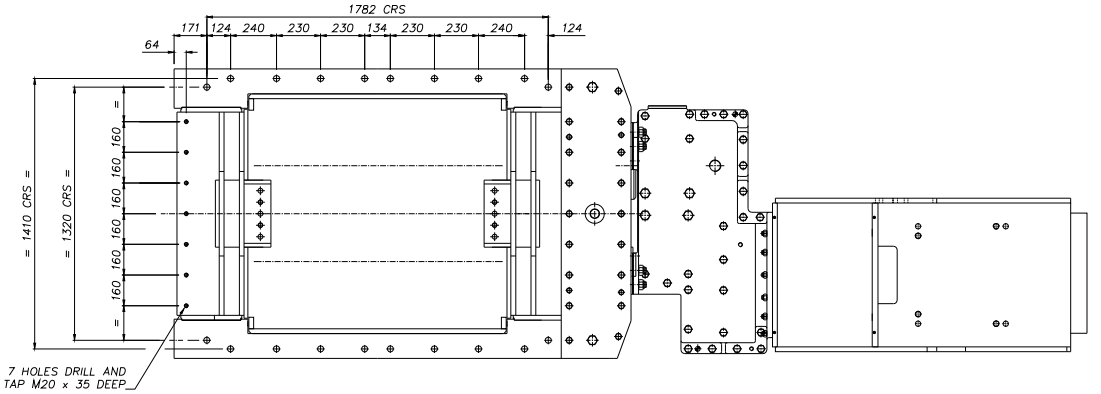




SECTION 'A–A'







VIEW FROM UNDERSIDE (WITH BREAKER BAR & SHAFTS REMOVED)

NOTES: –
J.C.E CO LTD S154–1102
JOB NUMBER 70967
TOTAL M/C MASS 11,500Kg
MASS OFF MACHINE EXCLUDING MOTOR AND GEARBOX 9,000Kg
REF S154–0782 & S154–0927

ISSUE	AMENDMENT	ERN	DATE
A	FIRST ISSUE		AS DRAWN

WELDING

ALL WELDING SYMBOLS ARE IN ACCORDANCE WITH B.S. E.N. 22553

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED

SURFACE FINISH MICROMETRE SYMBOLS ARE TO B.S.1134 C.L.A. SYSTEM MACHINE AT 'V' 6.3 MICRONS C.L.A. UNLESS OTHERWISE STATED

SYMBOLS TO B.S.308 UNLESS OTHERWISE STATED REMOVE ALL BURRS AND SHARP EDGES. STAMP ENGRAVE OR ETCH DRAWING NUMBER WHERE INDICATED THUS →

TOLERANCES TO BE AS SPECIFIED BELOW UNLESS OTHERWISE STATED

MACHINING	FABRICATION AND PLATEWORK	ANGLES
UP TO 100mm ±0.15mm 100 TO 300mm ±0.4mm 300 TO 1000mm ±0.8mm	UP TO 300mm ±1mm 300 TO 1000mm ±2mm 1000 TO 2000mm ±3mm	±1°

MMD Design & Consultancy Limited
Registered Office: Cotes Park Lane, Cotes Park Ind. Estate, Somercotes, Derbyshire, DE55 4NJ. England.
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Internet: www.mmdsizers.com

DRAWN	SA	15.02.12
CHECKED	RIS	2/3/12
APPROVED	RDT	2/3/12
SCALE	1:10	

STD/LT,STD/HT 500 CRS M/C SINGLE R200 30:1 G/BOX, C/W 487 VOITH COUPLING, 3 TOOTH X 8 RING

S154–1102 | A

S154–1102

SIZER ASSEMBLY

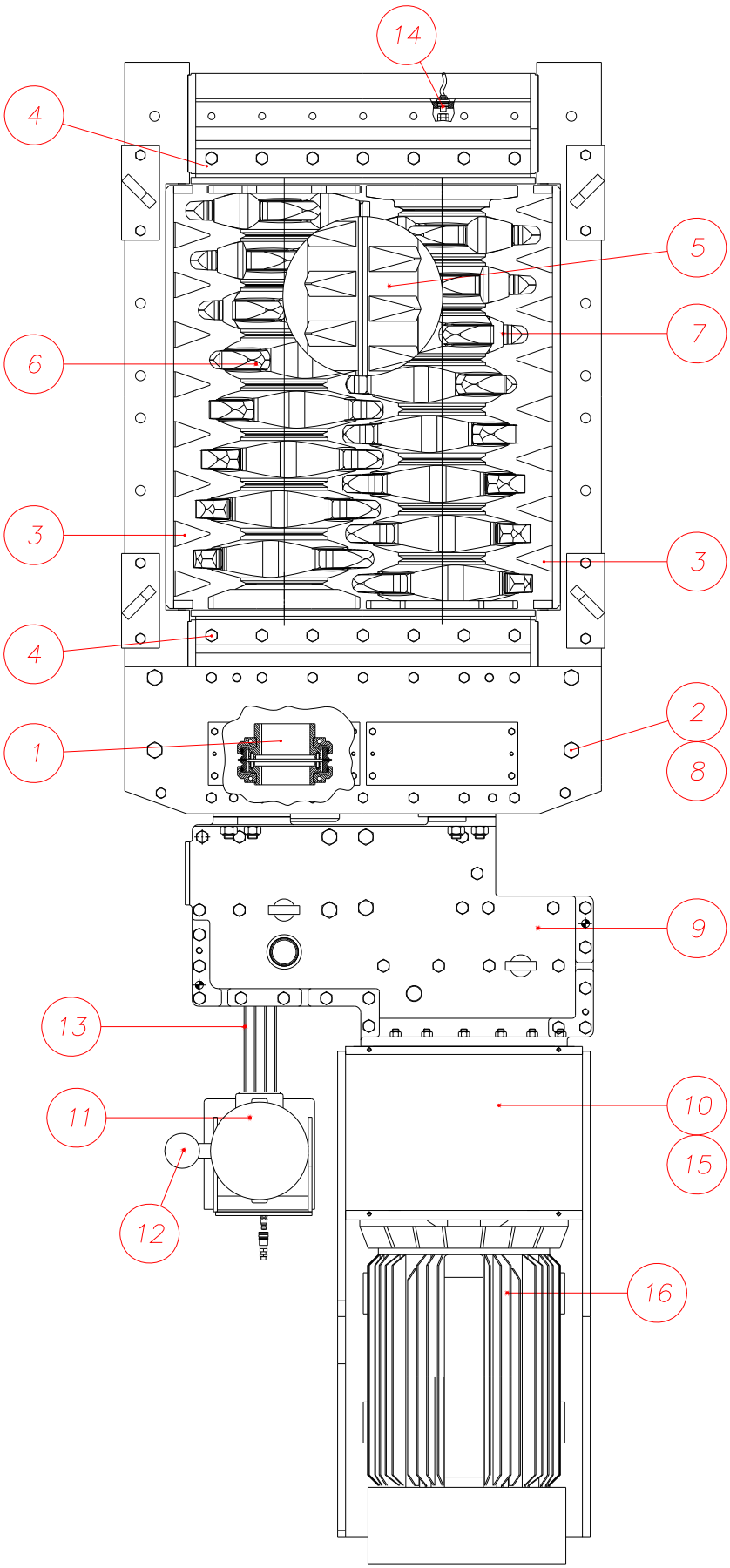
SERIAL NUMBER - S154-1102

JOB NUMBER - 70967

MMD MINING MACHINERY DEVELOPMENTS LIMITED

500CRS 3 TOOTH X 8 RING B/BAR, R200 30:1

Part Number : S154-1102



MMD MINING MACHINERY DEVELOPMENTS LIMITED

500CRS 3 TOOTH X 8 RING B/BAR, R200 30:1

Part Number : S154-1102

Item	Part Number	Description	Unit Mass	Qty
1	111700313	GEAR COUPLING ASSEMBLY	43.44	1
2	14154-1102	BOLT LIST FOR S154-1102	62.84	1
3	141563049	SIDE WEARPLATE/ PYRAMID ASSEMBLY	169.08	2
4	141563440	END WEARPLATE ASSEMBLY	77.04	2
5	145070352	BREAKER BAR ASSEMBLY	326.26	1
6	241564163	BREAKER SHAFT ASSEMBLY	1610.79	1
7	241564164	BREAKER SHAFT ASSEMBLY	1614.49	1
8	341563057	CASE ASSEMBLY	2862.96	1
9	S7070435-166	R200 GEARBOX 30:1 RATIO (VOITH)	1950.00	1
10	487000055	VOITH 487TV 55MM BORE C/W EEKE DRIVEBOSS	111.00	1
11	023060300	PUMP ASSEMBLY – CODE 6000/M-150-5-30L (NEW)	34.00	1
12	023060302	MOTOR – 230/400V, 50HZ, 3PH, 0.37KW (LUB)	8.00	1
13	15154-1102	GREASING ASSEMBLY COMPONENTS (SIZER)	6.00	1
14	143210033	UNDERSPEED SENSING ASSEMBLY	0.37	1
15	141564162	MOTOR MOUNTING ASSEMBLY	769.46	1
16		TOSHIBA ELECTRIC MOTOR 200HP/150WK, 460V, 60HZ	1140.00	1
		Total Mass :-	**11031.85 Kg**	

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CASE ASSEMBLY

PART NUMBER - 341563057

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

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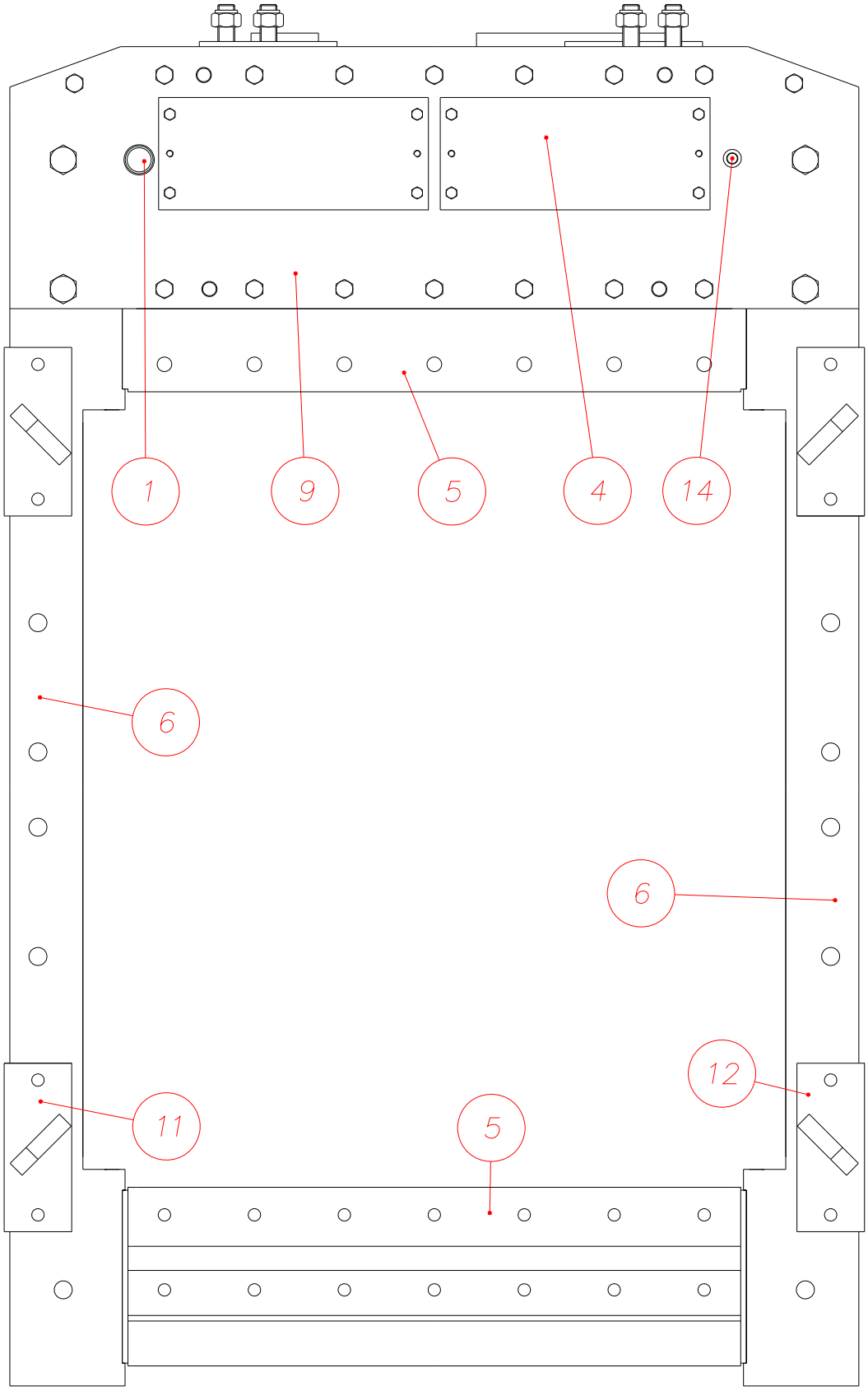
CASE ASSEMBLY

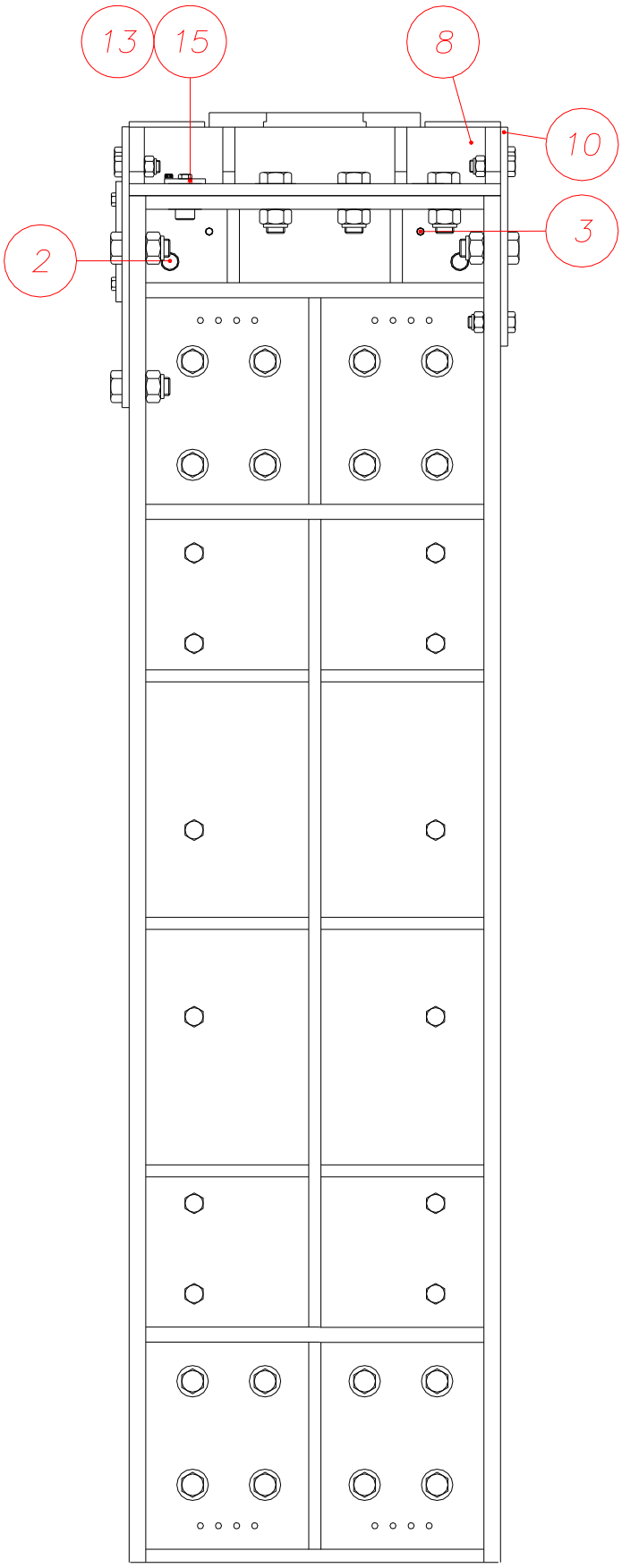
Part Number : 341563057



MMD MINING MACHINERY DEVELOPMENTS LIMITED

CASE ASSEMBLY

Part Number : 341563057



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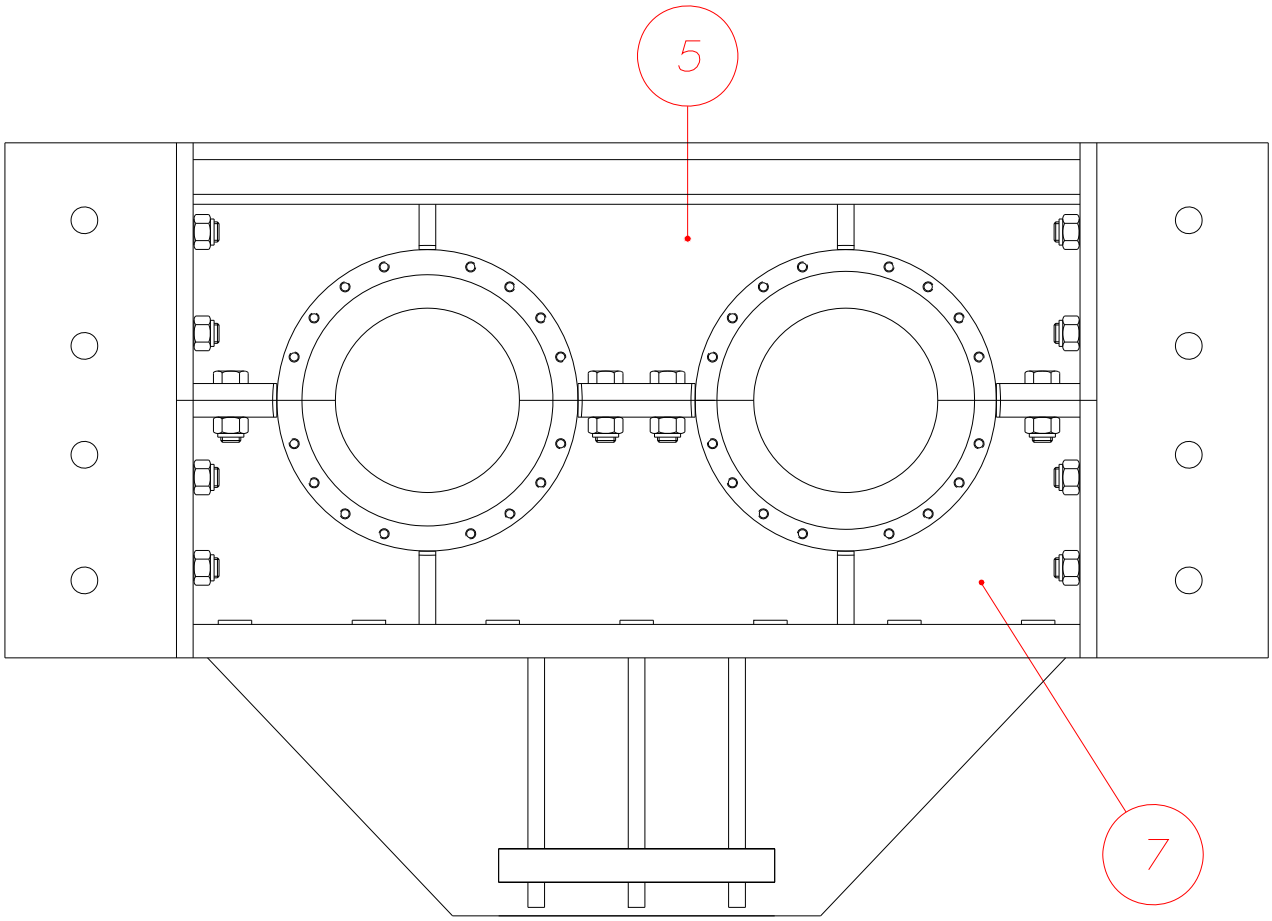
CASE ASSEMBLY

Part Number : 341563057



Item	Part Number	Description	Unit Mass	Qty
1	023301601	FILLER BREATHER UCAB 1380-10 IP65	0.10	1
2	036000026	1" NPT HEX HD BLANKING PLUG	0.13	4
3	036000027	1/2" NPT BLANKING PLUG	0.06	4
4	1544239-84	INSPECTION COVER	9.50	2
5	1563043-85	TOP BEARING HOUSING	210.00	2
6	1563045-85	SIDEPLATE	620.00	2
7	1563047-85	BOTTOM BEARING HOUSING	370.00	2
8	1563048-85	GEARBOX MOUNTING PLATE	298.00	1
9	1563051-85	TOP COVER PLATE	50.00	1
10	1563052-85	BOTTOM COVER PLATE	51.00	1
11	5130000-85	LIFTING LUG SWL 3000 KGS	10.50	2
12	5130001-85	LIFTING LUG SWL 3000 KGS	10.50	2
13	6250194-01	DOWEL RETAINING PLATE	0.25	2
14	6251023-01	DIPSTICK	0.80	1
15	6252857-01	DOWEL	0.40	2
		Total Mass :-	**2862.96 Kg**	

SIZER BOLT LIST

PART NUMBER - 14154-1102

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

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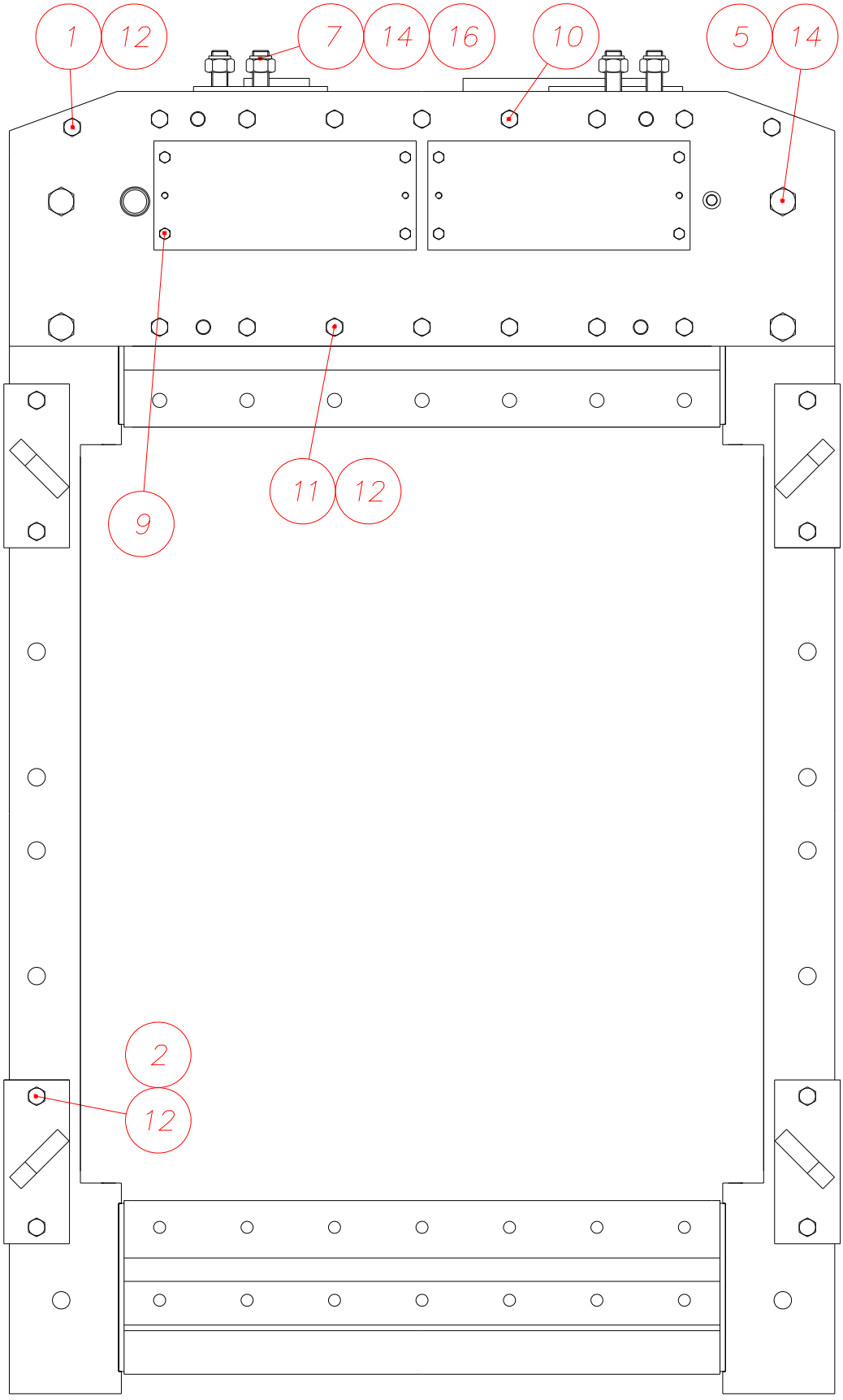
BOLT LIST FOR 154-1102

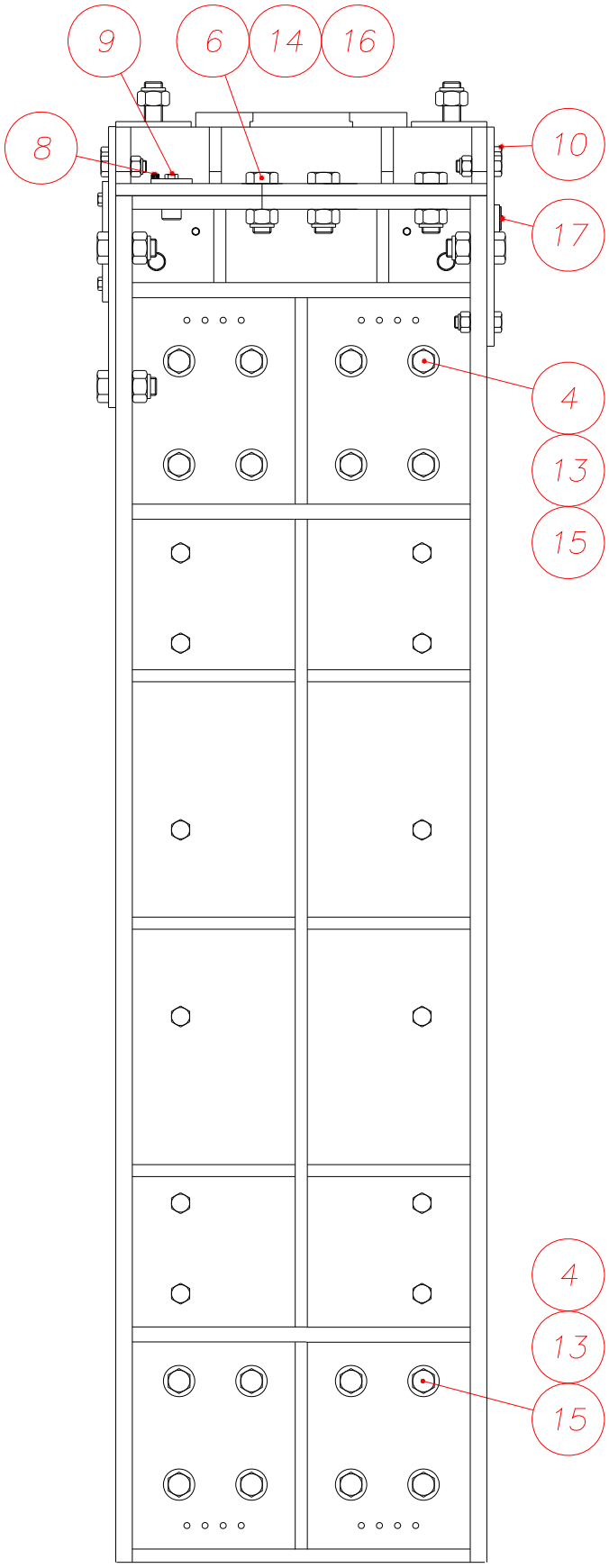
Part Number : 14154-1102



MMD MINING MACHINERY DEVELOPMENTS LIMITED

BOLT LIST FOR 154-1102

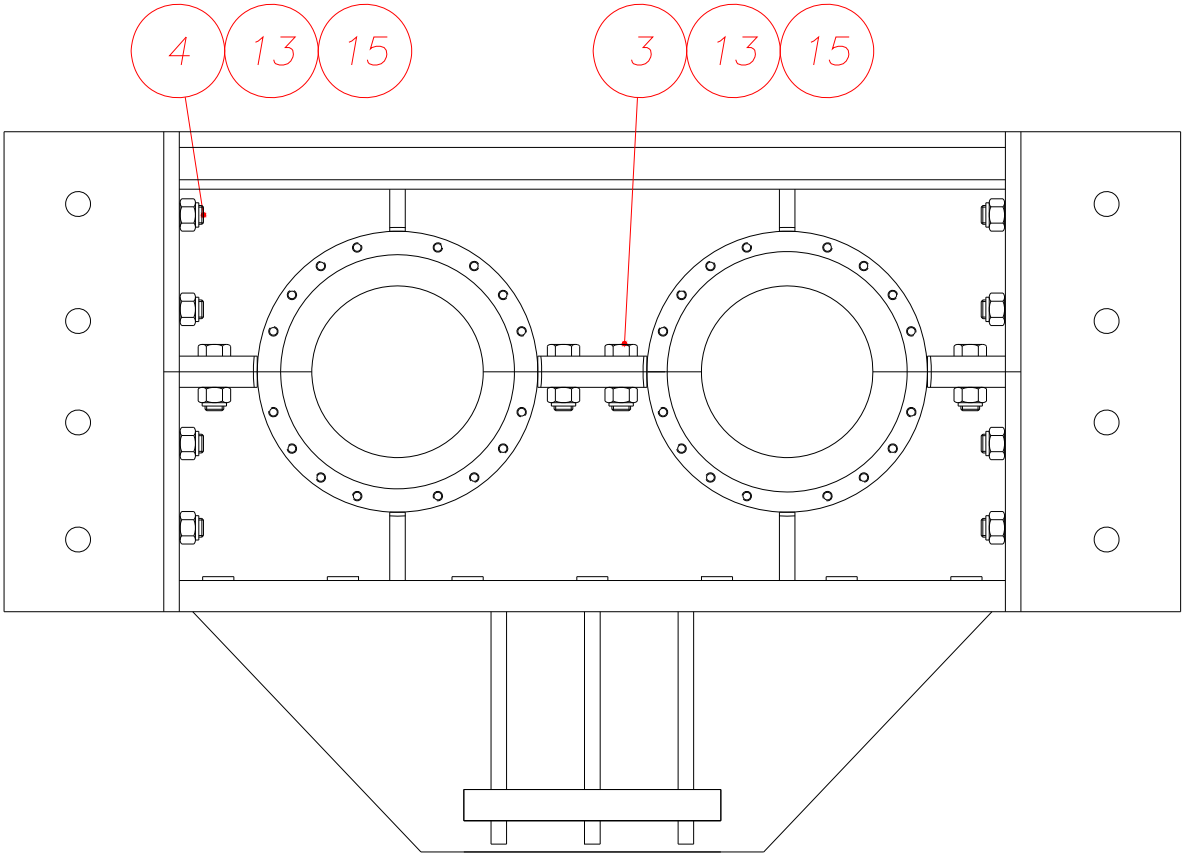
Part Number : 14154-1102



MMD MINING MACHINERY DEVELOPMENTS LIMITED

BOLT LIST FOR 154-1102

Part Number : 14154-1102



Item	Part Number	Description	Unit Mass	Qty
1	030320065	M20 X 65 HEX BOLT EN24014 GR8.8	0.24	6
2	030320080	M20 X 80 HEX BOLT EN24014 GR8.8	0.27	8
3	030324090	M24 X 90 HEX BOLT EN24014 GR8.8	0.45	16
4	030324100	M24 X 100 HEX BOLT EN24014 GR8.8	0.49	32
5	030330075	M30X75 8.8 HEX BOLT (USE 031330075)	0.60	6
6	030330090	M30 X 90 HEX BOLT EN24014 GR8.8	0.69	6
7	030330110	M30 X 110 HEX BOLT EN24014 GR8.8	0.80	8
8	030508025	M8 X 25 SKT CAP SCREW BS4168	0.00	2
9	031312025	M12 X 25 HEX SET SCREW BS4168 GR8.8	0.04	10
10	031320035	M20 X 35 HEX SET SCREW BS4168 GR8.8	0.16	21
11	031320055	M20 X 55 HEX SET SCREW BS4168 GR8.8	0.21	7
12	031420000	M20 NYLOC NUT BS4929	0.08	21
13	031424000	M24 NYLOC NUT BS4929	0.11	48
14	031430000	M30 NYLOC NUT BS4929	0.21	20
15	035624000	M24 HV WASHER SPECIFICATION DIN 6916	0.04	96
16	035630000	M30 HV WASHER SPECIFICATION DIN 6916	0.06	28
17	036000022	2" BSPT SQUARE HEAD PLUG	0.31	1
		Total Mass :-	**62.84 Kg**	

SIDE WEARPLATE ASSEMBLY

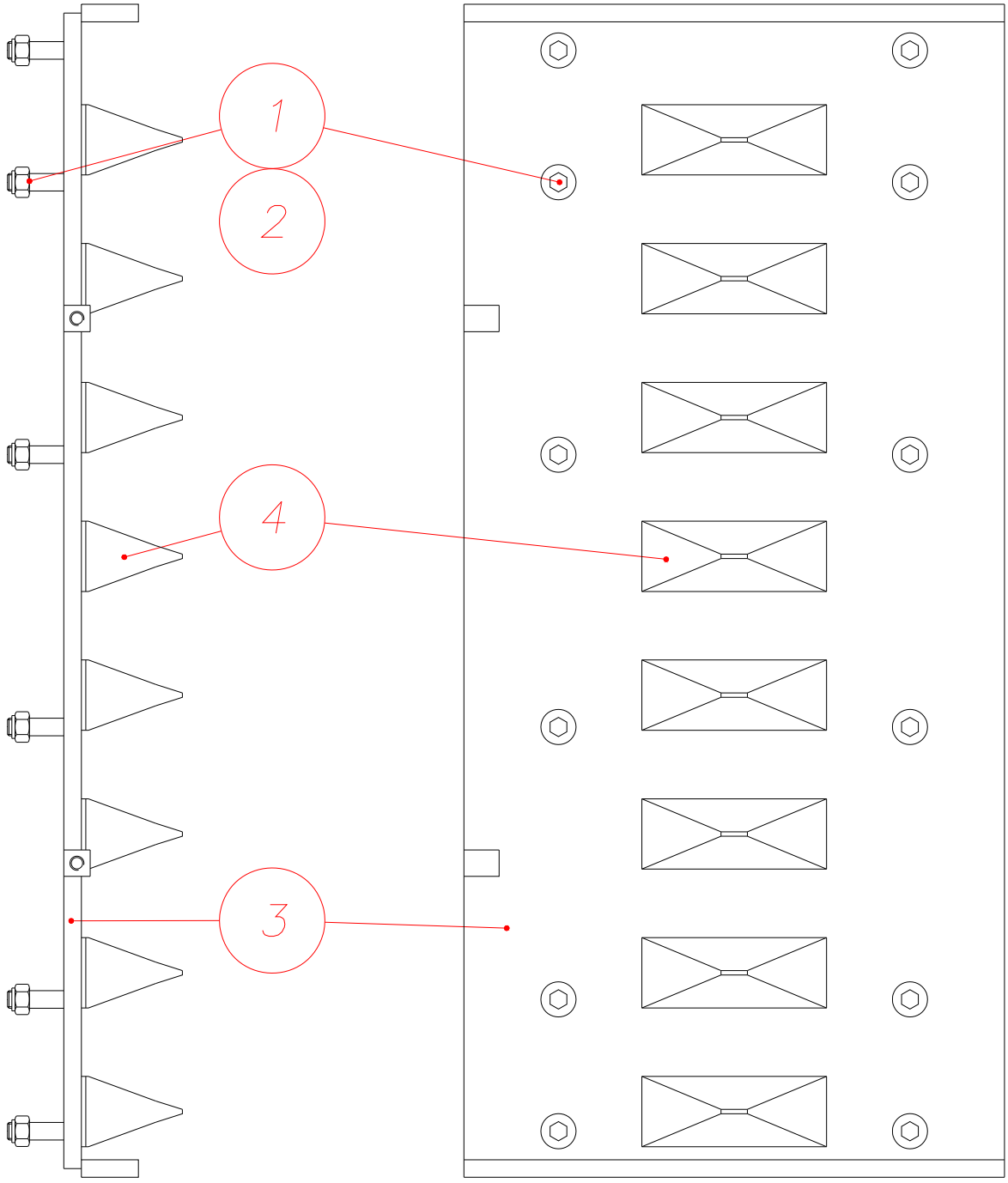
PART NUMBER - 141563049

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

SIDE WEARPLATE/PYRAMID ASSEMBLY

Part Number : 141563049



Item	Part Number	Description	Unit Mass	Qty
1	031420000	M20 NYLOC NUT BS4929	0.08	12
2	031820070	M20 X 70 CSK SKT SCREW BS4168	0.16	12
3	1563049-84	SIDE WEAR PLATE	135.00	1
4	5060314-01	5" PYRAMID-500 M/C-MMD505	3.90	8
		Total Mass :-	**169.08 Kg**	

END WEARPLATE ASSEMBLY

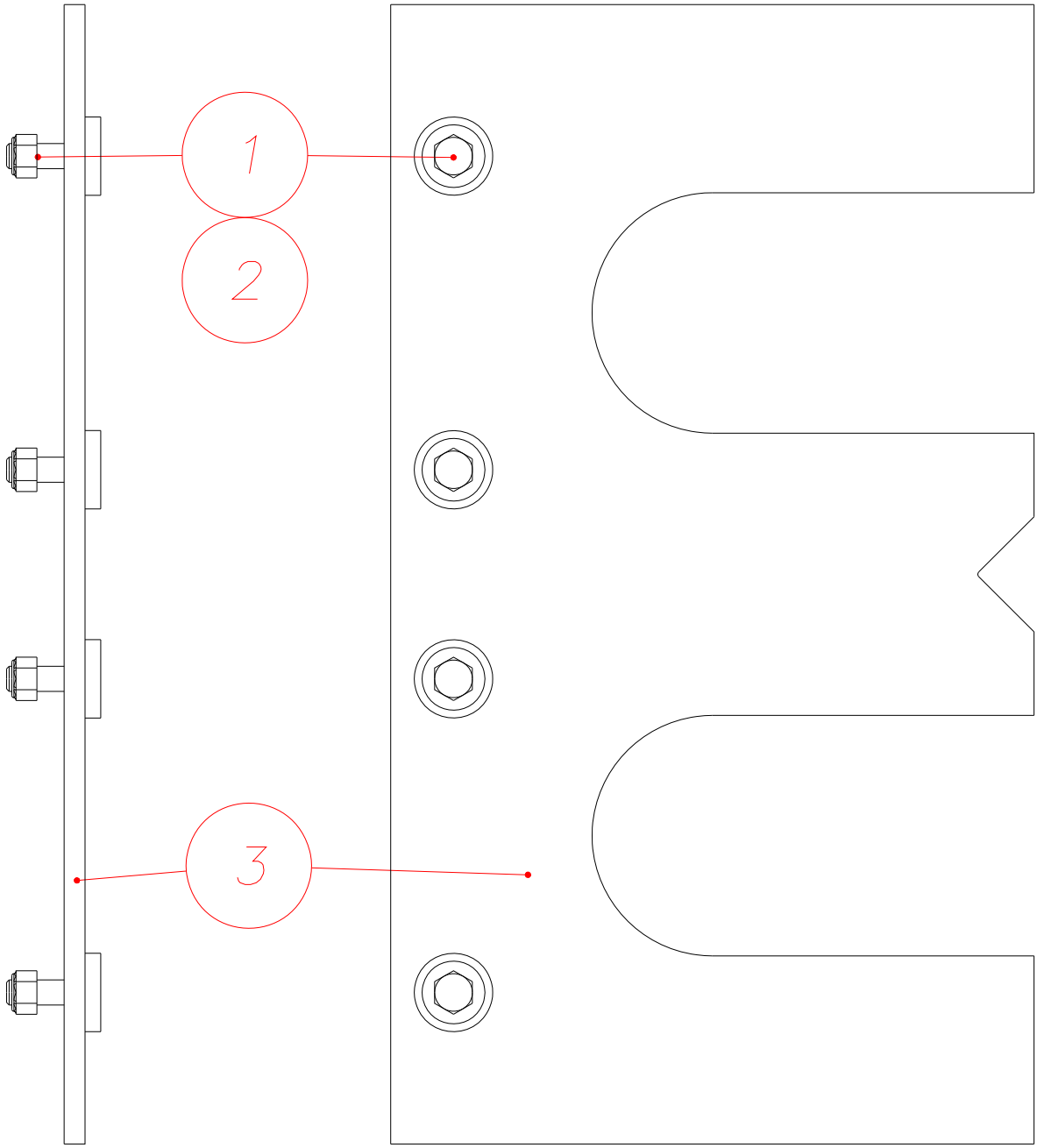
PART NUMBER - 141563440

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

END WEARPLATE ASSEMBLY

Part Number : 141563440



Item	Part Number	Description	Unit Mass	Qty
1	030324075	M24 X 75 HEX BOLT EN24014 GR8.8	0.40	4
2	031424000	M24 NYLOC NUT BS4929	0.11	4
3	1563050-84	END WEAR PLATE	75.00	1
		Total Mass :-	**77.04 Kg**	

BREAKER BAR ASSEMBLY

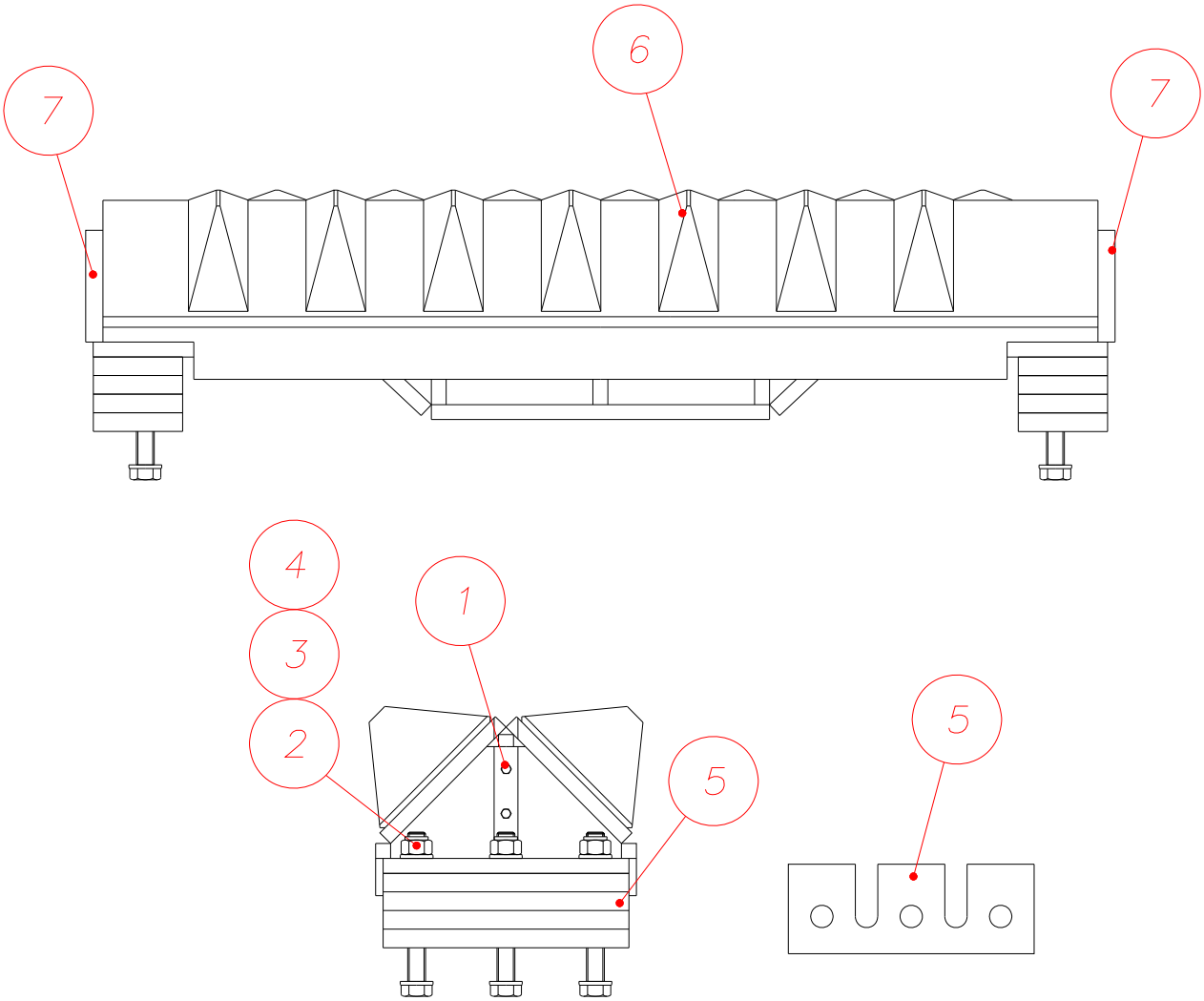
PART NUMBER - 145070352

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

BREAKER BAR ASSEMBLY

Part Number : 145070352



Item	Part Number	Description	Unit Mass	Qty
1	031308030	M8 X 30 HEX SET SCREW BS4168 GR8.8	0.02	4
2	031324200	M24 X 200 HEX SET SCREW BS4168 GR8.8	0.84	6
3	031424000	M24 NYLOC NUT BS4929	0.11	6
4	035624000	M24 HV WASHER SPECIFICATION DIN 6916	0.04	12
5	5070137-84	25MM PACKER	8.00	8
6	5070352-85	BREAKER BAR	254.00	1
7	5090066-01	KEY	1.00	2
		Total Mass :-	**326.26 Kg**	

MMD MINING MACHINERY DEVELOPMENTS LIMITED

LEFT-HAND BREAKER SHAFT ASSEMBLY

PART NUMBER - 241564163

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1.0	FIRST ISSUE	16 - 05 - 12

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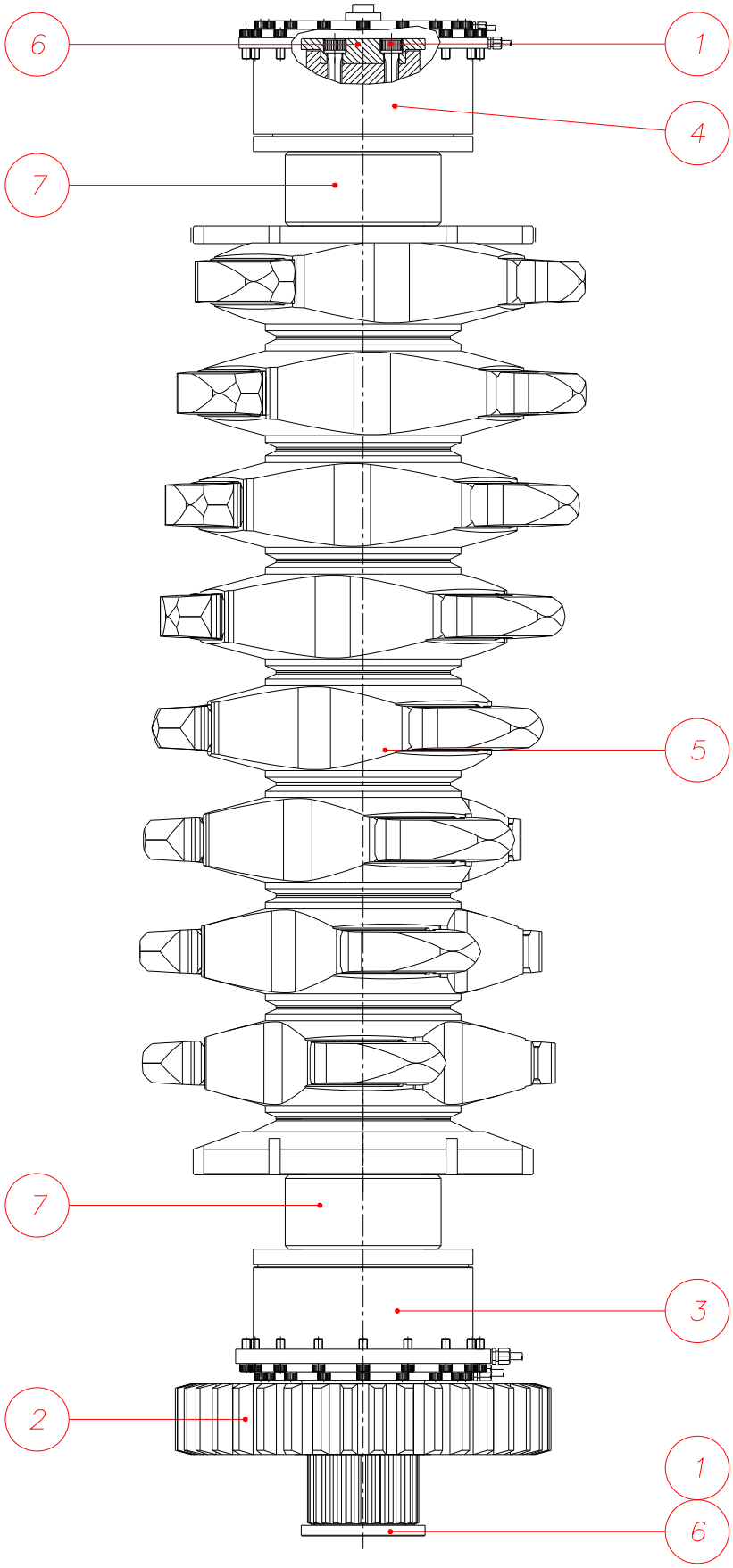
BREAKER SHAFT ASSEMBLY

Part Number : 241564163



MMD MINING MACHINERY DEVELOPMENTS LIMITED

BREAKER SHAFT ASSEMBLY

Part Number : 241564163

Item	Part Number	Description	Unit Mass	Qty
1	030520050	M20 X 50 SKT CAP SCREW BS4168	0.18	12
2	141540150	SPUR GEAR ASSEMBLY	140.00	1
3	141563053	FIXED BEARING ASSEMBLY	73.86	1
4	141563054	FLOATING BEARING ASSEMBLY	71.95	1
5	141564163	BREAKER SHAFT ASSEMBLY	1286.80	1
6	1561856-01	END CAP	3.50	2
7	1563042-01	SHAFT SPACER	14.50	2
		Total Mass :-	**1610.79 Kg**	

LEFT-HAND BREAKER SHAFT ASSEMBLY

PART NUMBER - 141564163

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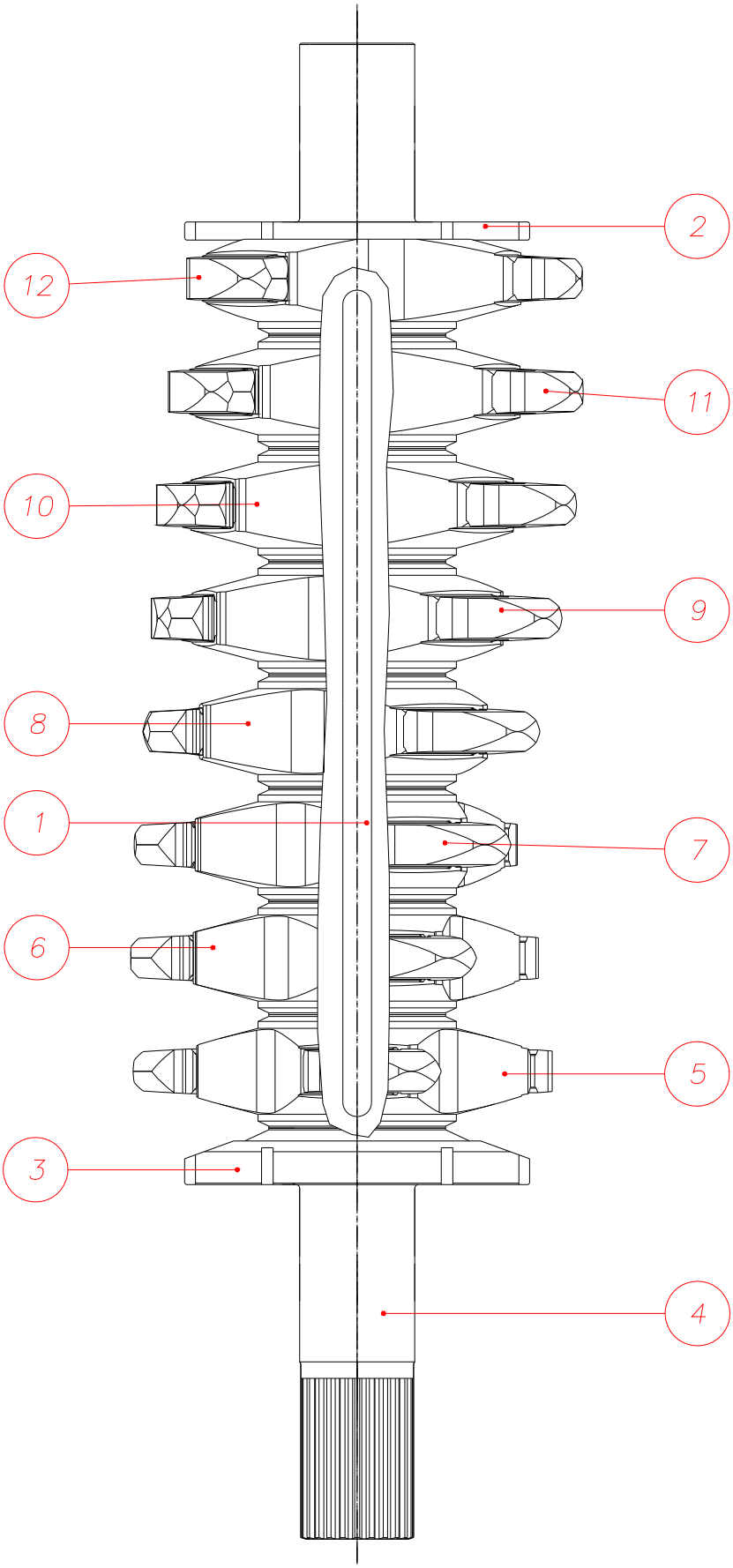
BREAKER SHAFT ASSEMBLY

Part Number : 141564163



MMD MINING MACHINERY DEVELOPMENTS LIMITED

BREAKER SHAFT ASSEMBLY

Part Number : 141564163

Item	Part Number	Description	Unit Mass	Qty
1	1549186-01	KEY	8.00	2
2	1562214-01	RIGHTHAND SCREWED COLLAR	37.00	1
3	1564169-84	LEFTHAND SCREWED COLLAR	62.80	1
4	5010326-06	BREAKER SHAFT	411.00	1
5	5051402-85	3 TOOTH RING	96.00	1
6	5051403-85	3 TOOTH RING	96.00	1
7	5051404-85	3 TOOTH RING	96.00	1
8	5051405-85	3 TOOTH RING	96.00	1
9	5051406-85	3 TOOTH RING	96.00	1
10	5051407-85	3 TOOTH RING	96.00	1
11	5051408-85	3 TOOTH RING	96.00	1
12	5051412-85	END 3 TOOTH RING	88.00	1
		Total Mass :-	**1286.80 Kg**	

SPUR GEAR ASSEMBLY

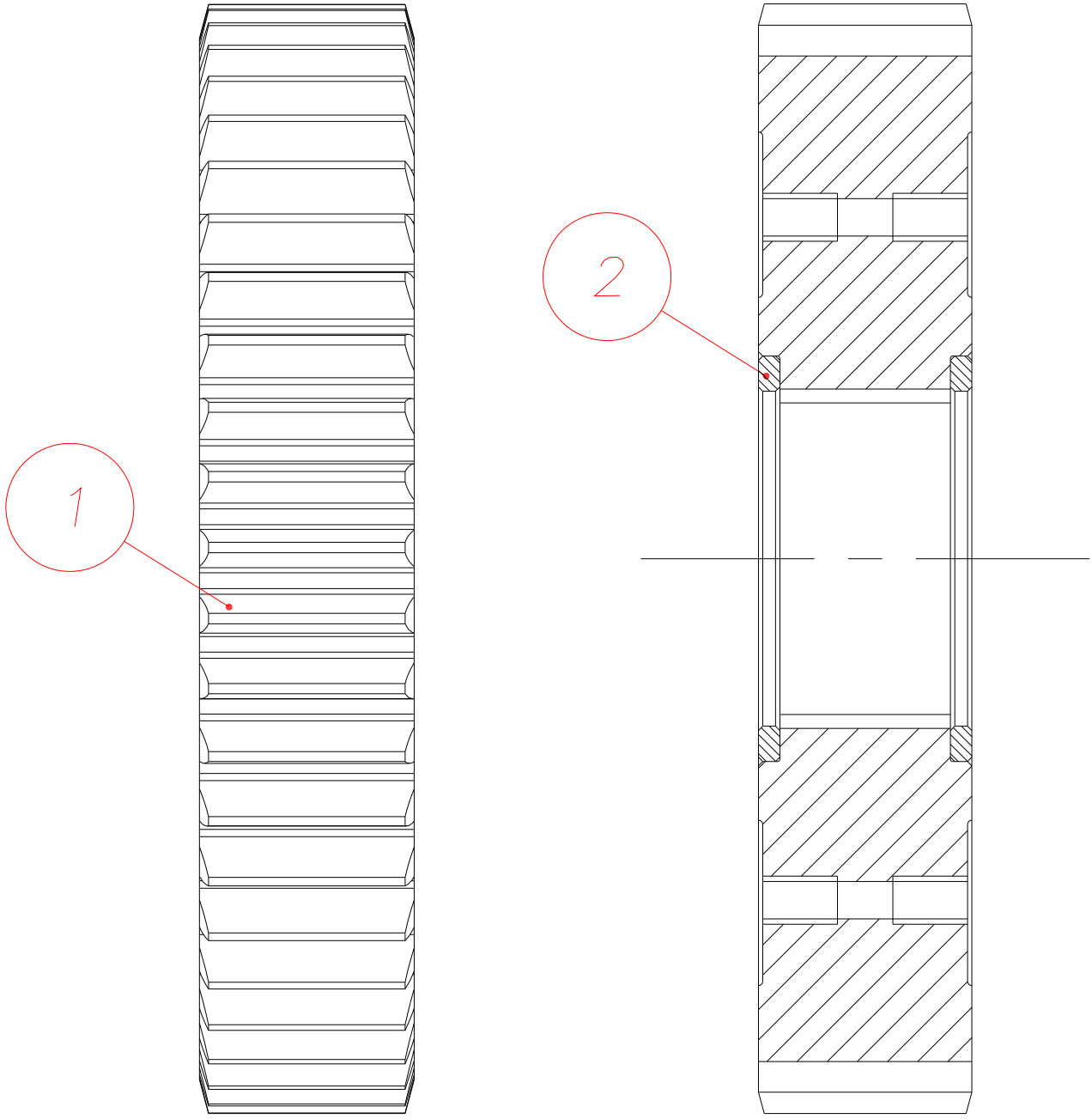
PART NUMBER - 141540150

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

SPUR GEAR ASSEMBLY

Part Number : 141540150

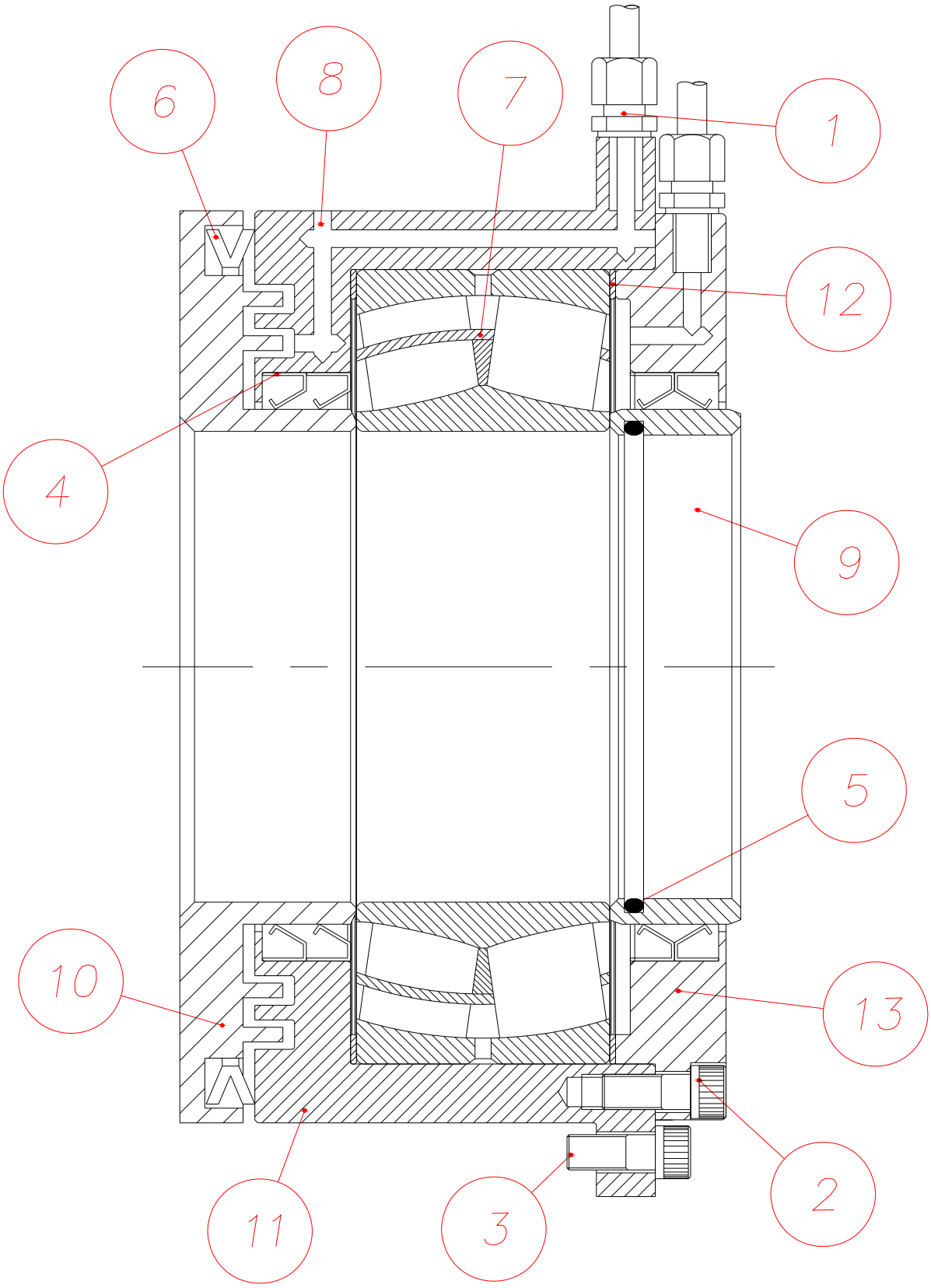


Item	Part Number	Description	Unit Mass	Qty
1	1540150-01	SPUR GEAR	138.68	1
2	1563177-01	SPUR GEAR CARRIER	0.66	2
		Total Mass :-	**140.00 Kg**	

FIXED BEARING ASSEMBLY

PART NUMBER - 141563053

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12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MMD MINING MACHINERY DEVELOPMENTS LIMITED

FIXED BEARING ASSEMBLY

Part Number : 141563053

Item	Part Number	Description	Unit Mass	Qty
1	023307509	1/4 BSP MALE-10MM PIPE ADAPTOR	0.10	2
2	030512030	M12 X 30 SKT CAP SCREW BS4168	0.04	16
3	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	16
4	032000080	175X200X15R4 OIL SEAL DIN 3760	0.20	4
5	032000100	RM 1543-57 O RING BS4518	0.01	1
6	032000760	V RING SEAL	0.01	1
7	035000014	23132 CC C3 W33 BEARING	20.50	1
8	036000001	1/8" BSPT PLUG	0.10	2
9	1540220-01	SEAL PATH	2.00	1
10	1562245-01	LABYRINTH SEAL	11.20	1
11	1563035-01	BEARING CAPSULE	27.80	1
12	1563036-01	FIXING PLATE	0.10	2
13	1563037-01	RETAINING PLATE	9.50	1
		Total Mass :-	**73.86 Kg**	

FLOATING BEARING ASSEMBLY

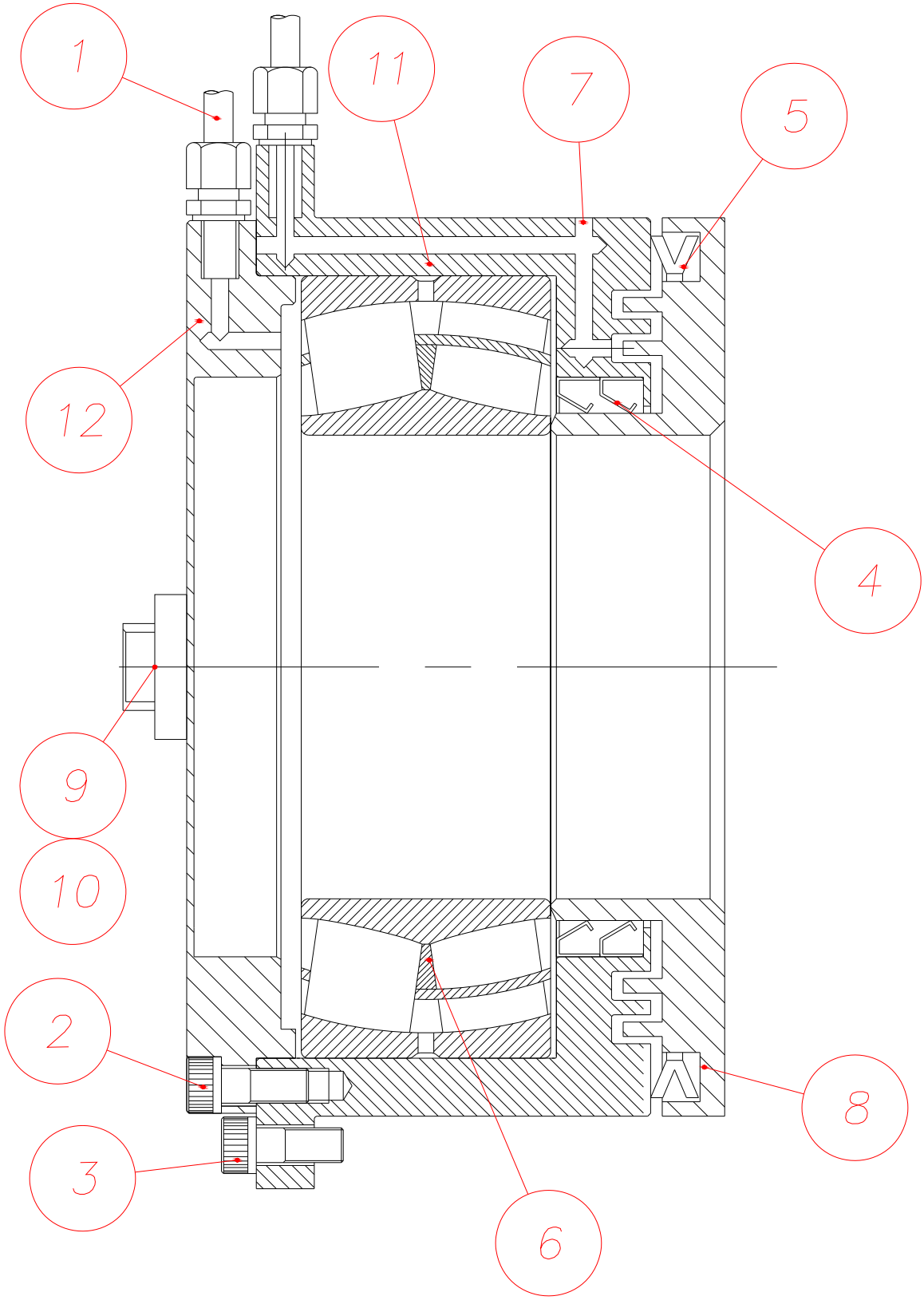
PART NUMBER - 141563054

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FLOATING BEARING ASSEMBLY

Part Number : 141563054



MMD MINING MACHINERY DEVELOPMENTS LIMITED

FLOATING BEARING ASSEMBLY

Part Number : 141563054

Item	Part Number	Description	Unit Mass	Qty
1	023307509	1/4 BSP MALE-10MM PIPE ADAPTOR	0.10	2
2	030512030	M12 X 30 SKT CAP SCREW BS4168	0.04	16
3	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	16
4	032000080	175X200X15R4 OIL SEAL DIN 3760	0.20	2
5	032000760	V RING SEAL	0.01	1
6	035000014	23132 CC C3 W33 BEARING	20.50	1
7	036000001	1/8" BSPT PLUG	0.10	2
8	1562245-01	LABYRINTH SEAL	11.20	1
9	1562523-01	SPEED SENSING BLANKING PLUG	0.10	1
10	1563010-01	SPEED SENSOR PLUG	0.10	1
11	1563035-01	BEARING CAPSULE	27.80	1
12	1563038-01	RETAINING PLATE	10.00	1
		Total Mass :-	**71.95 Kg**	

RIGHT-HAND BREAKER SHAFT ASSEMBLY

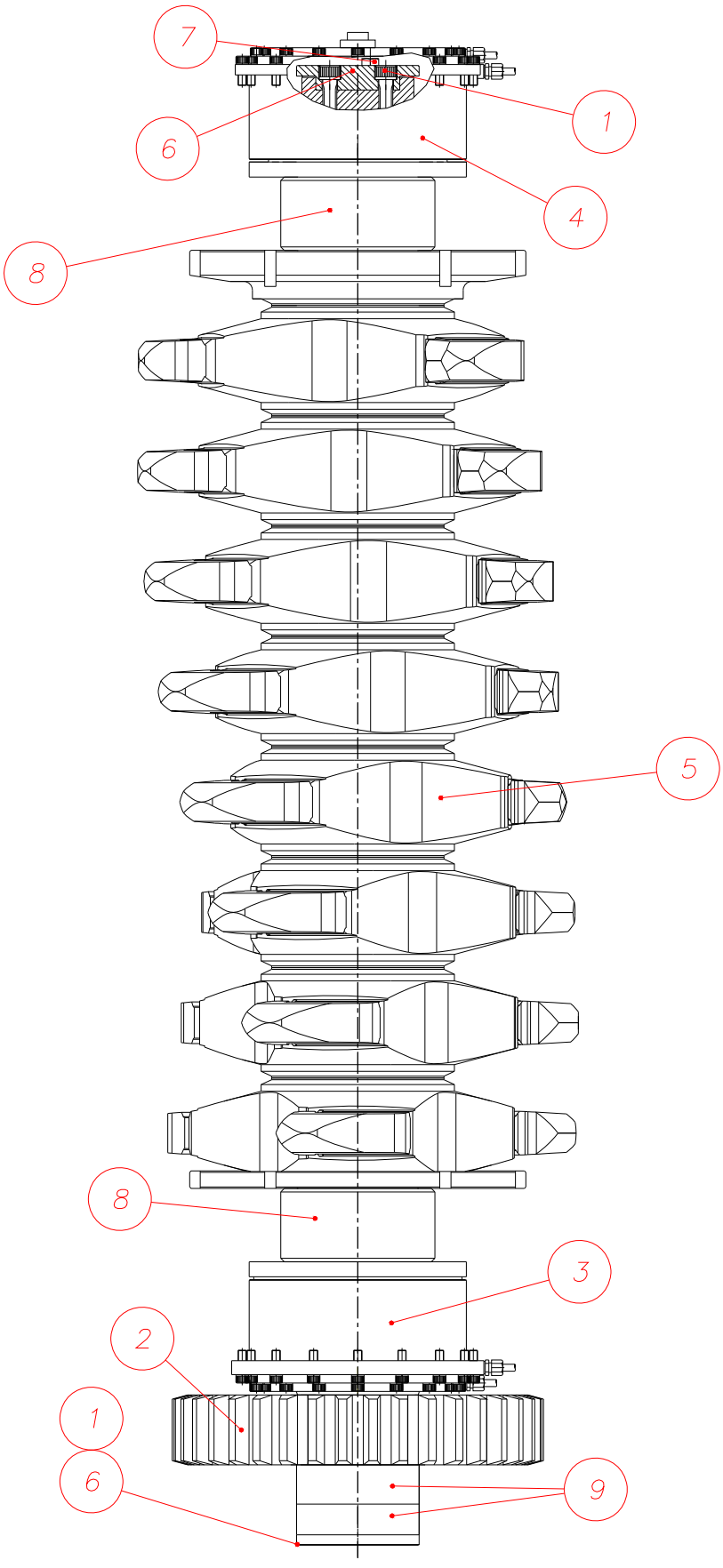
PART NUMBER - 241564164

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

BREAKER SHAFT ASSEMBLY

Part Number : 241564164



MMD MINING MACHINERY DEVELOPMENTS LIMITED

BREAKER SHAFT ASSEMBLY

Part Number : 241564164

Item	Part Number	Description	Unit Mass	Qty
1	030520050	M20 X 50 SKT CAP SCREW BS4168	0.18	11
2	141540150	SPUR GEAR ASSEMBLY	140.00	1
3	141563053	FIXED BEARING ASSEMBLY	73.86	1
4	141563054	FLOATING BEARING ASSEMBLY	71.95	1
5	141564164	BREAKER SHAFT ASSEMBLY	1286.80	1
6	1561856-01	END CAP	3.50	2
7	1561909-01	UNDERSPEED SENSING STUD	0.30	1
8	1563042-01	SHAFT SPACER	14.50	2
9	1563128-01	50MM SPACER	1.80	2
		Total Mass :-	**1614.49 Kg**	

RIGHT-HAND BREAKER SHAFT ASSEMBLY

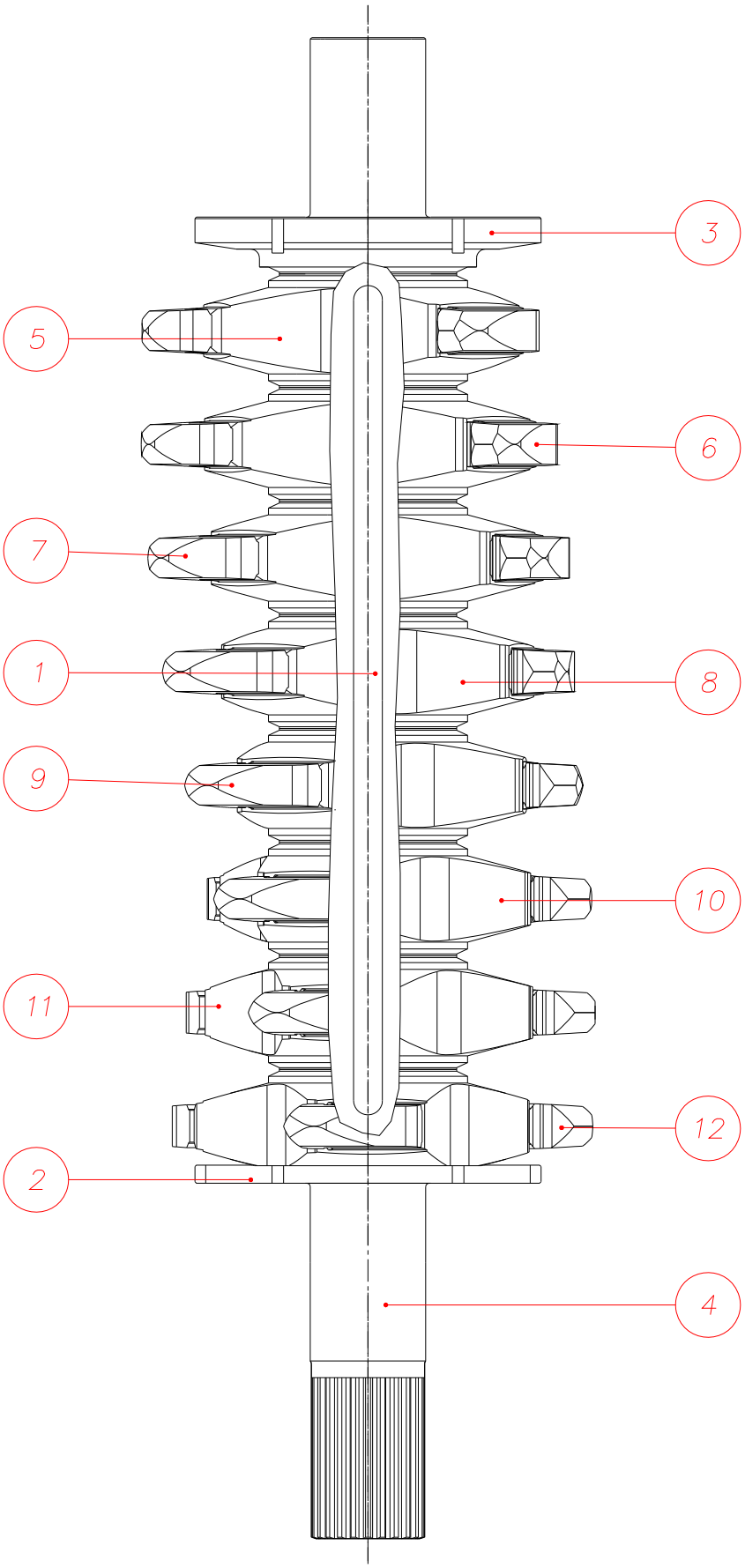
PART NUMBER - 141564164

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

BREAKER SHAFT ASSEMBLY

Part Number : 141564164



MMD MINING MACHINERY DEVELOPMENTS LIMITED

BREAKER SHAFT ASSEMBLY

Part Number : 141564164

Item	Part Number	Description	Unit Mass	Qty
1	1549186-01	KEY	8.00	2
2	1562214-01	RIGHTHAND SCREWED COLLAR	37.00	1
3	1564169-84	LEFTHAND SCREWED COLLAR	62.80	1
4	5010327-06	BREAKER SHAFT	411.00	1
5	5051405-85	3 TOOTH RING	96.00	1
6	5051406-85	3 TOOTH RING	96.00	1
7	5051407-85	3 TOOTH RING	96.00	1
8	5051408-85	3 TOOTH RING	96.00	1
9	5051409-85	3 TOOTH RING	96.00	1
10	5051410-85	3 TOOTH RING	96.00	1
11	5051411-85	3 TOOTH RING	96.00	1
12	5051412-85	END 3 TOOTH RING	88.00	1
		Total Mass :-	**1286.80 Kg**	

SPUR GEAR ASSEMBLY

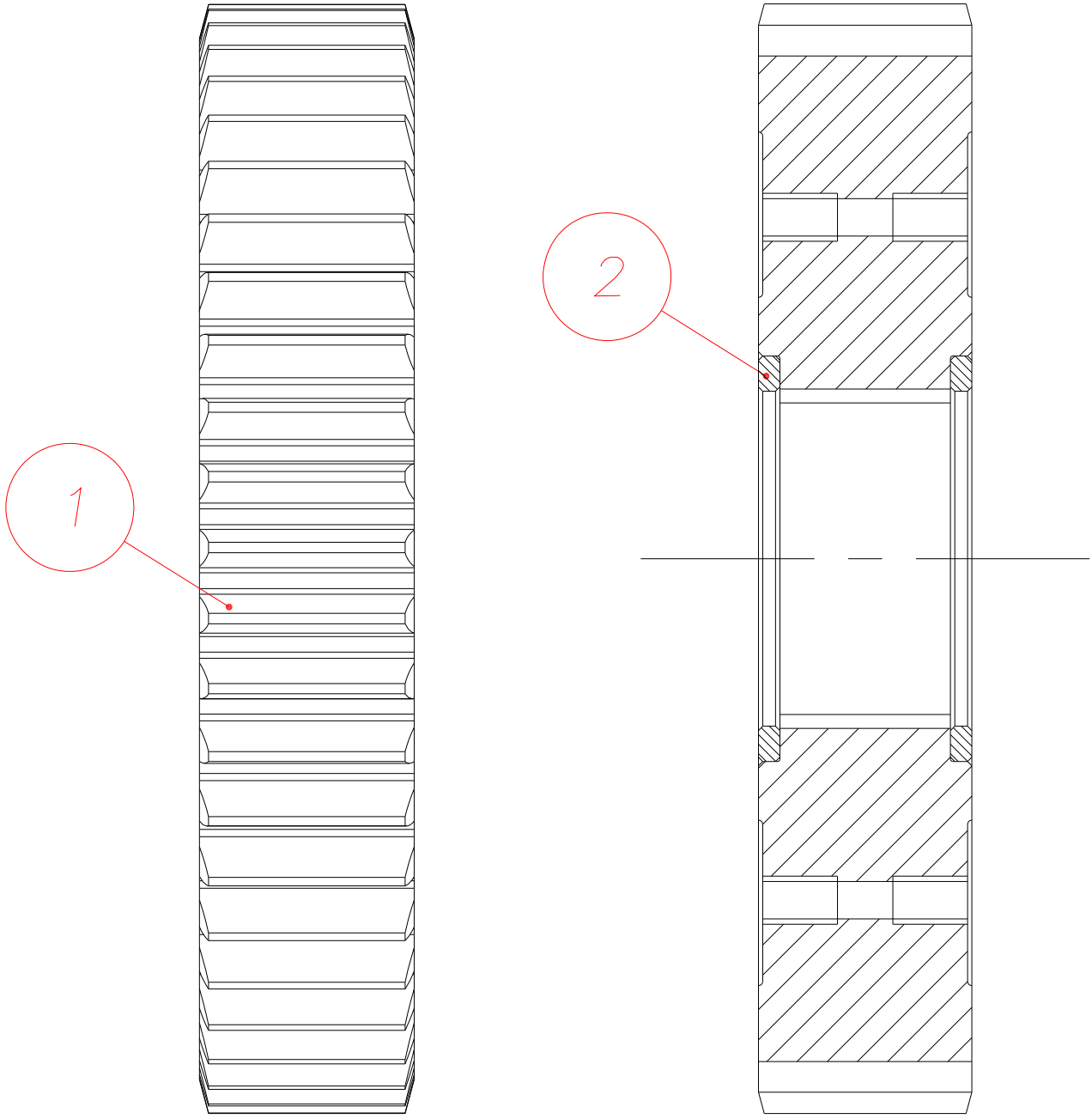
PART NUMBER - 141540150

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

SPUR GEAR ASSEMBLY

Part Number : 141540150

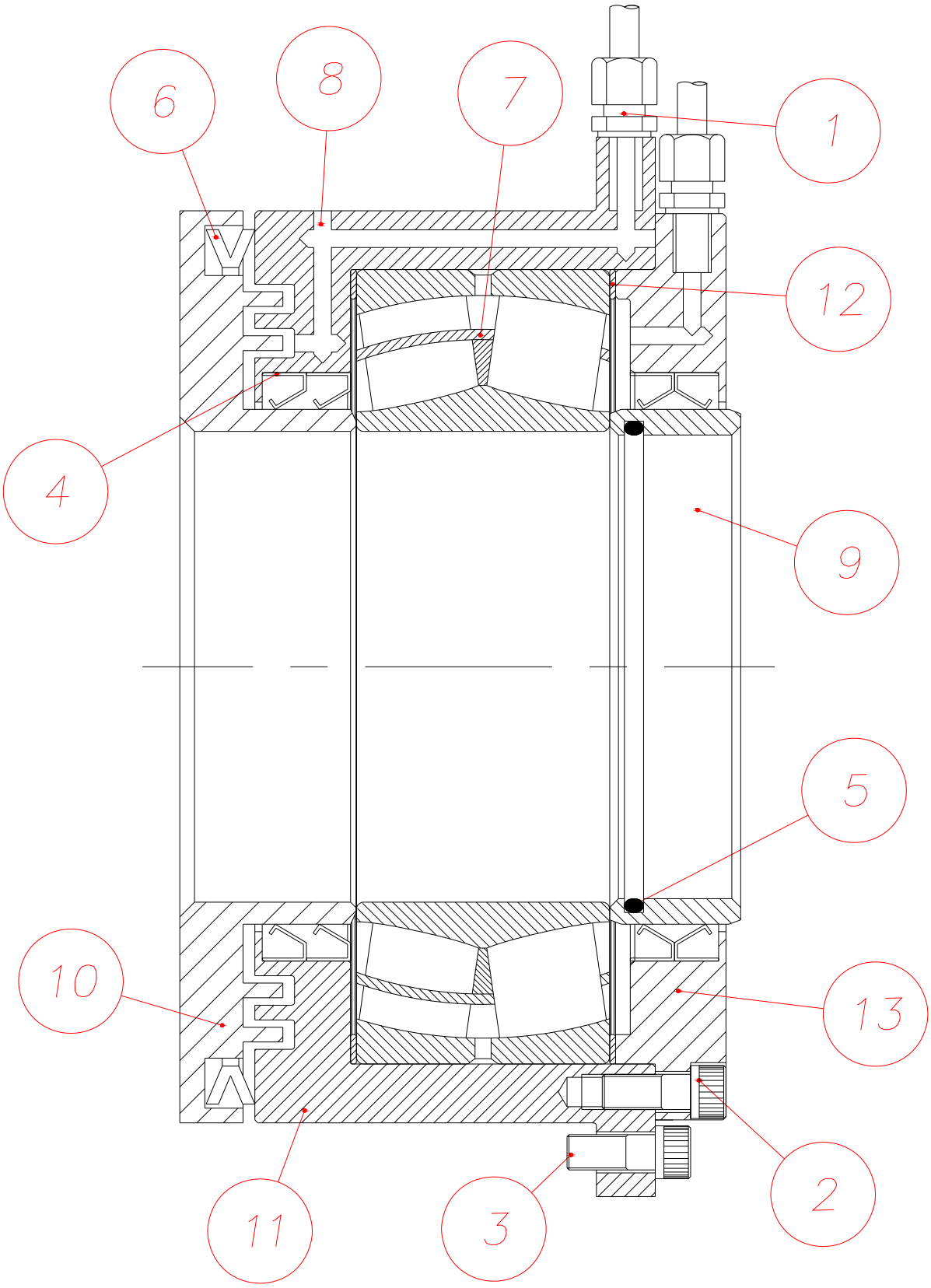


Item	Part Number	Description	Unit Mass	Qty
1	1540150-01	SPUR GEAR	138.68	1
2	1563177-01	SPUR GEAR CARRIER	0.66	2
		Total Mass :-	**140.00 Kg**	

FIXED BEARING ASSEMBLY

PART NUMBER - 141563053

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12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MMD MINING MACHINERY DEVELOPMENTS LIMITED

FIXED BEARING ASSEMBLY

Part Number : 141563053

Item	Part Number	Description	Unit Mass	Qty
1	023307509	1/4 BSP MALE-10MM PIPE ADAPTOR	0.10	2
2	030512030	M12 X 30 SKT CAP SCREW BS4168	0.04	16
3	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	16
4	032000080	175X200X15R4 OIL SEAL DIN 3760	0.20	4
5	032000100	RM 1543-57 O RING BS4518	0.01	1
6	032000760	V RING SEAL	0.01	1
7	035000014	23132 CC C3 W33 BEARING	20.50	1
8	036000001	1/8" BSPT PLUG	0.10	2
9	1540220-01	SEAL PATH	2.00	1
10	1562245-01	LABYRINTH SEAL	11.20	1
11	1563035-01	BEARING CAPSULE	27.80	1
12	1563036-01	FIXING PLATE	0.10	2
13	1563037-01	RETAINING PLATE	9.50	1
		Total Mass :-	73.86 Kg	

FLOATING BEARING ASSEMBLY

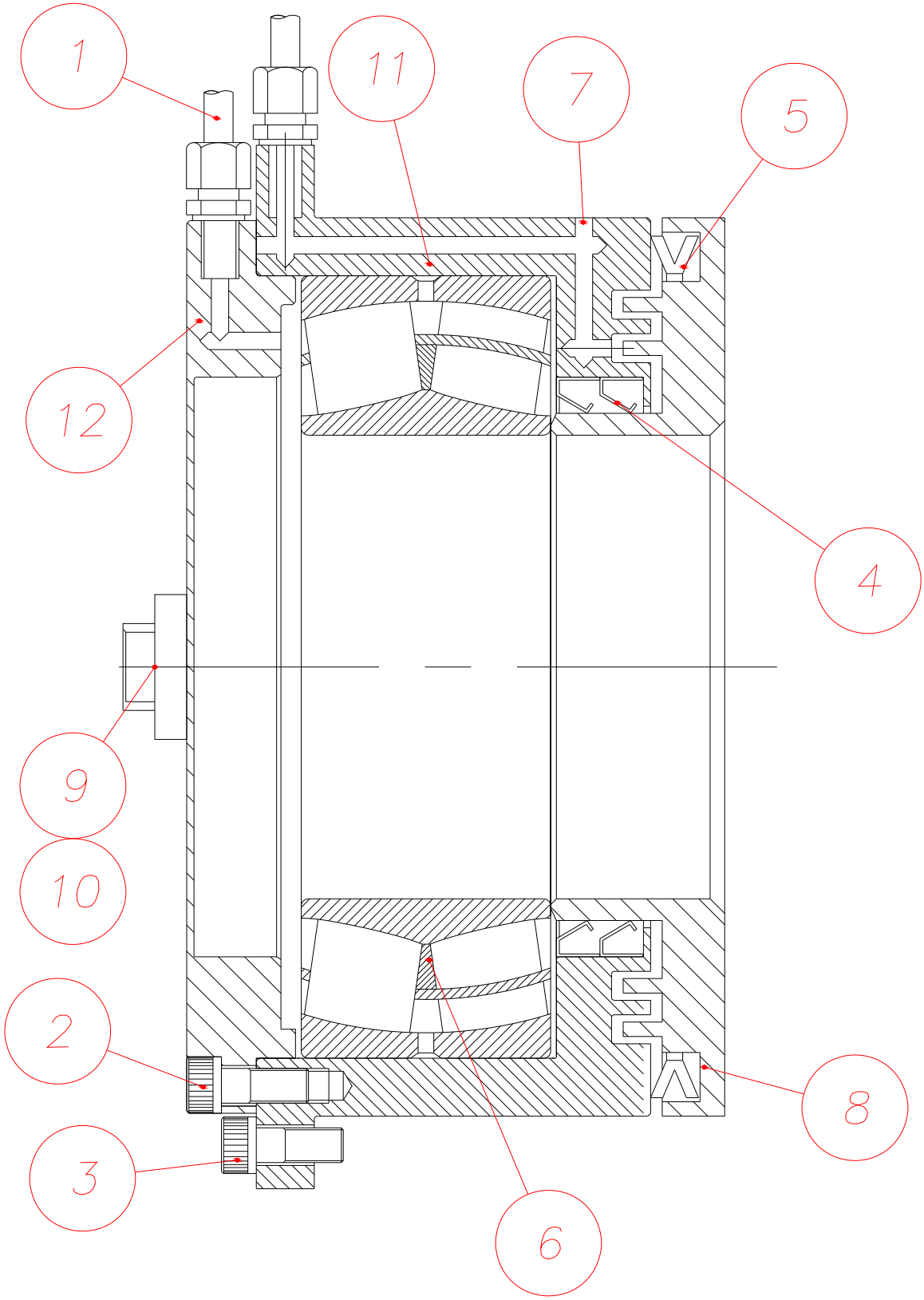
PART NUMBER - 141563054

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FLOATING BEARING ASSEMBLY

Part Number : 141563054



MMD MINING MACHINERY DEVELOPMENTS LIMITED
FLOATING BEARING ASSEMBLY
Part Number : 141563054

Item	Part Number	Description	Unit Mass	Qty
1	023307509	1/4 BSP MALE-10MM PIPE ADAPTOR	0.10	2
2	030512030	M12 X 30 SKT CAP SCREW BS4168	0.04	16
3	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	16
4	032000080	175X200X15R4 OIL SEAL DIN 3760	0.20	2
5	032000760	V RING SEAL	0.01	1
6	035000014	23132 CC C3 W33 BEARING	20.50	1
7	036000001	1/8" BSPT PLUG	0.10	2
8	1562245-01	LABYRINTH SEAL	11.20	1
9	1562523-01	SPEED SENSING BLANKING PLUG	0.10	1
10	1563010-01	SPEED SENSOR PLUG	0.10	1
11	1563035-01	BEARING CAPSULE	27.80	1
12	1563038-01	RETAINING PLATE	10.00	1
		Total Mass :-	**71.95 Kg**	

3 TOOTH RING ASSEMBLIES

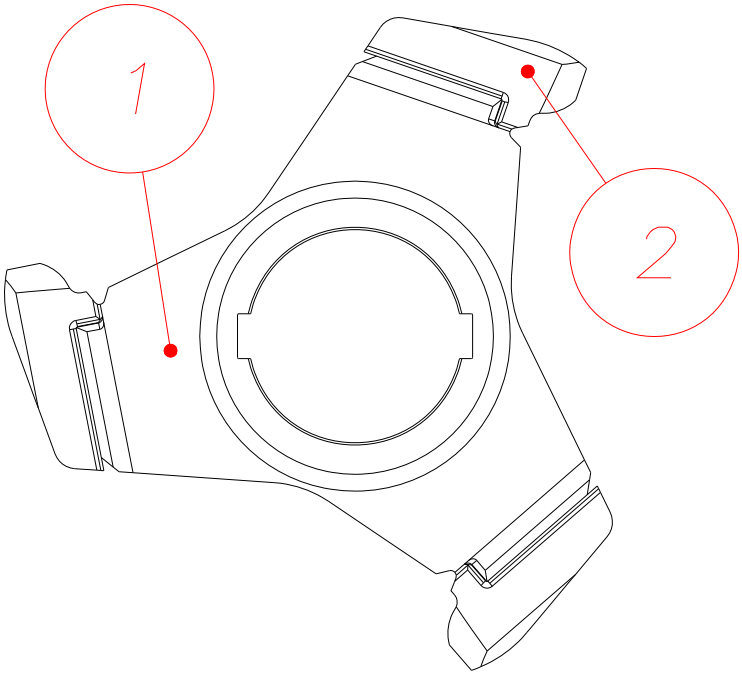
PART NUMBER - 5051402-85
TO
PART NUMBER - 5051412-85

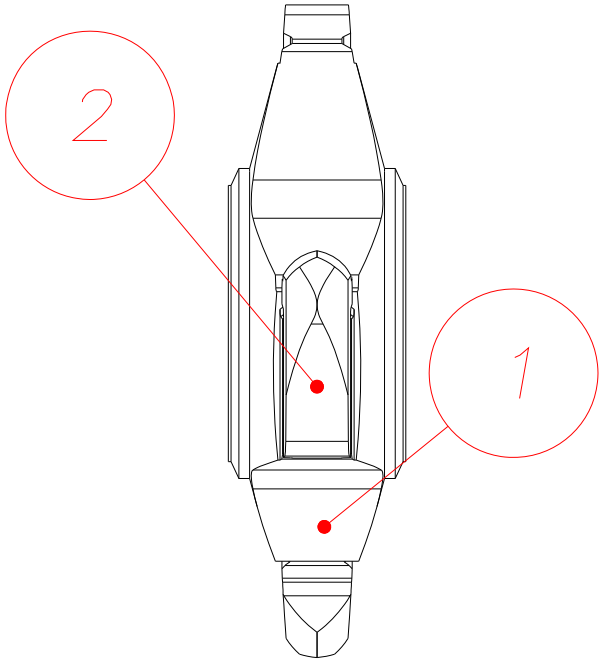
REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

3 TOOTH RING ASSEMBLY

Part Number : 5051402-85 TO 5051411-85



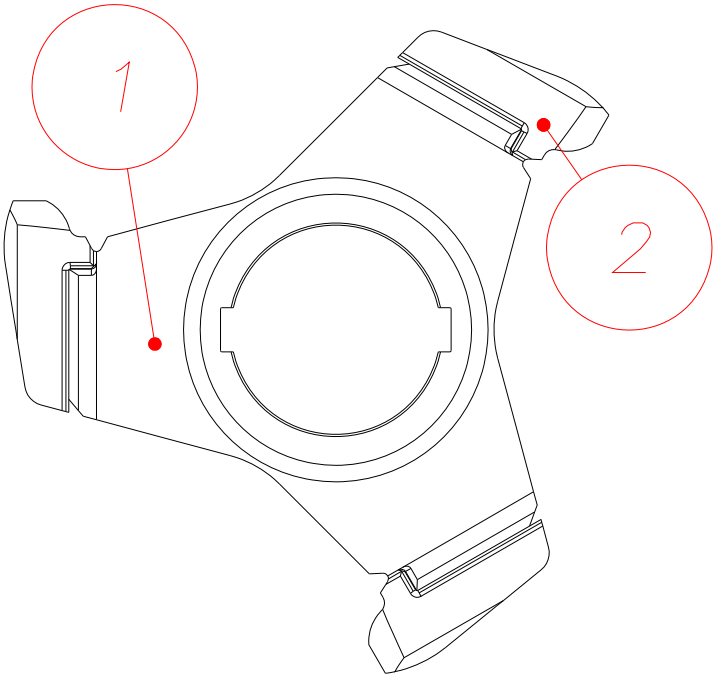


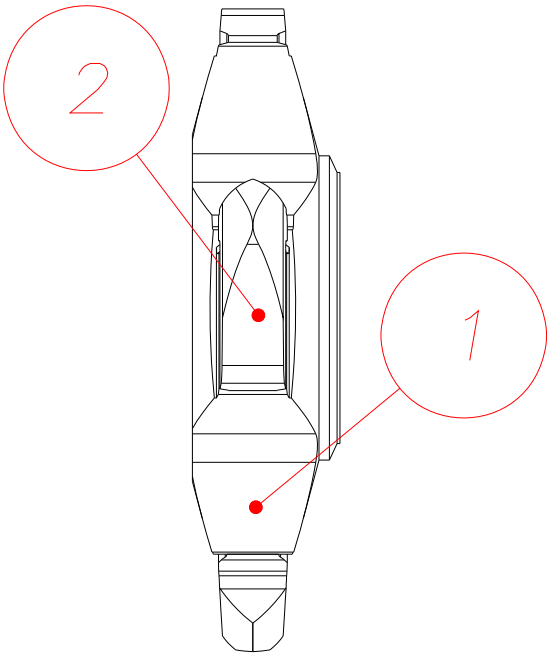
Item	Part Number	Description	Unit Mass	Qty
1	5051401-01	3 TOOTH RING	84.00	1
2	5061352-01	SOLID TIP REPLACEMENT	4.00	3
		Total Mass :-	**96.00 Kg**	

MMD MINING MACHINERY DEVELOPMENTS LIMITED

3 TOOTH END RING ASSEMBLY

Part Number : 5051412-85





Item	Part Number	Description	Unit Mass	Qty
1	5051412-01	3 TOOTH END RING	76.00	1
2	5061352-01	SOLID TIP REPLACEMENT	4.00	3
		Total Mass :-	**88.00 Kg**	

GEAR COUPLING ASSEMBLY

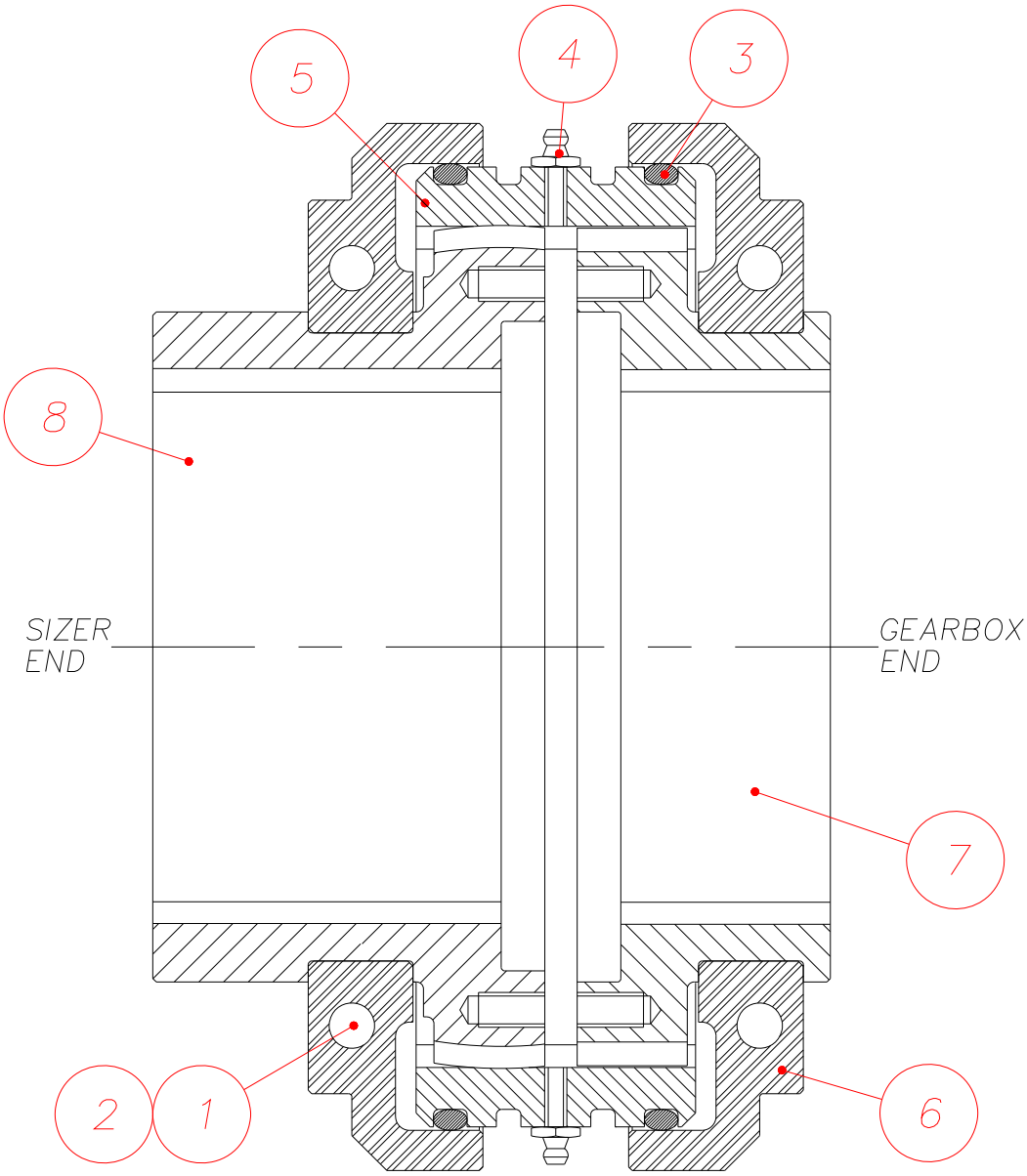
PART NUMBER - 111700313

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

GEAR COUPLING ASSEMBLY

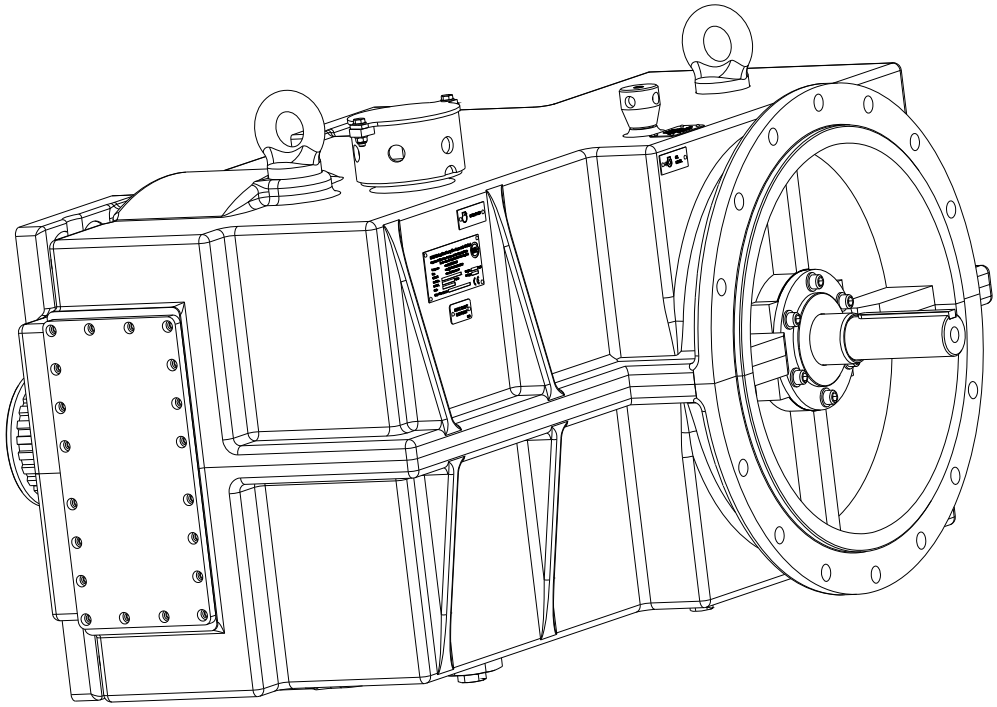
Part Number : 111700313



Item	Part Number	Description	Unit Mass	Qty
1	030512080	M12 X 80 SKT CAP SCREW BS4168	0.08	4
2	031412000	M12 NYLOC NUT BS4929	0.02	4
3	032000360	R81000 O RING BS4518	0.01	2
4	036000604	1/4 BSP GREASE NIPPLE	0.01	2
5	1010030-01	SLEEVE	9.00	1
6	1010040-91	GEAR COUPLING CLAMPS	7.50	2
7	1020010-01	HUB	8.00	1
8	1700049-01	HUB	11.00	1
		Total Mass :-	**43.44 Kg**	

MMD R200, 30:1 RATIO GEARBOX ASSEMBLY

PART NUMBER - 247070435



REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	25 - 09 - 98
5.0	UPDATED	29 - 02 - 12

MMD 707 SERIES R200
30:1 RATIO GEARBOX
247070435, TO SUIT VOITH COUPLING

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

REMOVAL

Split the gear coupling, and remove gearbox from machine.

Completely drain oil from gearbox.

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

Split gearbox case halves, taking care not to damage machined faces.There are two tapped holes provided to break seal on machined faces when required.

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 BSP Plugs to bottom gearcase half. Also NPT blanking plugs.

   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.

Please be aware that all Bearings, Spacers, Seal paths and Wheels must be heated to 110^{o}C prior to fitting. Using suitable measures. Suitable measures are:- Induction Heater, Oil Bath, Oven or Similar

2nd Reduction Pinion Assembly;

(a) Trial fit keys 5090016-01 to 1st reduction wheel 4001860-01
(b) Heat wheel 4001860-01.
(c) Heat and Fit bearing 23218 CC C3.
(d) Heat and fit second bearing 22218 EC3.
(e) Fit spacer 4001910-01.
(f) Fit keys 5090016-01 to pinion 7070350-01.
(g) Fit wheel 4001860-01 to pinion.
(h) Fit end cap 4001930-01.

3rd Reduction Shaft Assembly;

(a) Heat gear wheel 7070351-01.
(b) Trial fit keys to wheel 7070351-01.
(c) Heat and Fit bearings 23034 CC/C3.
(d) Heat and Fit spacer 7070359-01.
(e) Fit keys, 5090017-01 to pinion.
(f) Fit wheel 7070351-01, to pinion.
(g) Fit end cap 2060090-01.

Output Shaft Assembly;

(a) Heat and Fit bearing 23032 CC/C3.
(b) Heat and Fit spacer 7070385-01.
(c) Heat wheel 7070383-01 and fit spacer 7070384-01.
(d) Re-heat Wheel and Spacer and fit to shaft 7070213-01.
(e) Heat and Fit second bearing 23028 CC/C3.
(f) Fit end cap 1773024-01.
(g) Fit ‘O’ Ring 032000100 to seal path 7070211-01.
(h) Heat and Fit Seal Path 7070211-01.
(i) Fit seals 032000819 to seal housing 7070238-01.

Input Pinion Assembly;

(a) Heat and fit bearings 30311 J2Q.
(b) Fit seal 032000741 to seal housing 7070477-01.
(c) Fit ‘O’ Ring 032000625 to seal path,
(d) Heat seal path and slide over Input Shaft.
(e) Fit seal housing 7070477-01 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. (With spacer 7070476-01 behind back bearing)
(c) 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.
(d) Fit 3rd Reduction Assembly.(Repeat part (c))
(e) Lastly, the output shaft assembly.(Repeat part (c))

NOTE: Remove 2nd,3rd and Output Assemblies and fit 'O' Rings to W33 Feature of Bearings. (Refer to MMD Procedure TO139)
'O' Rings to be made up as required, (SEE PAGE 5 for Sizes)

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.

Lower the top gearcase half down over the gears ensuring that bearings are seated correctly. Fit both Dowels to ensure gearcase is held square. Fit all side bolts and gearcase long bolts, 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 Caliper 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 as per MMD Procedure 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, 7070388-01 and end plate 7070391-01, Filler breather 023301600, Breather Protector 147071025 and dipstick 7070370-01.

Tighten oil seal housing into gearcase on output shaft assembly.

Tighten oil seal housing into gearcase on input shaft assembly.Set up input shaft for a clearance of 0.25mm This should be completed by an experienced person.
IF IN DOUBT CONTACT MMD FOR ADVICE.

Fill with oil. (See Maintenance Schedule for oil Specification, **Approx. 70 litres**.)

Set up and run up for a minimum of 4 hours doing regular temperature checks.
Maximum temperature rise in Input shaft bearing of 80^{o}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.

GEARBOX 'O' RINGS

R200

4mm - 560mm x 2 3rd Reduction

4mm - 510mm x 1 Output

3mm - 450mm x 1 Output

2mm - 350mm x 2 2nd Reduction

R250

4mm 550mm

3mm 470mm

3mm 440mm

2mm 430mm

R400

4mm - 1150mm Output

4mm - 1200mm 3rd

3mm - 1300mm Output

3mm - 900mm 3rd

3mm - 650mm 2nd

2mm - 750mm 2nd

AGMA

4mm - 800mm x 1

4mm - 700mm x 1

4mm - 750mm x 1

3mm - 800mm x 2

3mm - 600mm x 1

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.

The lubricant specification is specified as per MMD Procedure TO138.

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 to 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% to10%.
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 TO138.

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.

Gearbox oil replacement instructions.

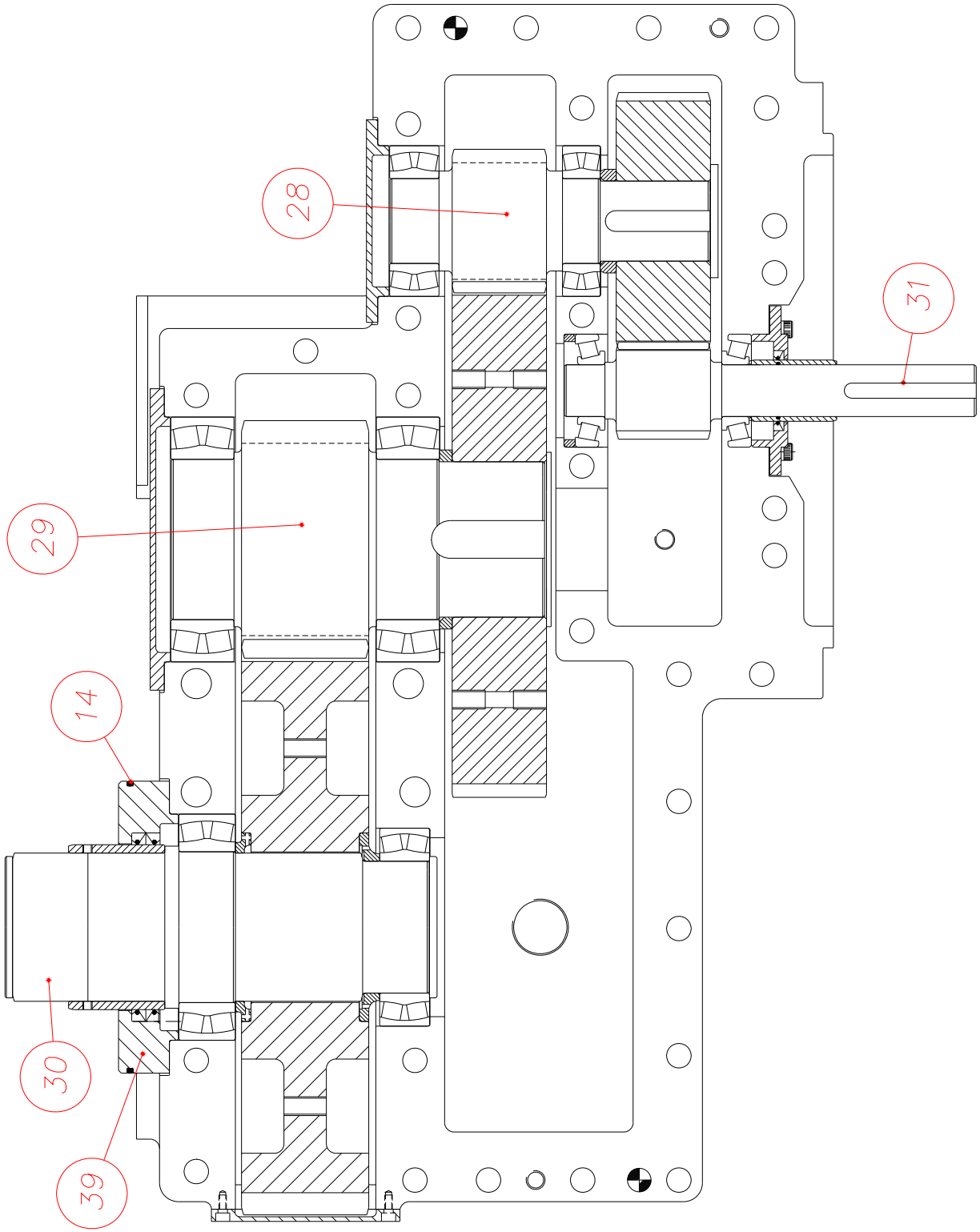
- It is recommended that the oil be warm when draining the gearbox, an ideal time would be 20 minutes after the sizer was switched off and all the oil has had time to drain to the bottom of the gearbox.

WARNING – HOT OIL CAN CAUSE SERIOUS INJURY IF IT COMES IN CONTACT WITH THE EYES OR SKIN. SUITABLE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN.

- Place a catching container of suitable size directly under the draining plug and ensure that it is properly supported to take the weight of the filled container.
- Remove the filler/breather protector top cover plate and the filler/breather cap.
- Carefully remove the draining plug in the bottom of the gearbox and let all the oil drain into the container taking care not to spill any of the used oil.
- Once the gearbox is empty, remove the magnetic plug (7070432) from the bottom of the gearbox and thoroughly clean it by removing any metal particles that may be clinging to it. Once the magnetic plug is clean, replace it and the draining plug and ensure that they are properly tightened.
- Remove the container with the old oil and discard the contents in accordance with the requirements of the local environmental regulations.
- Fill the gearbox with new oil. Always use the correct oil as specified in this manual for refilling!

CAUTION – OVERFILLING IS KNOWN TO CAUSE SERIOUS DETRIMENTAL EFFECTS AND CAN BE AS HARMFUL AS UNDER FILLING.

- An oil level dipstick is provided on the gearbox for checking the oil level. This is carried out by removing the dipstick and wiping it with a cloth. Re-insert the dipstick (Screwing in fully) and remove again. 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. Add oil until the desired level is reached.
- Once the gearbox has been filled to the correct level, replace the filler/breather cap and the filler/breather protector top cover plate.
- The gearbox is now ready to be returned to service.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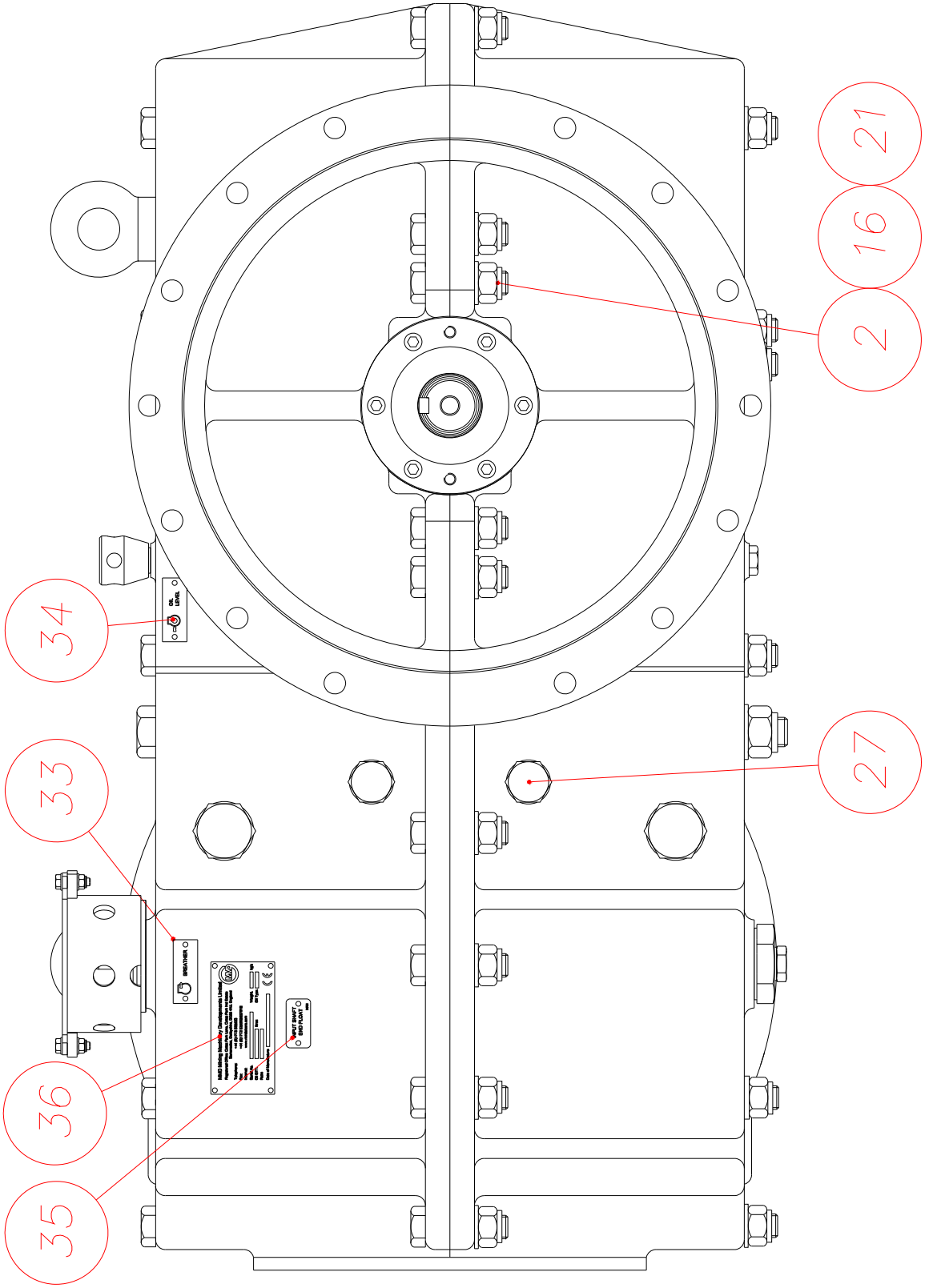
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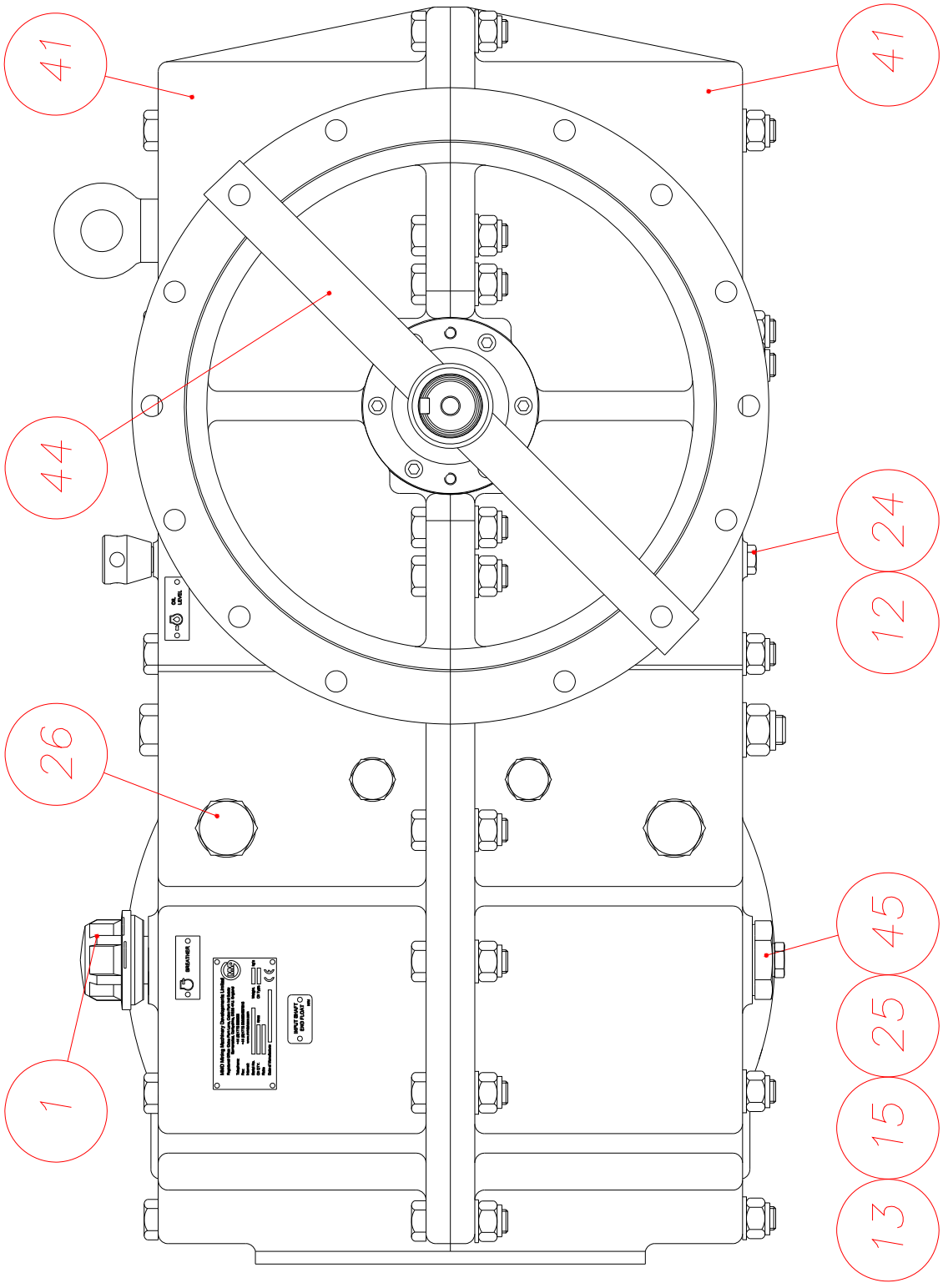
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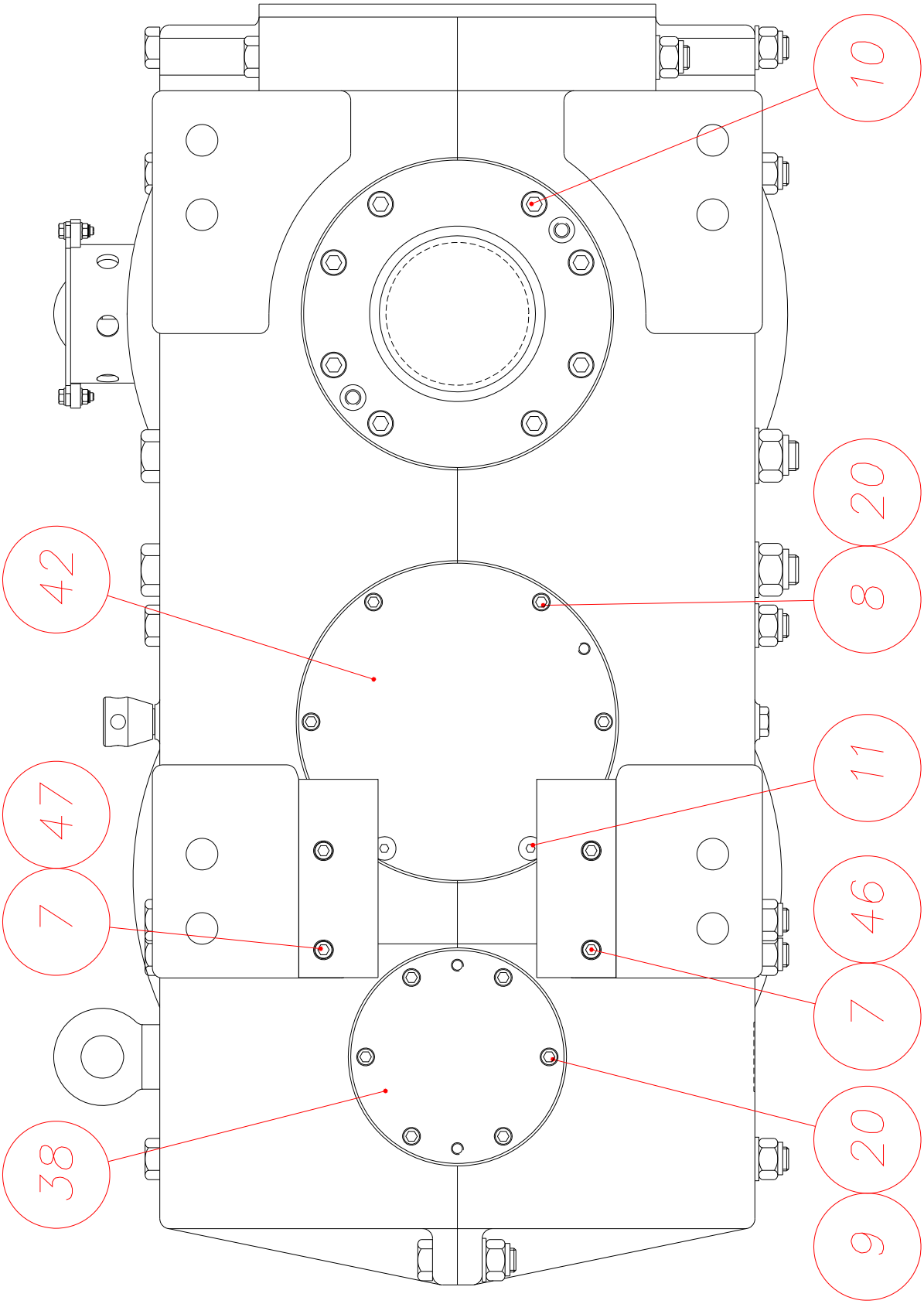
FILLER BREATHER PROTECTOR PART NUMBER 14707025
REMOVED FROM THIS VIEW FOR REFERENCE ONLY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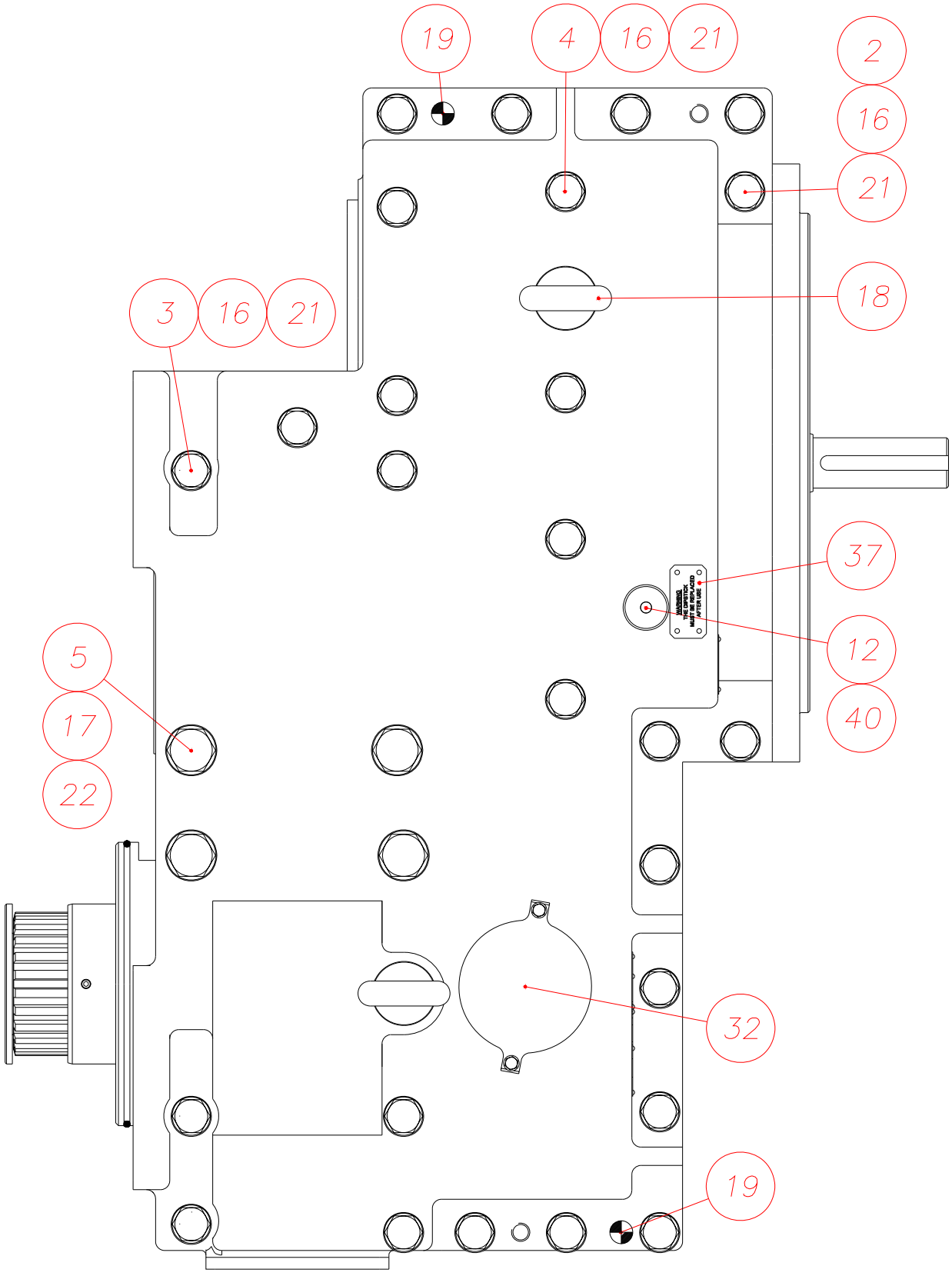
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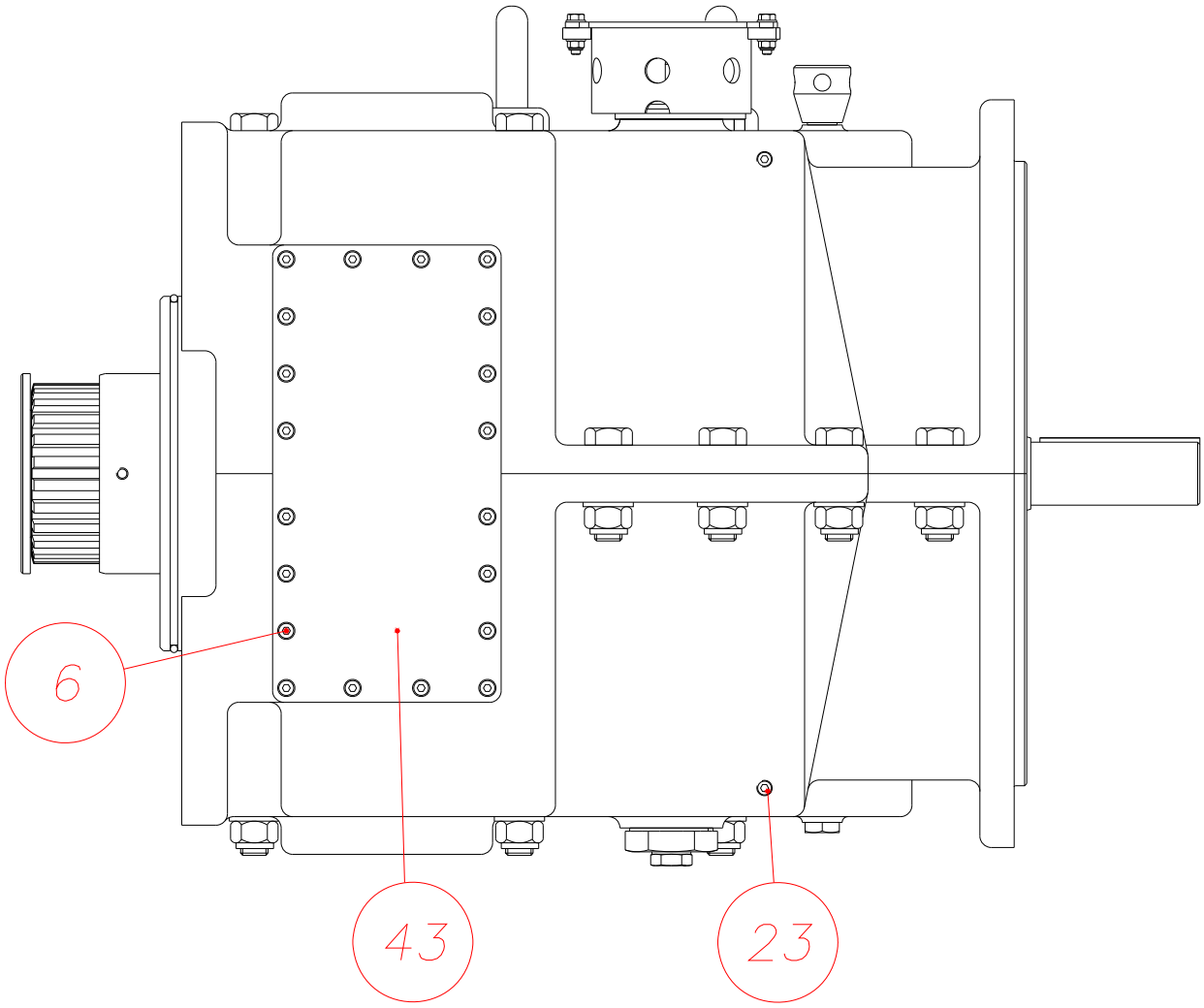
MMD MINING MACHINERY DEVELOPMENTS LIMITED

R200 GEARBOX 30:1 RATIO(VOITH)

Part Number : 247070435



Item	Part Number	Description	Unit Mass	Qty
1	023301600	FILLER BREATHER UCAB 116340 IP65	0.40	1
2	030324090	M24 X 90 HEX BOLT EN24014 GR8.8	0.45	17
3	030324390	M24 X 390 HEX BOLT EN24014 GR8.8	1.52	3
4	030324640	M24 X 640 HEX BOLT EN24014 GR8.8	2.41	10
5	030330650	M30 X 650 HEX BOLT EN24014 GR8.8	3.87	4
6	030508016	M8 X 16 SKT CAP SCREW BS4168	0.01	20
7	030512025	M12 X 25 SKT CAP SCREW BS4168	0.04	4
8	030512030	M12 X 30 SKT CAP SCREW BS4168	0.04	4
9	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	6
10	030516060	M16 X 60 SKT CAP SCREW BS4168	0.12	8
		Total Mass :-	**SEE NEXT PAGE**	

MMD MINING MACHINERY DEVELOPMENTS LIMITED

R200 GEARBOX 30:1 RATIO(VOITH)

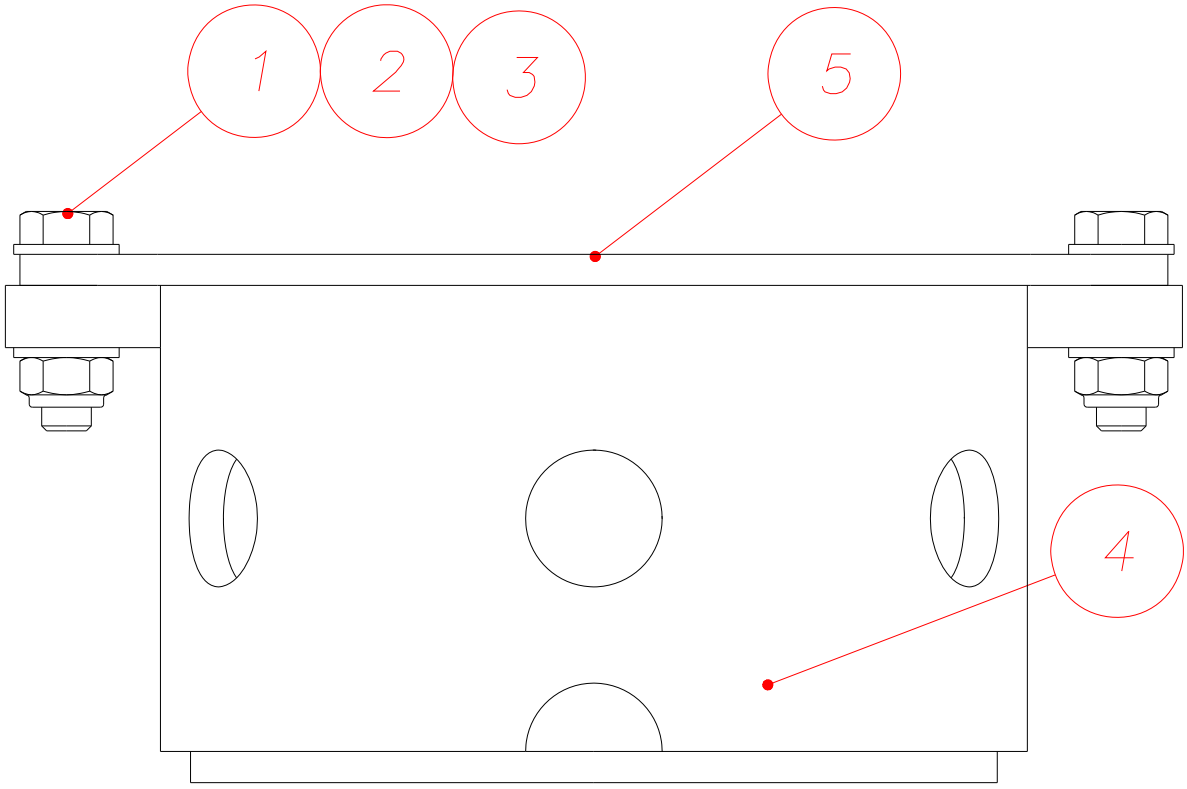
Part Number : 247070435

Item	Part Number	Description	Unit Mass	Qty
11	031812030	M12 X 30 CSK SKT SCREW BS4168	0.03	2
12	032000140	1/2" BSP BONDED SEAL BS4518	0.01	2
13	032000410	3/4" BSP BONDED SEAL BS 4518	0.01	1
14	032000589	RM2993-57 O RING BS4518	0.01	1
15	032000691	2" BSP BONDED SEAL BS4518	0.02	1
16	033424000	M24 PHILIDAS NUT DIN980	0.10	30
17	033430000	M30 PHILIDAS NUT DIN980	0.27	4
18	033630000	M30 COLLARED EYEBOLT BS4278	1.66	2
19	034325050	M25 X 50 DOWEL BS7055	0.20	2
20	035612000	M12 HV WASHER SPECIFICATION DIN 6916	0.01	10
21	035624000	M24 HV WASHER SPECIFICATION DIN 6916	0.04	60
22	035630000	M30 HV WASHER SPECIFICATION DIN 6916	0.06	8
23	036000002	1/4" BSPT PRESSURE PLUG	0.01	2
24	036000009	1/2" BSP BLANKING PLUG	0.06	1
25	036000010	3/4" BSP BLANKING PLUG	0.12	1
26	036000026	1" NPT HEX HD BLANKING PLUG	0.13	4
27	036000027	1/2" NPT BLANKING PLUG	0.06	4
28	147070364	2ND RED.PINION ASSY	80.24	1
29	147070365	3RD REDUCTION PINION ASSY	285.19	1
30	147070411	OUTPUT SHAFT ASSEMBLY	295.00	1
31	147070453	INPUT SHAFT ASSY	18.00	1
32	147071025	FILLER BREATHER PROTECTOR	2.90	1
33	3991514-01	BREATHER LABEL	0.01	1
34	3991515-01	OIL LEVEL LABEL	0.01	1
35	3991519-01	INPUT PINION FLOAT LABEL	0.01	1
36	3991841-01	GEARBOX SERIAL NUMBER PLATE	0.07	1
37	3992655-01	OIL DIPSTICK REPLACEMENT WARNING LABEL	0.01	1
38	7070209-01	COVER PLATE	3.00	1
39	7070238-01	OUTPUT SEAL HOUSING	18.00	1
40	7070370-01	DIPSTICK	0.25	1
41	7070381-06	GEARCASE	1054.00	1
42	7070388-01	END COVER	6.00	1
43	7070391-01	END PLATE	7.00	1
44	7070402-84	INPUT PINION PROTECT TUBE	10.00	1
45	7070432-01	MAGNETIC DRAIN PLUG	1.30	1
46	7070456-01	KEY PLATE	2.42	1
47	7070457-01	KEY PLATE	2.42	1
		Total Mass :-	**1851.66 Kg**	

MMD MINING MACHINERY DEVELOPMENTS LIMITED

FILLER BREATHER PROTECTOR FOR 023301600

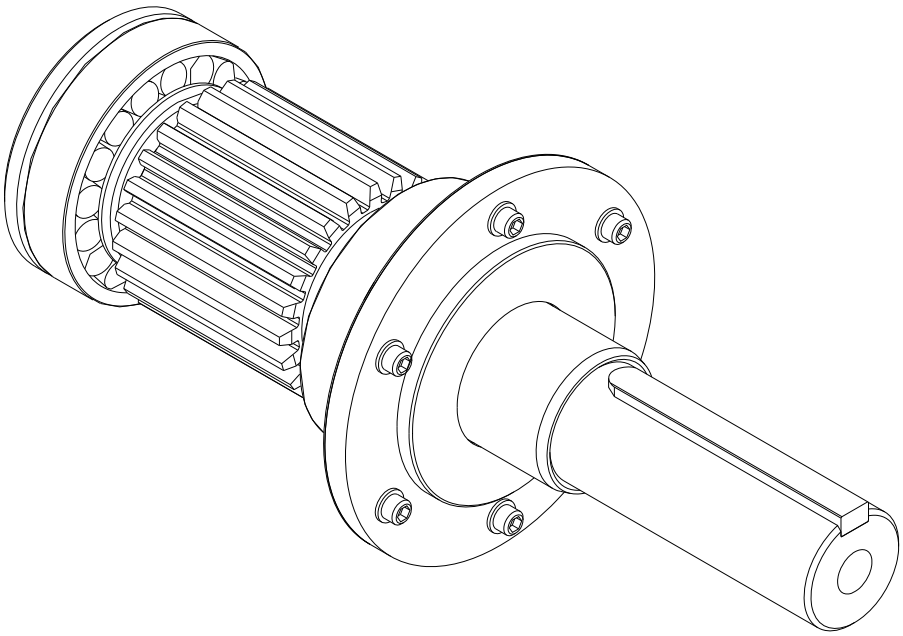
Part Number : 147071025



Item	Part Number	Description	Unit Mass	Qty
1	031308030	M8 X 30 HEX SET SCREW BS4168 GR8.8	0.02	2
2	031408000	M8 NYLOC NUT BS4929	0.01	2
3	035608000	M8 HV WASHER SPECIFICATION DIN 6916	0.01	4
4	7071025-84	GEARBOX FILLER BREATHER PROTECTOR	1.90	1
5	7071026-91	TOP COVER	0.70	1
		Total Mass :-	**2.70 Kg**	

INPUT SHAFT ASSEMBLY

PART NUMBER - 147070453

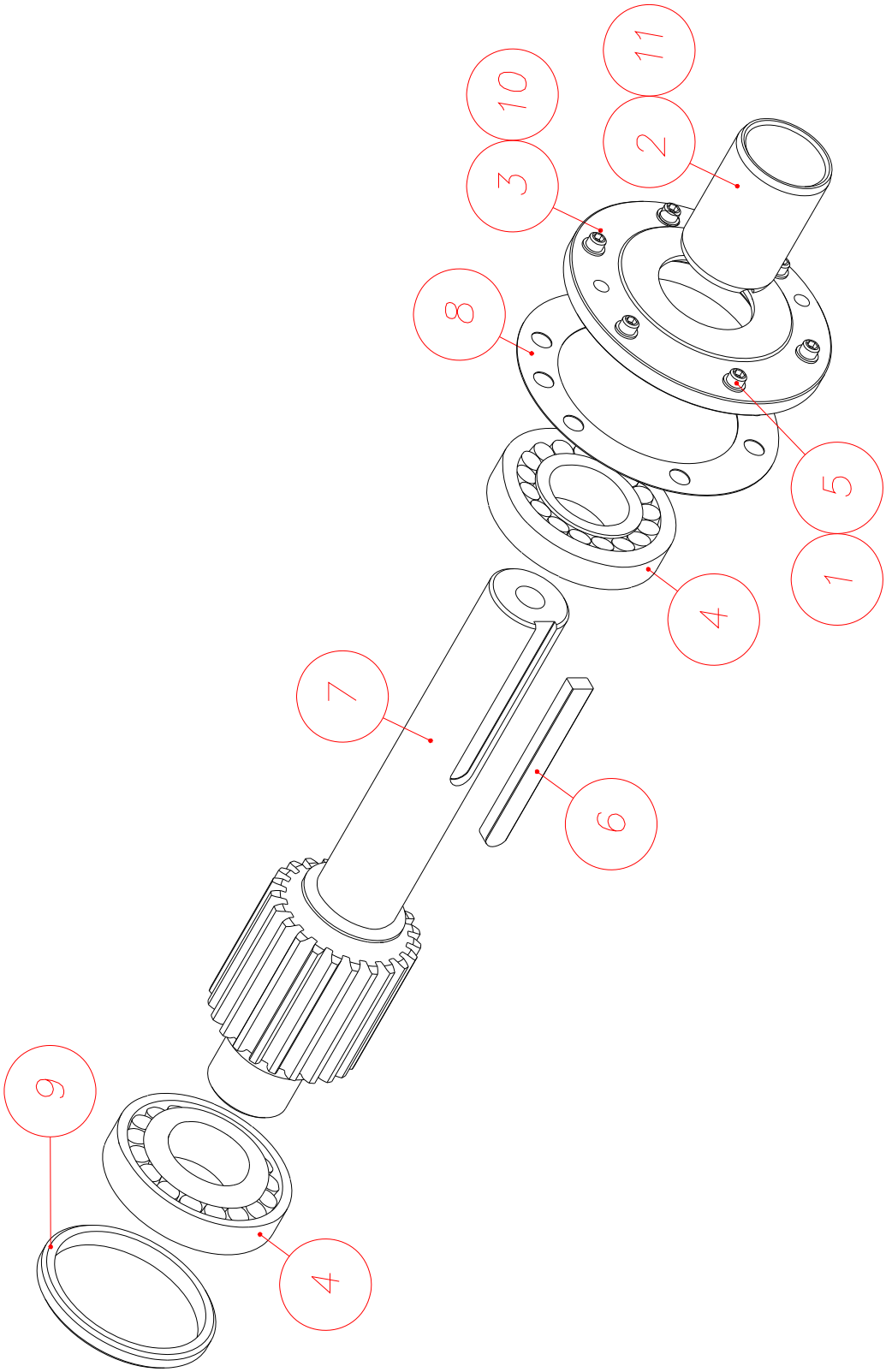


REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	28 - 09 - 11
2.0	UPDATED	29 - 02 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

INPUT SHAFT ASSEMBLY

Part Number : 147070453



MMD MINING MACHINERY DEVELOPMENTS LIMITED

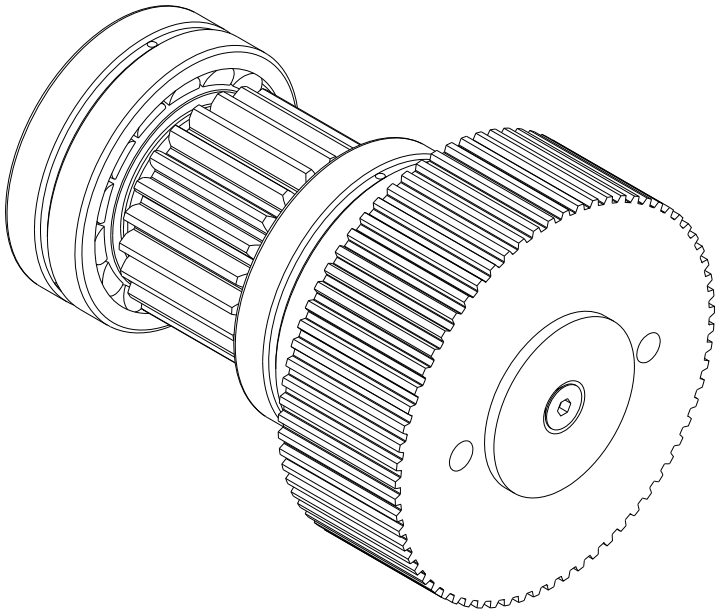
INPUT SHAFT ASSEMBLY

Part Number : 147070453

Item	Part Number	Description	Unit Mass	Qty
1	030512035	M12 X 35 SKT CAP SCREW BS4168	0.05	6
2	032000625	RM0545-30 O RING	0.01	1
3	032000741	VITON OIL LIP SEAL 65X85X10 R21 DIN 3760	0.02	1
4	035000496	30311 J2Q TAPER ROLLER BEARING	1.60	2
5	035612000	M12 HV WASHER SPECIFICATION DIN 6916	0.01	6
6	5090043-01	KEY	0.50	1
7	7070419-01	INPUT PINION	13.00	1
8	7070475-01	SHIM PACK	0.05	1
9	7070476-01	INPUT SHAFT SPACER	0.26	1
10	7070477-01	SEAL HOUSING	2.50	1
11	7070478-01	SEAL PATH	0.60	1
		Total Mass :-	**20.50 Kg**	

2ND REDUCTION PINION ASSEMBLY

PART NUMBER - 147070364

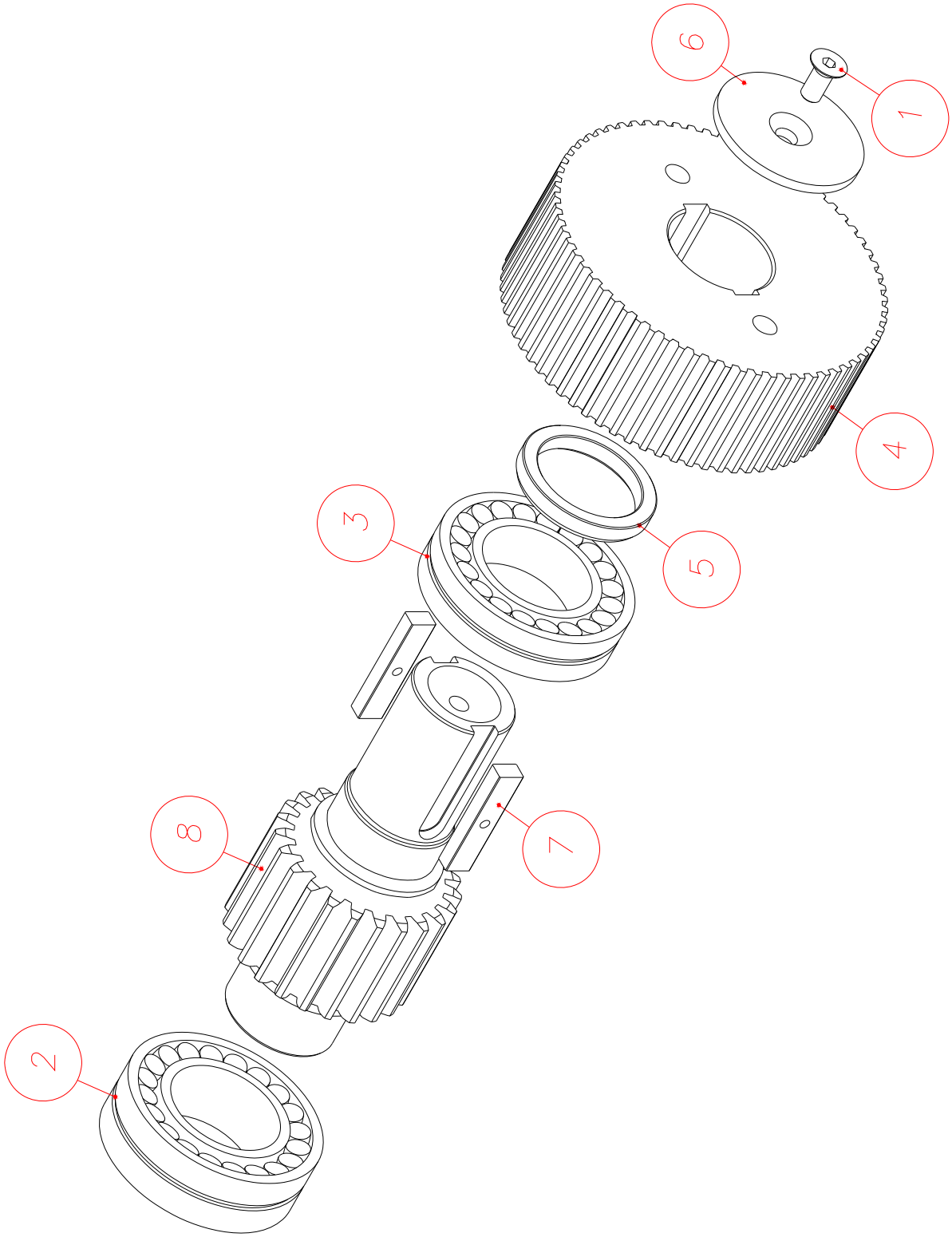


REVISION	MODIFICATION	DATE
1.0 2.0	FIRST ISSUE UPDATED	28 - 09 - 11 29 - 02 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

2ND REDUCTION PINION ASSEMBLY

Part Number : 147070364



MMD MINING MACHINERY DEVELOPMENTS LIMITED

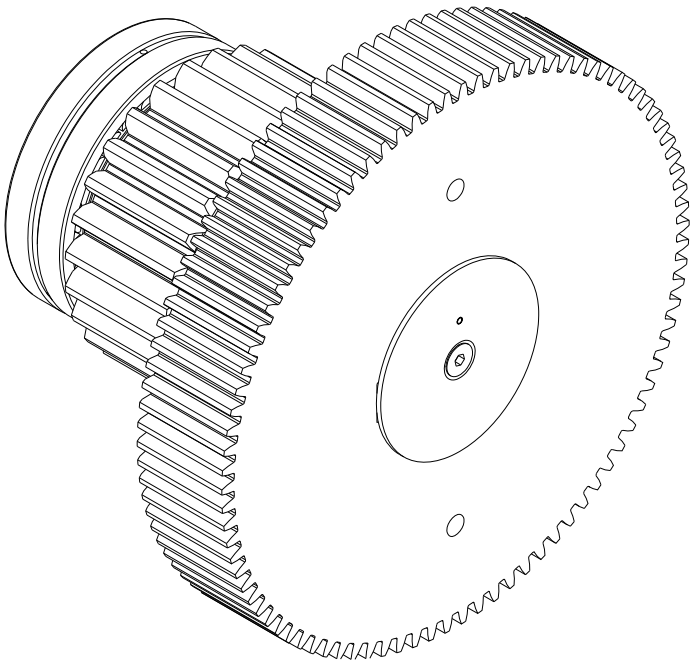
2ND REDUCTION PINION ASSEMBLY

Part Number : 147070364

Item	Part Number	Description	Unit Mass	Qty
1	031816035	M16 X 35 CSK SKT SCREW BS4168	0.08	1
2	035000017	23218 CC C3 W33 BEARING	4.60	1
3	035000286	22218 E C3 SKF BEARING	3.40	1
4	4001860-01	1ST REDUCTION WHEEL	38.00	1
5	4001910-01	SPACER	0.50	1
6	4001930-01	END PLATE	0.70	1
7	5090016-01	KEY	0.23	2
8	7070350-01	2ND REDUCTION PINION	24.00	1
		Total Mass :-	**71.74 Kg**	

3RD REDUCTION PINION ASSEMBLY

PART NUMBER - 147070365

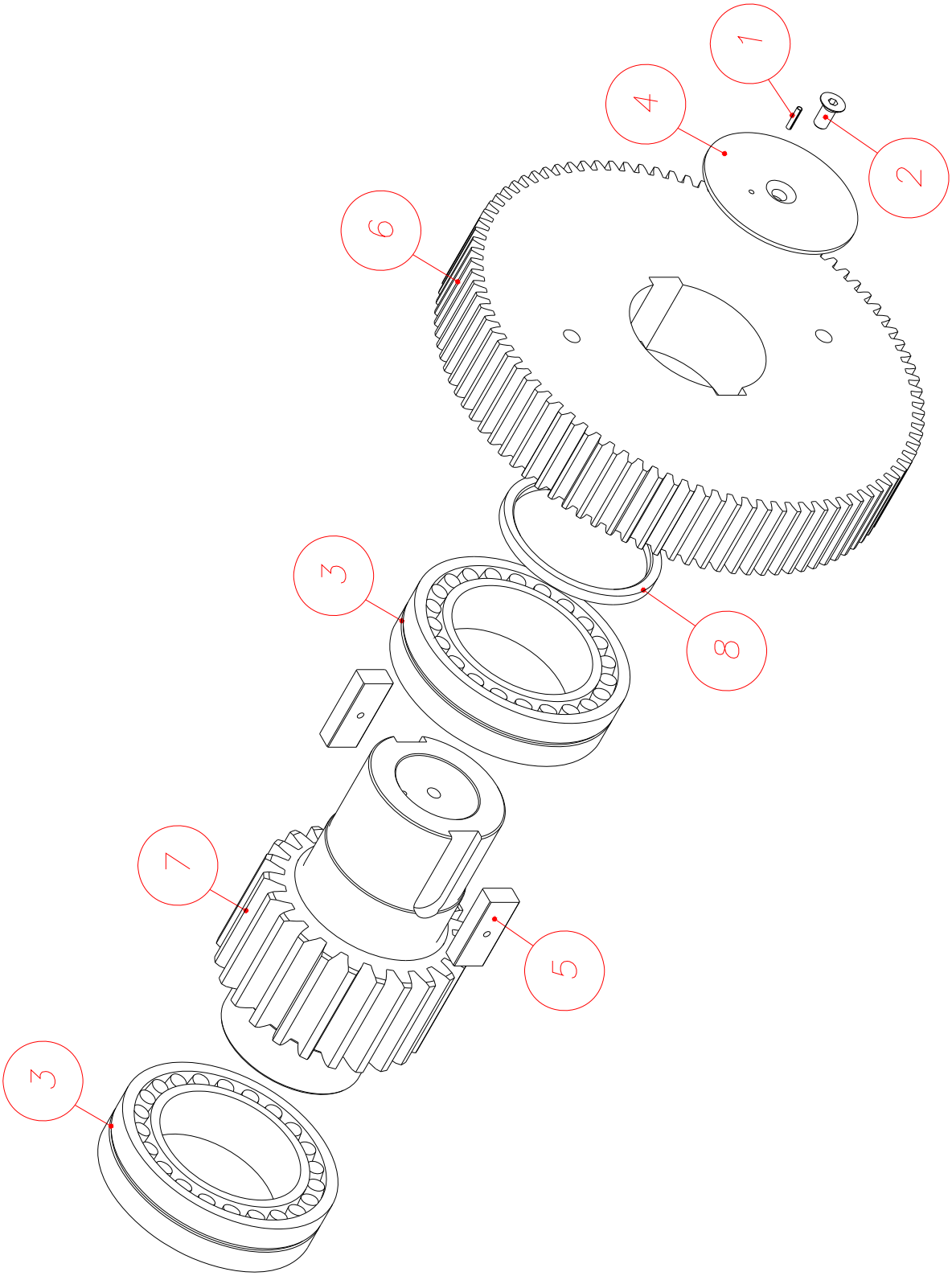


REVISION	MODIFICATION	DATE
1.0 2.0	FIRST ISSUE UPDATED	28 - 09 - 11 29 - 02 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

3RD REDUCTION PINION ASSEMBLY

Part Number : 147070365



MMD MINING MACHINERY DEVELOPMENTS LIMITED

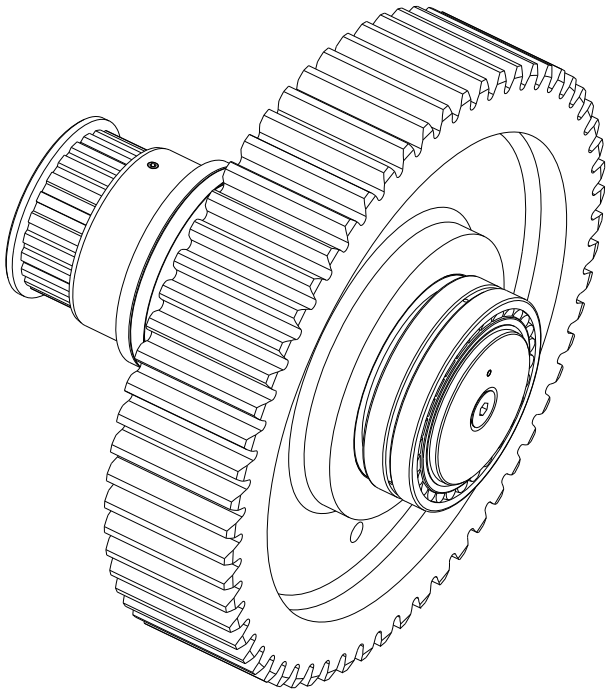
3RD REDUCTION PINION ASSEMBLY

Part Number : 147070365

Item	Part Number	Description	Unit Mass	Qty
1	031706030	M6X 30 SPRING TENSION PIN BS7058	0.01	1
2	031816035	M16 X 35 CSK SKT SCREW BS4168	0.08	1
3	035000012	23034 CC C3 W33 BEARING	13.00	2
4	2060090-01	SHAFT END PLATE	2.00	1
5	5090017-01	KEY	0.65	2
6	7070351-01	2ND REDUCTION WHEEL	168.00	1
7	7070352-01	3RD REDUCTION PINION	87.00	1
8	7070359-01	SPACER	0.80	1
		Total Mass :-	**285.19 Kg**	

OUTPUT SHAFT ASSEMBLY

PART NUMBER - 147070411

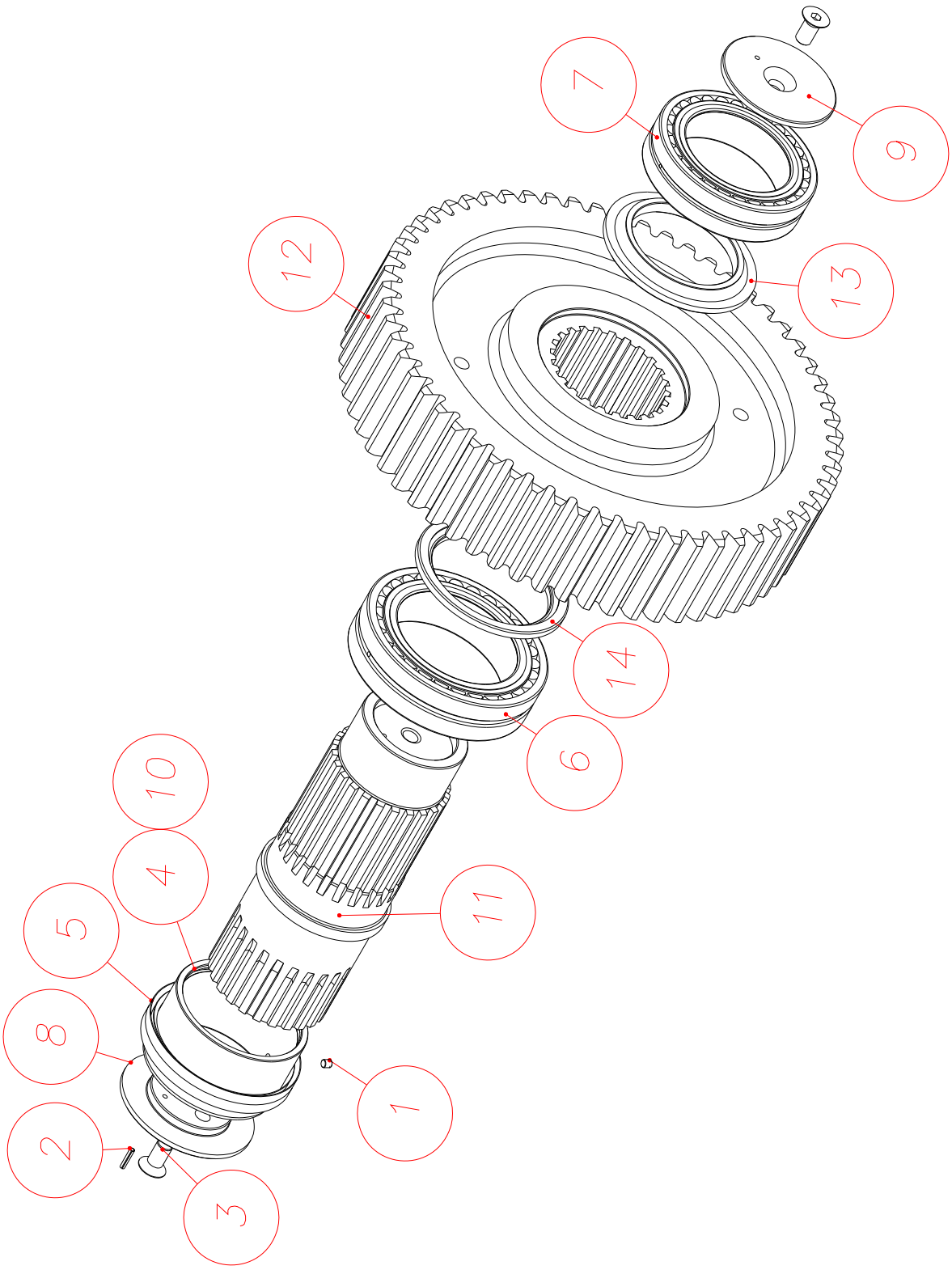


REVISION	MODIFICATION	DATE
1.0 2.0	FIRST ISSUE UPDATED	28 - 09 -11 29 - 02 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

OUTPUT SHAFT ASSEMBLY

Part Number : 147070411



MMD MINING MACHINERY DEVELOPMENTS LIMITED

OUTPUT SHAFT ASSEMBLY

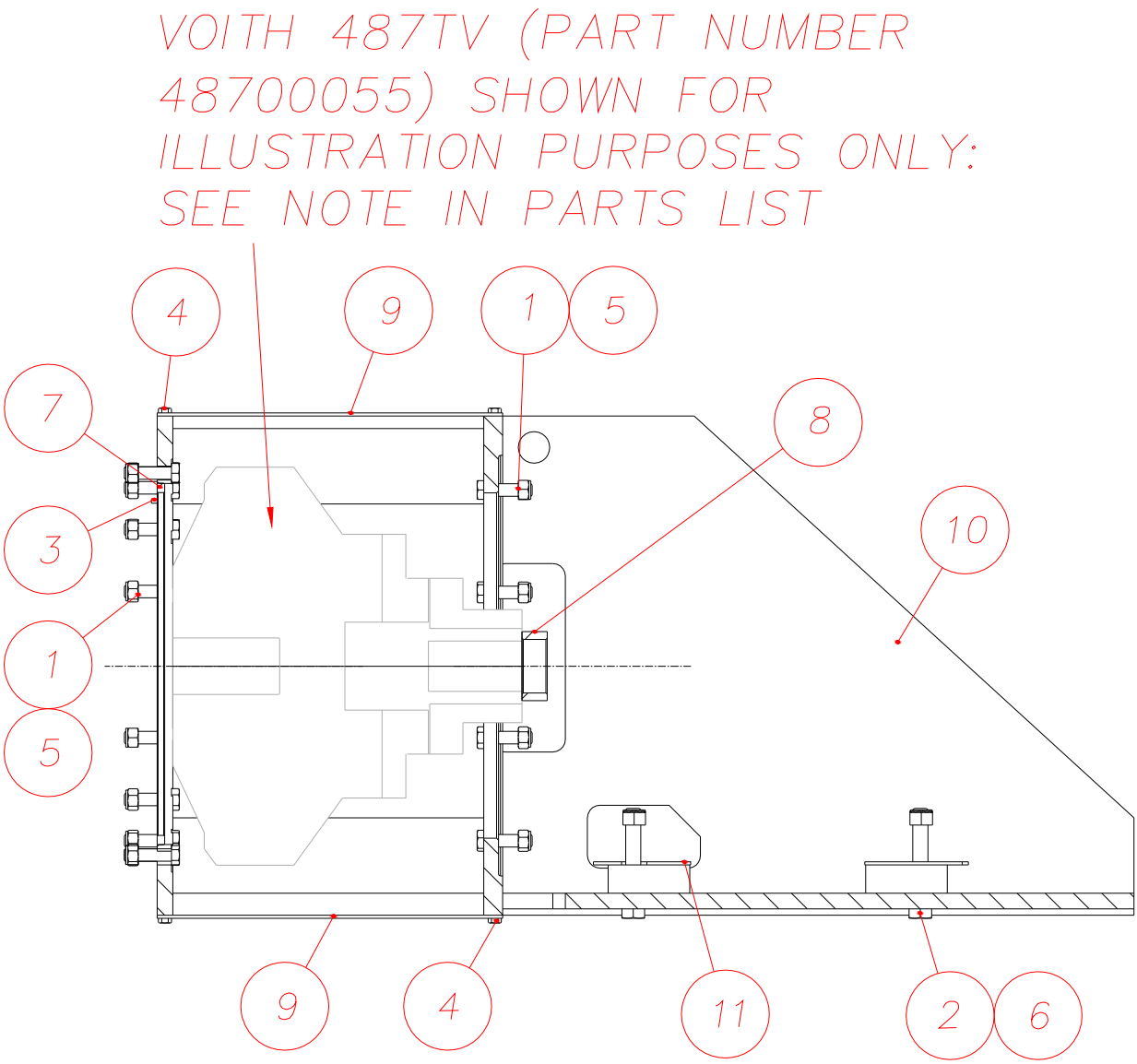
Part Number : 147070411

Item	Part Number	Description	Unit Mass	Qty
1	030710020	M10 X 20 GRUB SCREW BS4168 GR8.8	0.01	2
2	031706030	M6X 30 SPRING TENSION PIN BS7058	0.01	2
3	031820050	M20 X 50 CSK SKT SCREW BS4168	0.12	2
4	032000100	RM 1543-57 O RING BS4518	0.01	1
5	032000819	175 X 200 X 15 R21 VITON OIL SEAL	0.20	2
6	035000011	23032 CC C3 W33 BEARING	9.10	1
7	035000072	23028 CC C3 W33 BEARING	6.50	1
8	1080090-01	END CAP	2.00	1
9	1773024-01	END CAP	1.80	1
10	7070211-01	SLEEVE	4.00	1
11	7070213-01	OUTPUT SHAFT	60.00	1
12	7070383-01	OUTPUT WHEEL	140.00	1
13	7070384-01	SPACER	0.70	1
14	7070385-01	SPACER	0.30	1
		Total Mass :-	**225.09 Kg**	

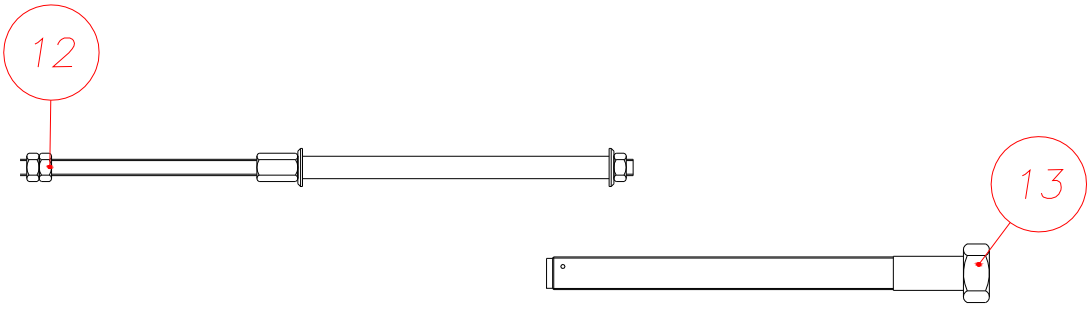
VOITH 487 MOTOR MOUNTING ASSEMBLY

PART NUMBER - 141564162

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12



TYPICAL SECTION THROUGH



MMD MINING MACHINERY DEVELOPMENTS LIMITED

MOTOR MOUNTING FRAME ASSEMBLY

Part Number : 141564162

Item	Part Number	Description	Unit Mass	Qty
1	030320075	M20 X 75 HEX BOLT EN24014 GR8.8	0.26	22
2	030324160	M24 X 160 HEX BOLT EN24014 GR8.8	0.70	4
3	030506015	M6 X 15 SKT CAP SCREW BS4168	0.01	2
4	031312030	M12 X 30 HEX SET SCREW BSEN24014 GR8.8	0.04	8
5	031420000	M20 NYLOC NUT BS4929	0.08	22
6	031424000	M24 NYLOC NUT BS4929	0.11	4
7	1561828-01	SPIGOT RING	3.00	1
8	1563700-01	MOTOR SHAFT SPACER	1.20	1
9	1563740-84	COVER PLATE	16.00	2
10	1564162-85	MOTOR MOUNTING FRAME	711.20	1
11	1564165-01	SHIM PACK	0.80	4
12	3991324-01	VOITH FITTING TOOL	2.40	1
13	3991325-01	VOITH REMOVAL TOOL	5.40	1
XXXX	487000055	VOITH 487TV 55MM BORE C/W EEKE DRIVEBOSS	111.00	1
	XXXXXXXXXX	THIS ASSEMBLY DOES NOT INCLUDE THE VOITH COUPLING		
		THIS IS A SEPERATELY ORDERED ITEM	XXXXXXX	
		Total Mass :-	769.46 Kg	

GREASING ASSEMBLY COMPONENTS

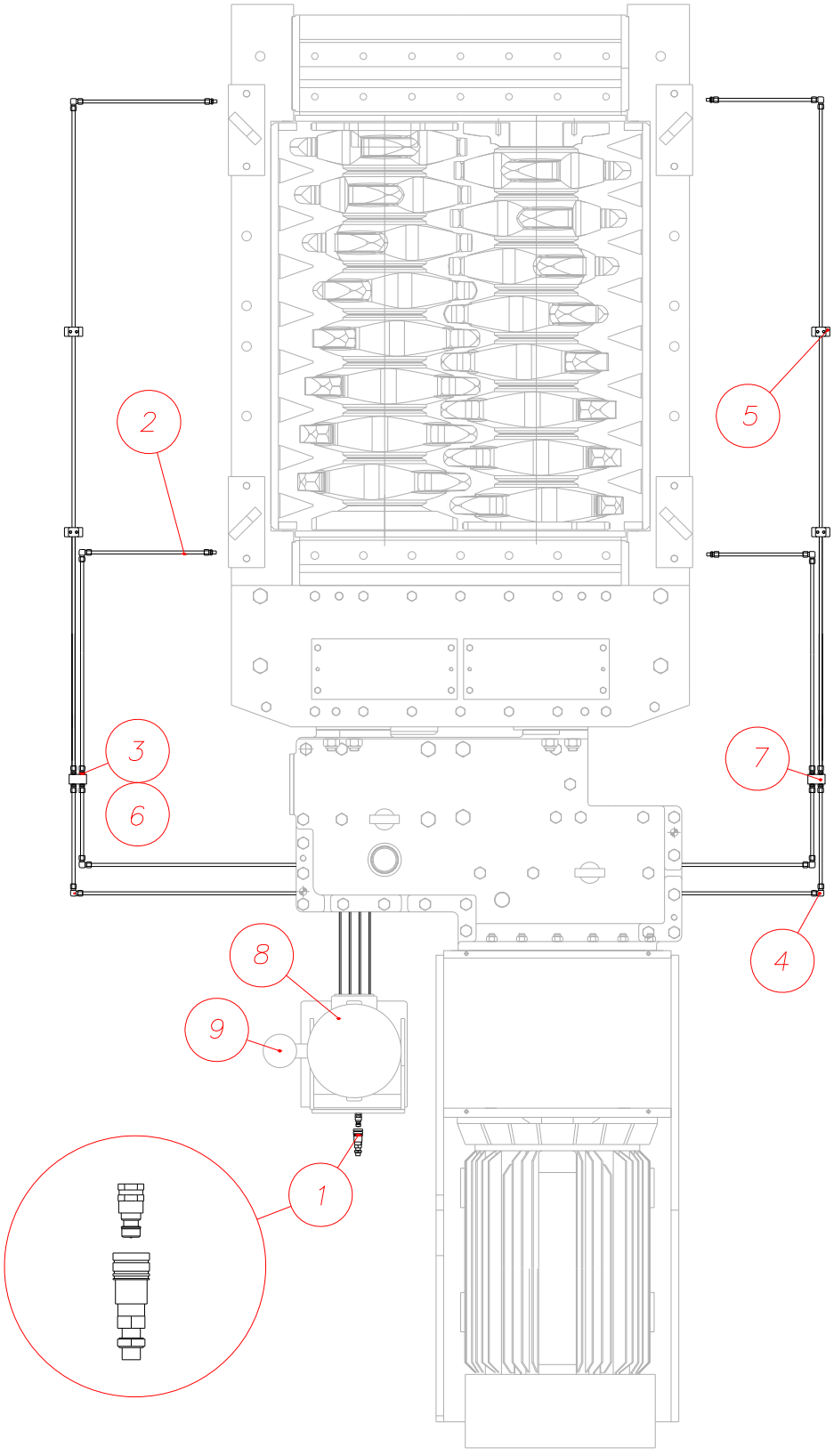
PART NUMBER - 15154-1102

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

GREASING ASSEMBLY COMPONENTS - S154-1102

Part Number : 15154-1102



THE ABOVE DIAGRAM IS A SCHEMATIC VIEW ONLY AND DOES NOT REPRESENT THE ACTUAL PIPEWORK LAYOUT

MMD MINING MACHINERY DEVELOPMENTS LIMITED

GREASING ASSEMBLY COMPONENTS - S154-1102

Part Number : 15154-1102

Item	Part Number	Description	Unit Mass	Qty
1	023060310	EO 21526 QUICK RELEASE COUPLING	0.30	1
2	023307507	10MM O/D X 1.5MM WALL X 6MT LONG PIPE	1.30	2
3	023307509	1/4 BSP MALE-10MM PIPE ADAPTOR	0.10	10
4	023307510	10MM X 10MM ELBOW	0.10	4
5	023307511	PIPE CLAMPS (10MM PIPE)	0.10	6
6	032000451	1/4" BSP BONDED SEAL BS4518	0.01	10
7	3991663-01	1/4" BSP PIPE JOINT BLOCK (TWIN)	0.50	2
8	**023060300**	**PUMP ASSEMBLY – CODE 6000/M-150-5-30L (NEW)**	**34.00**	**1**
9	**023060302**	**MOTOR – 230/400V, 50HZ, 3PH, 0.37KW (LUB)**	**8.00**	**1**
	XXXXXXXXX	**ITEMS 8 AND 9 SHOWN FOR REFERENCE ONLY**		
		THIS ASSEMBLY DOES NOT INCLUDE THESE PARTS		
		THESE ARE SEPERATELY ORDERED ITEMS	**XXXXXX**	
		Total Mass :-		**6.00 Kg**

UNDERSPEED SENSING ASSEMBLY

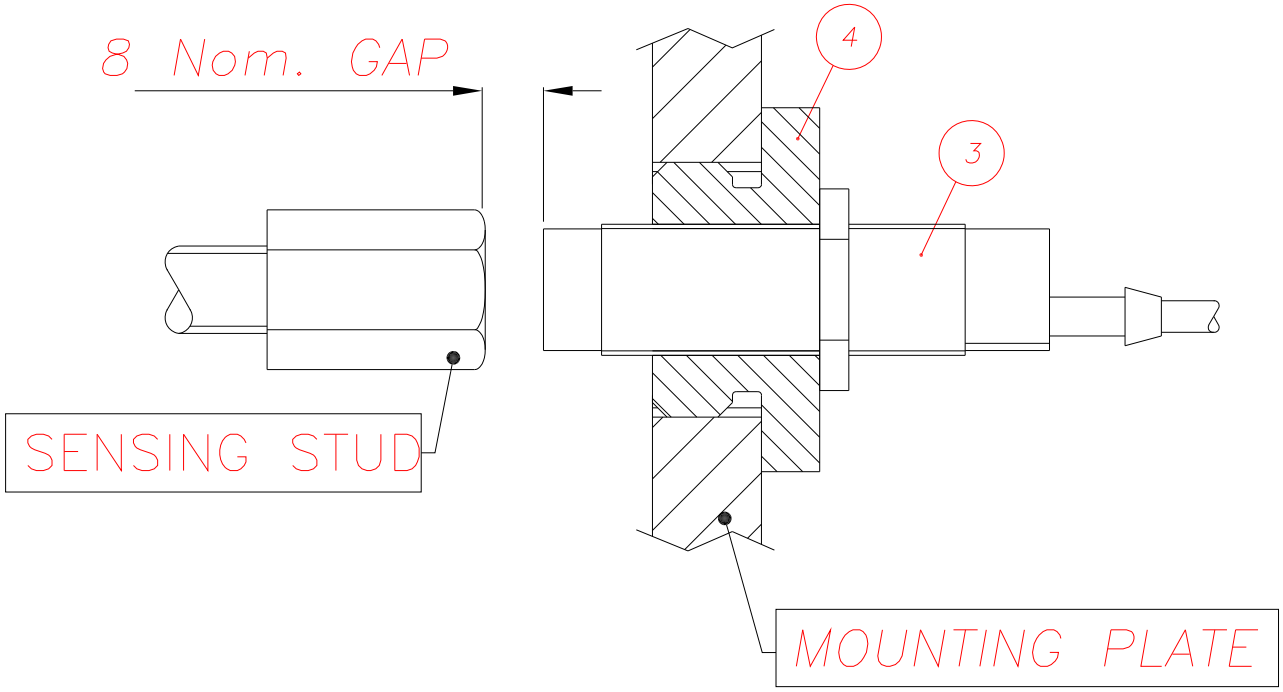
PART NUMBER - 143210033

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	16 - 05 - 12

MMD MINING MACHINERY DEVELOPMENTS LIMITED

24V DC +/-20% UNDERSPEED SENSING ASSEMBLY

Part Number : 143210033



Item	Part Number	Description	Unit Mass	Qty
1	023210004	ZPD 11 SOCKET TYPE BASE DIN RAIL(S411) (NOT SHOWN)	0.06	1
2	023210007	PMC 01 C 724 TIMER (REF.S114156724) (NOT SHOWN)	0.20	1
3	023210036	SPEED SENSOR REF.IA 18 ELN 08 UC	0.01	1
4	1563010-01	SPEED SENSOR PLUG	0.10	1
		Total Mass :-	**0.37 Kg**	

MMD SERIES TWIN SHAFT MINERAL SIZER

PRINCIPLES OF OPERATION & MAINTENANCE SCHEDULE

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	18 - 06 - 08
2.0	SAFE OPERATING PROCEDURE ADDED	26 - 03 - 09
3.0	SIZER LIFTING PROCEDURE UPDATED	19 - 11 - 09
4.0	SEGMENT REPLACEMENT UPDATED	13 - 02 - 12
5.0	SIZER LIFTING PROCEDURE UPDATED	01 -05 - 12

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

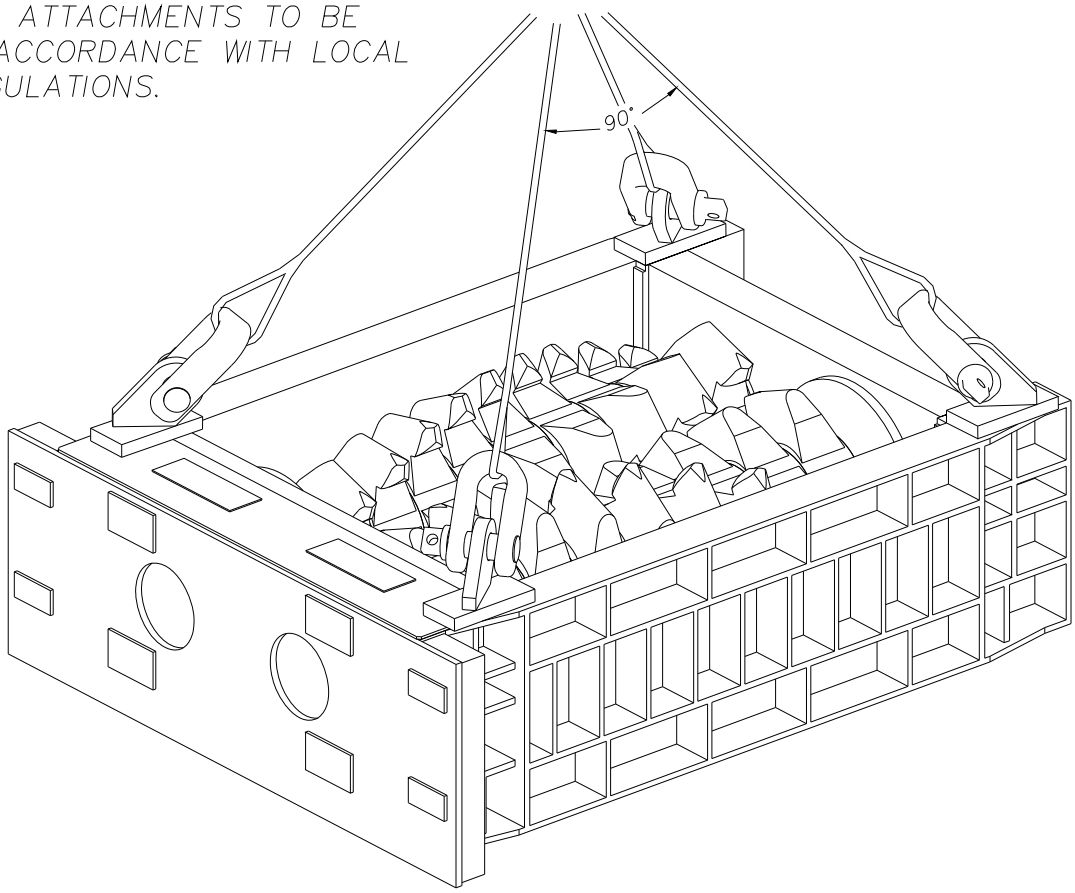
The MMD SIZER comes supplied with lifting lugs which are fixed to the top of the machine side plates to allow for relevant lifting attachments to move and site the SIZER.

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.

- Installation of safety guards and hand rails shall be the responsibility of the customer at the time of commissioning.
- During operation of the machine, no person or persons should violate the safety guards and hand rails in its vicinity.
- 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.
- MMD will not be responsible for the use or operation of the machine for any purpose other that the specified / accepted operation requirement in the official order.
- 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.

Careful consideration must be given to the stability of the overall sizer and preventative measures must be taken when certain parts are removed from the main sizer assembly during maintenance. A drastic shift in the centre of gravity can for example be caused if the shafts are removed from the sizer case while the gearboxes and motors are still attached to the sizer. This condition can be very hazardous especially if the sizer is mounted on wheels and proper supports must be in place to ensure that the machine is stable at all times.

It is the legally appointed person's responsibility to ensure that there are safe operating procedures in place for all the equipment that is in operation at the sizing plant as well as to ensure that these procedures are adhered to at all times.

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^{o}C and 80^{o}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 **SIX** 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

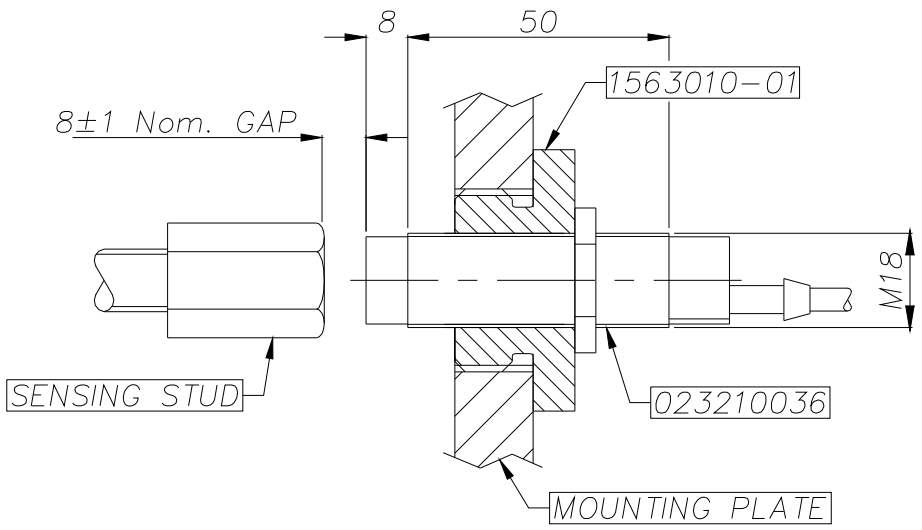
Should the underspeed sensor become inoperative, it will be necessary to replace it. To do this the machine must be isolated electrically together with any upstream supply systems, so that they cannot be started accidentally whilst work is being carried out.

i Isolate power supply.

ii Disconnect electric leads.

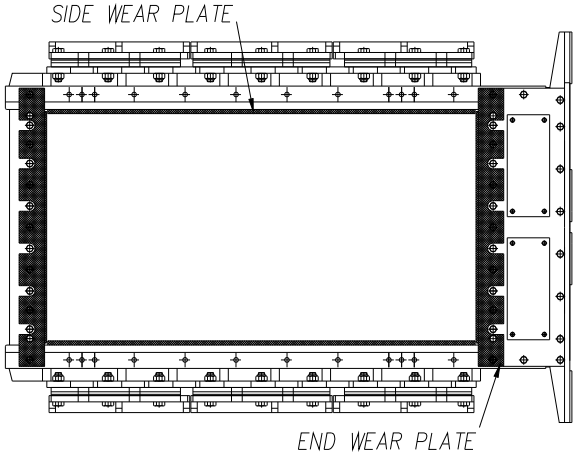
iii Loosen the lock nuts, and unscrew the detector head.

iv Refitting is the reverse of the above procedure. However, care must be taken to ensure that the sensor head is within 8+/- 1mm 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:

- 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.
- Weld two temporary lifting lugs to each wear plate, (on smaller machines this procedure may not be necessary).
- Remove the bolts retaining the side wear plates and pyramids to the side plates, and discard them.
- Attach lifting equipment to the lifting lugs.
- Remove the bolts retaining the side wear plates and discard them.
- Remove the wear plate.
- 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.
- Weld temporary lifting lugs to the new side wear plate.
- Lift the new wear plate into position, and line up with fixing holes.
- 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.
- Tighten the bolts to the torque specified on **MMD procedure T056**.
- Remove the temporary lifting lugs and discard them.
- Check the clearance between tooth caps/segments and wear plates. Clearance should be a minimum of 10mm.

End Wear Plates:

- Thoroughly clean the top of the machine to expose the holes for the lifting eye bolts.
- 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.
- Fit lifting eye bolts into the top of the wear plates, and lift out.
- 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.
- Attach lifting eye bolts to the new wear plate, and lift it into position.
- Bolt the wear plate into position using the existing set screws.
- Remove the lifting eyes.
- Tighten the bolts to the torque rating specified in **MMD procedure T056**.

Gearbox Fitting & Removal

Gearbox Fitting Procedure:

- Clean the output shaft of the gearbox and the gear coupling.
- Slide the coupling half onto the output shaft.
- Fit the end cap onto the output shaft. Threadlock should be applied to the bolts prior to fitting.
- 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**.
- Align the teeth on the coupling half, with the teeth on the coupling sleeve, and slide the coupling sleeve into position.
- 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.**
- Fill the gearbox with the correct lubricant to the designated level. (See Maintenance Schedule for Specification).
- Fill the gear coupling with grease. (See Maintenance Schedule for Specification).

Removal:

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

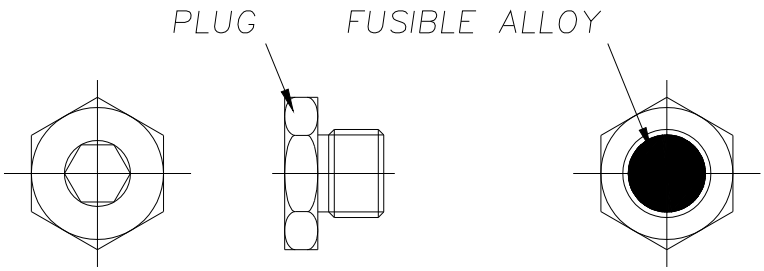
Description

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 couplng 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.

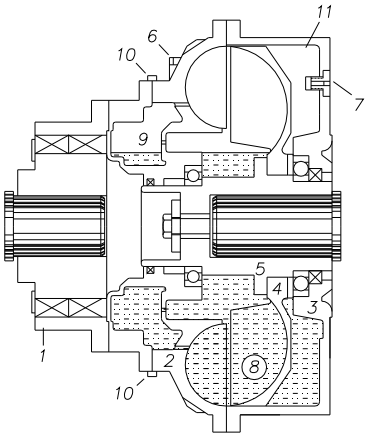
O Where fitted, re-fit the Voith sensor bracket and sensor to the motor mounting bracket.

O Where fitted, connect power supply to Voith MTS temperature monitoring device.

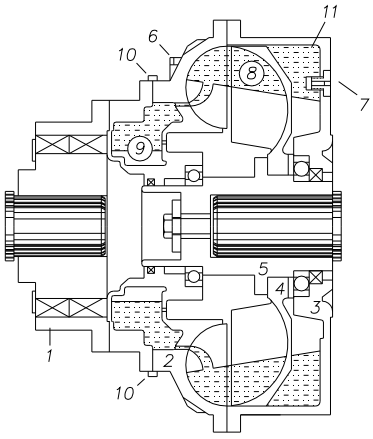
O Refit the motor (See heading ‘Motor Installation’)

Voith Fluid Coupling Design Type: TVSC

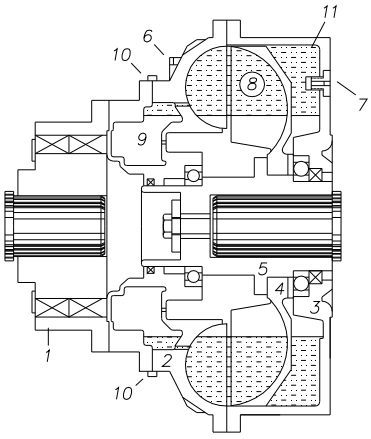
Coupling At **Stand-Still**



Coupling At **Start-Up**



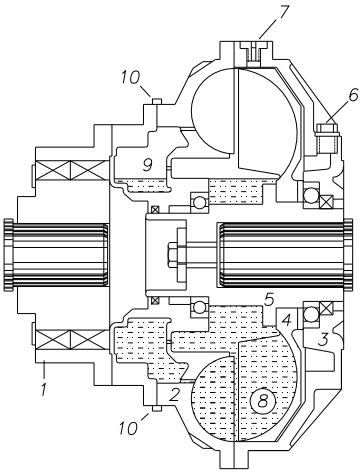
Coupling **Running**



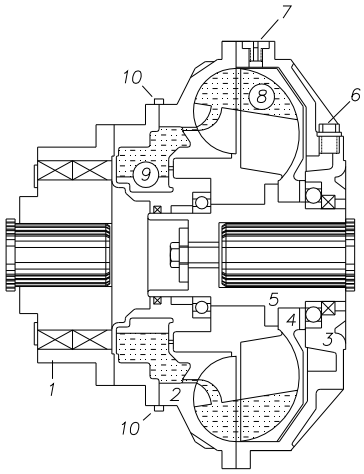
VOITH DESIGN TYPE: TVSC			
1	Flexible Connecting Cpl'g	**6**	Filler Plug
2	Outer Wheel	**7**	Fusible Plug
3	Coupling Shell	**8**	Operating Fluid
4	Inner Wheel	**9**	Delayed Filling Chamber
5	Coupling Hub	**10**	Delay Chamber
		11	'SC' Chamber

Voith Fluid Coupling Design Type: TV

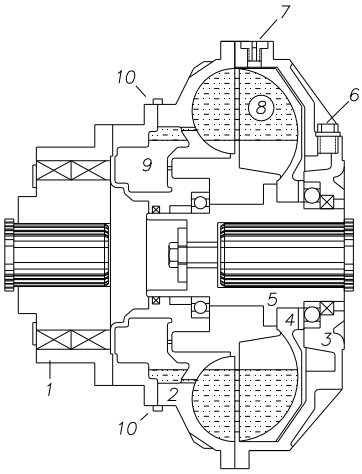
Coupling At **Stand-Still**



Coupling At **Start-Up**



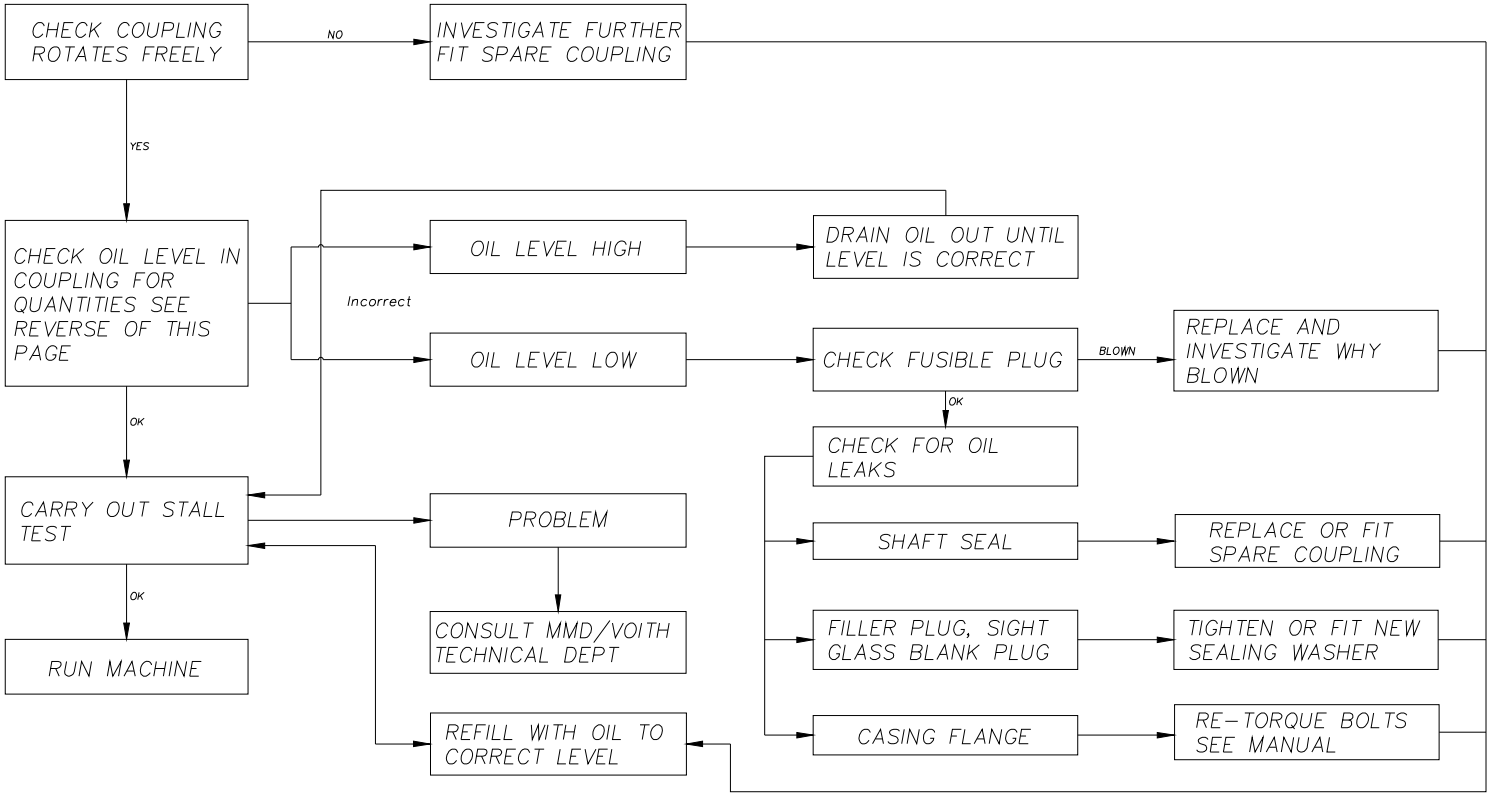
Coupling **Running**



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 conjunctionw 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 specific fluid coupling in question.
However, if this information is not available the following approximate values may be used.

TYPE 487 TV 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
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 bewteen 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 acheive 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:

- **Isolate the machine electrically by removing the cable from the SIZER drive electric motor.**
- Undo the bolts securing the top cover plate to the side plates, gearbox mounting plate, and top bearing housing.
- 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).
- Remove the end cap from the driven (non-drive) shaft by unscrewing the fixings which secure it.
- Remove the shaft spacers.
- 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.
- Rotate the driven shaft to the desired position.
- Move the spur gear back along the splines, and into position, so that it meshes with the other spur gear.
- Replace the spacers and end cap then replace the fixings using a threadlock.
- 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:

- **Isolate the machine electrically by removing the cable from the SIZER™ drive electric motor.**
- Undo the bolts securing the top cover plate to the side plates, end cover and the top bearing housing.
- If desired drain the gear oil.
- Remove the top cover plate. (There is no need to drain the oil).
- Remove the end cap from the driven (non-drive) shaft by unscrewing the fixings which secure it.
- 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.
- Rotate the driven shaft to the desired position.
- Move the spur gear back along the splines, and into position, so that it meshes with the other spur gear.
- Replace the shaft end cap, and replace the fixings, using a threadlock.
- 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 on a bearing heater or similar to 110^{o}C. Remove from the heater 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 on a bearing heater or similar to 110^{o}C. Remove from the heater 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 on a bearing heater and heat to 110^{o}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 ion a bearing heater to 110^{o}C. Remove from the haeter 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 on a bearing heater or similar to 110^{o}C. Remove from the heater 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 on a bearing heater and heat to 110^{o}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.

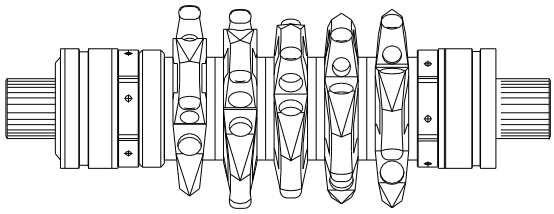
- Push the seal retaining plate into the capsule. Fit the retaining bolts and torque to the required amount as specified in T056.

- Re-assemble the machine in reverse sequence.

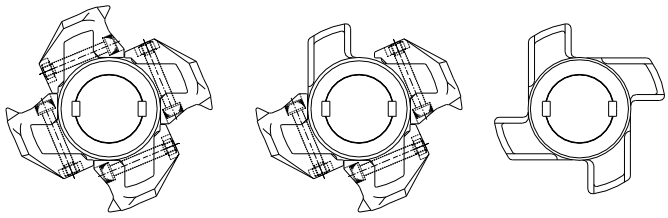
Procedure For The Removal Of Tooth Rings

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.

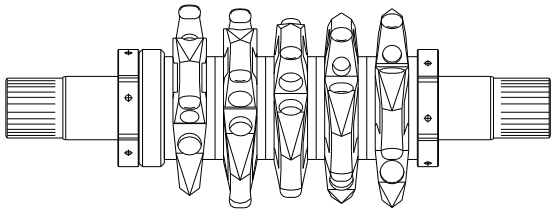
- Follow the procedure for removing the breaker shaft from the machine case.
- Remove both the fixed and floating bearing assemblies from the shaft. (Refer to the section on bearing removal).
- Before attempting to remove the tooth ring, the breaker caps will have to be removed from the tooth ring. Clean 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 procede 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 it's 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).



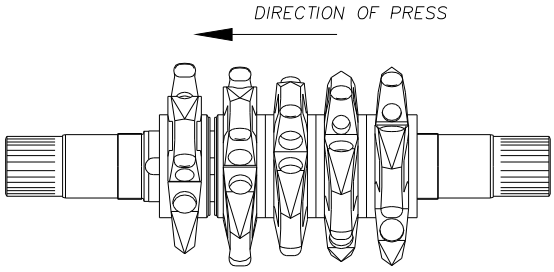
REMOVE THE SPUR GEAR AND GEAR COUPLING HUB TO LIFT THE SHAFT FROM THE MACHINE CASE



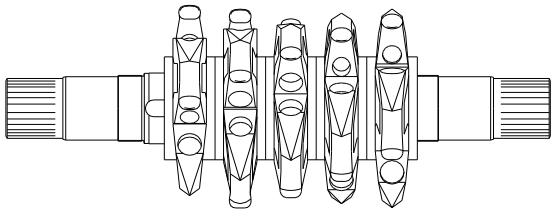
REMOVE THE TOOTH CAPS FROM THE DAMAGED RING



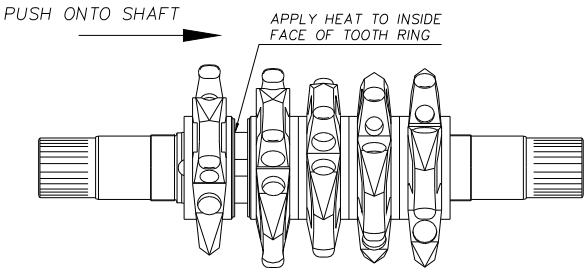
WITH THE SHAFT OUT OF THE MACHINE CASE, PROCEED TO REMOVE BOTH THE BEARING ASSEMBLIES



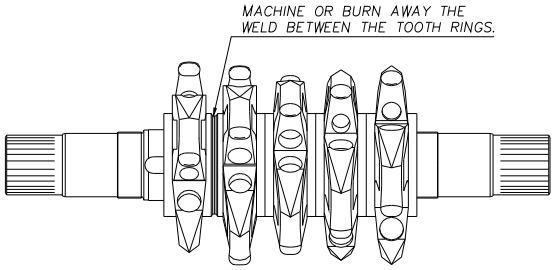
WITH THE WELD DETAIL REMOVED, A SUITABLE HYDRAULIC PRESS OR PULLER SHOULD BE EMPLOYED TO PRODUCE ENOUGH FORCE TO MOVE THE RING FROM THE SHAFT

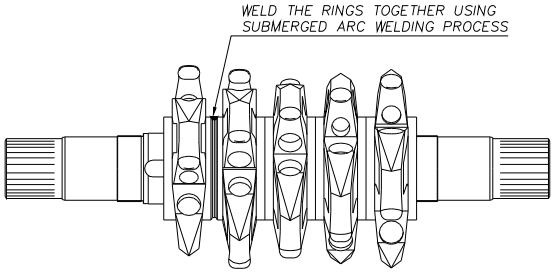


NEXT REMOVE THE SCREWED COLLARS AND SPACER



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

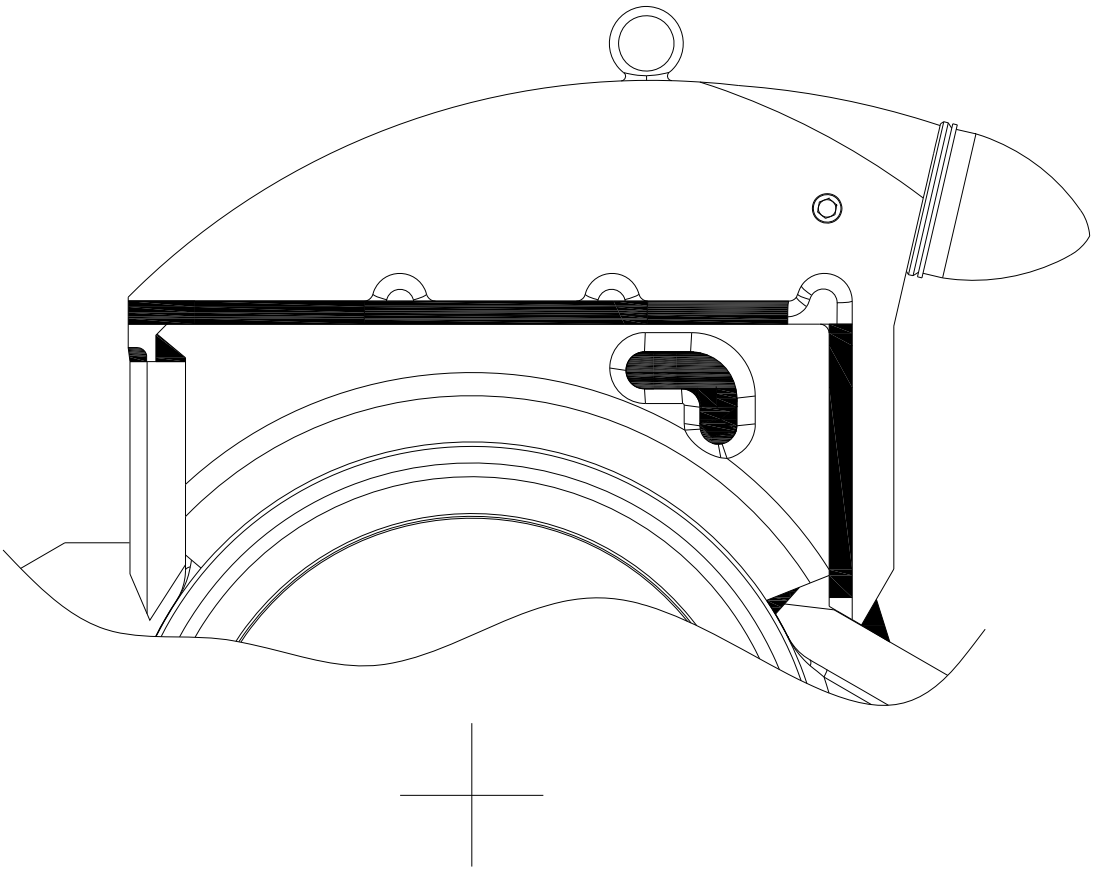




Procedure For The Removal Of Weld-On Type Tooth Caps

In the event of raplacing a weld-on type tooth cap the following procudure must be followed.

- **Isolate the machine electrically.**
- Mechanically isolate breaker shafts from rotation.
- By using gouging/air arching methods proceed to remove front, vertical, horizontal and rear welds from the top cap. Refer to insert.
- Safely remove worn top cap. If the top cap is unable to be removed, check that all relevant welds have been removed, the using suitable means knock the top cap to help release it. Force may be required to assist removal.
- Follow above two steps to remove back plate &/or cheek plates if necessary.
- Care must be taken to not damage components not being replaced.
- Once all worn components have been removed, surfaces must be cleaned & prepared to accept replacement components.
- Replace in reverse order new components to the correct T.O.Procedure



= INDICATES WELD TO BE REMOVED

SEGMENT REPLACEMENT PROCEDURE

1) The machine must be electrically isolated, as per the local lockout procedures, prior to starting any work inside the sizer.

2) Make a strategic decision. The segments can be replaced by a 'remove one on the uppermost row, replace and repeat', procedure, or by blocking the shafts, perhaps with wooden wedges, then removing the uppermost row and replacing these. There is no reason why the segments should be replaced in any particular order, but be aware that unbalance may cause sudden rotation of the shafts.

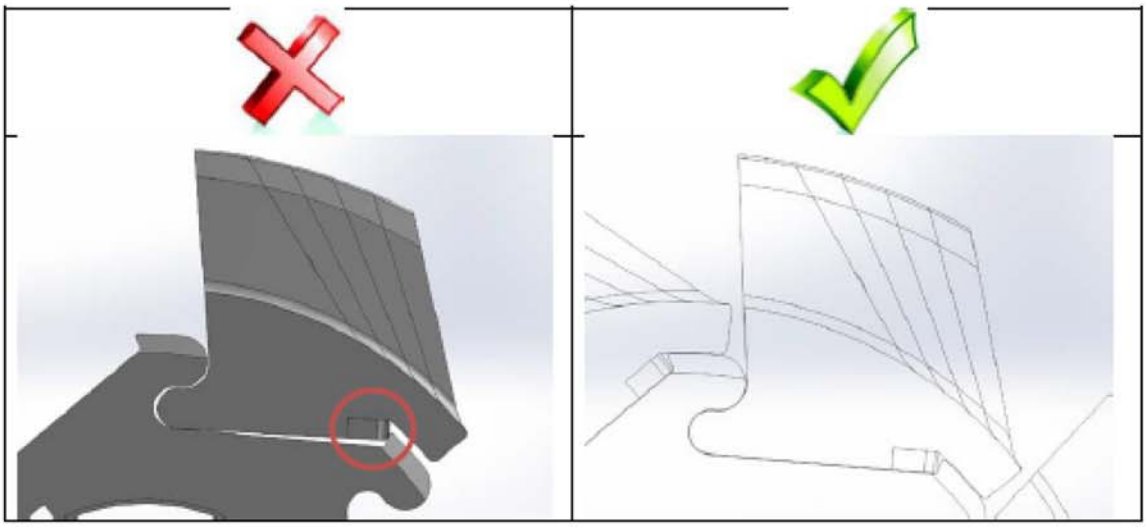
3) With an air chisel or needle gun, clean out the area in the segment bolt counter bores. Ensure personal protective equipment (PPE) is worn. With a socket, remove the nut. In severe circumstances it may be necessary to burn off the nut, and remove the pieces with a pair of pliers. With the nut removed, the washer and the spangle (small plate with a hole) can be removed using a pair of long nose pliers. Rotate the bolt counter clockwise through 90° (using mole grips if necessary) and remove the bolt.

4) Repeat step 3, for the other remaining bolts in the toothed segment. If the segments are welded into position then remove any weld with a grinder.

5) Using a large striking hammer, hit the segment to loosen its fit to the barrel. The segment can now be removed. Attach a temporary lifting eye to the segment to assist in lifting it out of position. Appropriate care should be taken if the segment is to be removed by hand as the segments are very heavy and will require more than one person to carry out the lift.

6) To fit a new segment, clean the area where the segment fits, especially the lugs for the bolt retention. High pressure air would be useful for this purpose, being careful to take the appropriate safety measures.

7) Place a new segment in position. In some cases careful dressing of the locating surfaces may be required to obtain a good fit. An ideal segment fit should be seated flat/flush with the barrel and require a hammer to drive it into position. There may also be a need to grind the castellation in areas so that the desired fit can be achieved, (as illustrated in the diagram below).



Thread the bolt through the segment slots and engage in its locating lug by a clockwise rotation through 90°. Drop the spangle into position with the small hole uppermost. The spangles are important to prevent the bolt from falling out of position. Place the washer over the bolt with the chamfer downward. Screw on the nut with the skirt downward. Repeat the process for the three remaining positions.

8) Repeat for subsequent toothed segments.

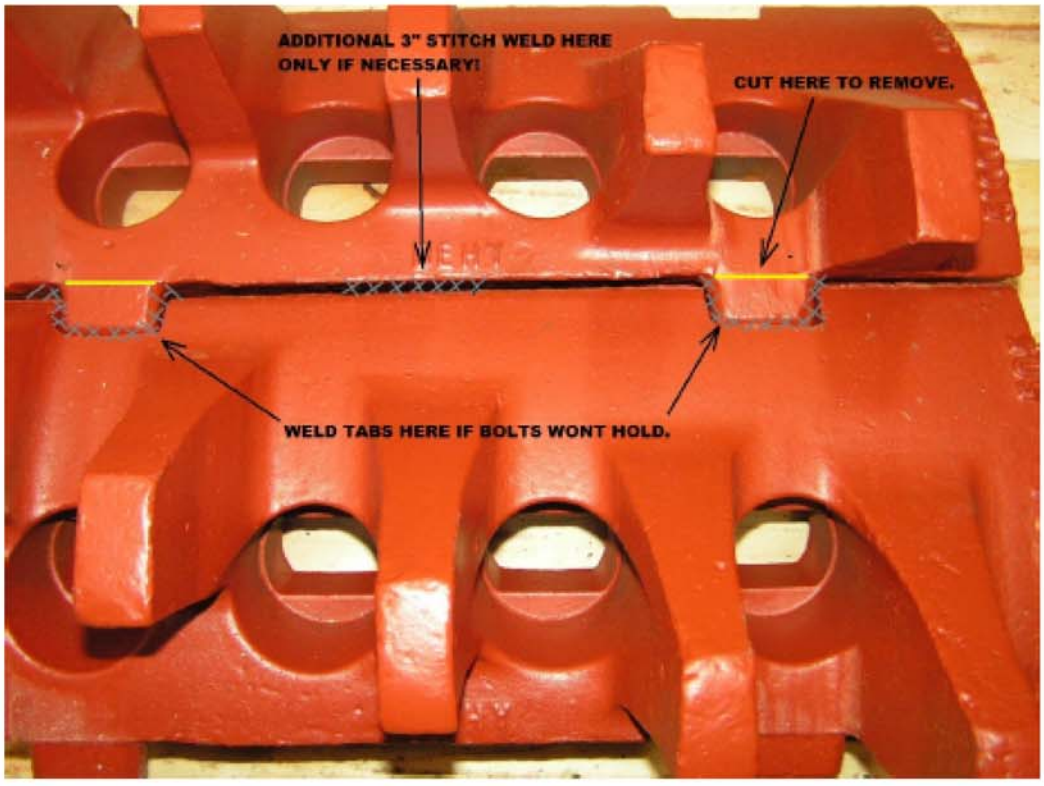
9) Hand tighten the nuts evenly. Rotate each shaft once with a long bar to ensure that no interference exists between teeth. If any of the teeth do interfere, find the offending teeth and adjust the segment position. Correct minor errors by hand grinding, taking the appropriate safety measures.

10) With a calibrated torque wrench, tighten the nuts to the correct torque setting. Take note that the nuts have a non-standard metric thread. Please refer to TO56 for the correct torque setting.

NOTE: In exceptional circumstances where the segments can come loose during operation due to the hardness of the materials being processed, a weld can be applied along the back edge and around the locating lugs of the segment (as shown in the picture below) to ensure this does not happen.

Weld Procedure According to Segment Material

Segment Material	Welding Procedure
MMD 101	TO30
MMD 505	TO63
MMD 501	T055



Breaker Bar Adjustment

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

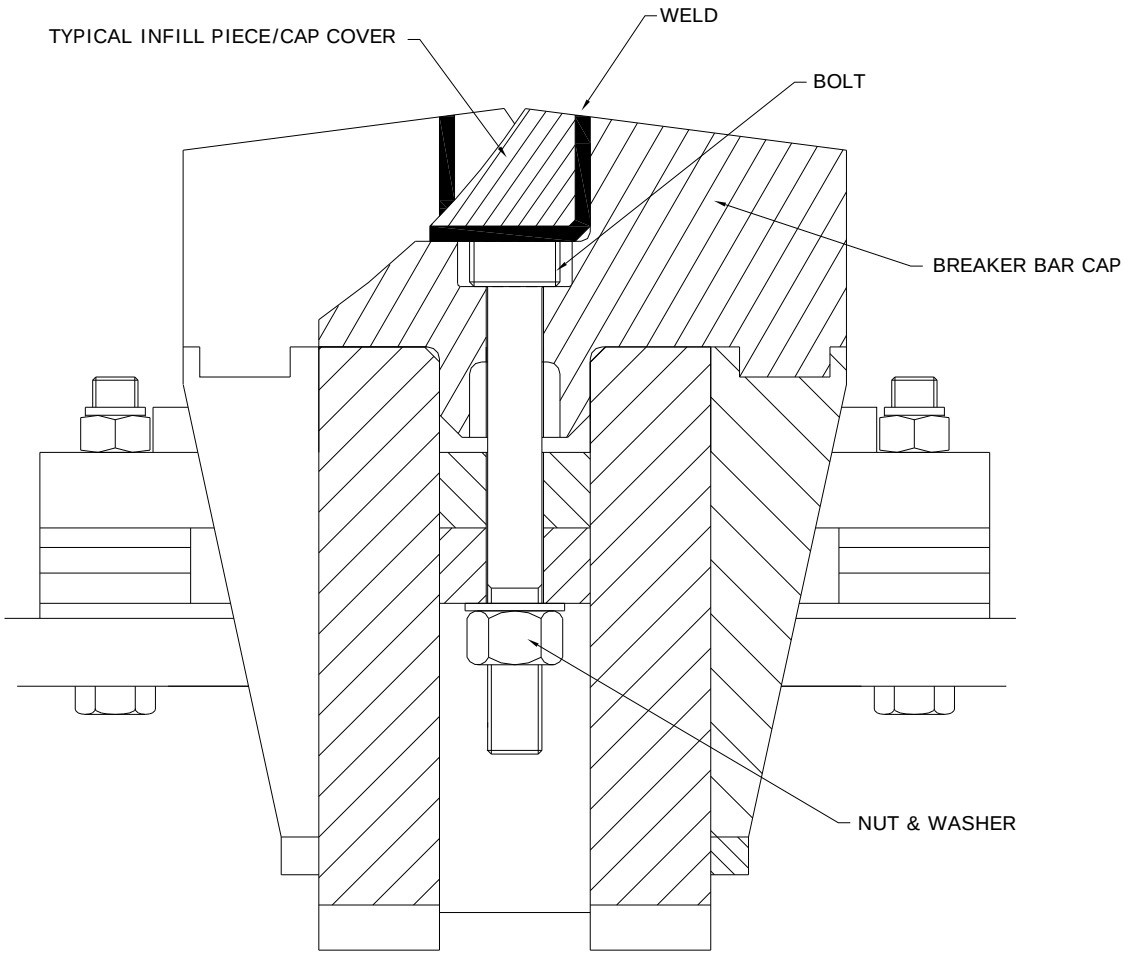
- O Remove the bolts securing the breaker bar to the machine.
- O Using the jacking screws, raise the breaker bar to the desired height.
- O Adjust the breaker bar by removal/insertion of packers as required.
- O When the height is satisfactory, refit the bolts, and tighten in accordance with **MMD procedure 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 damaged/worn breaker bar caps immediately, if left this could result in damage to the breaker bar.

Removal:

- O Clean the area around the cap which is to be replaced.
- O If applicable, by a process of gouging/air arching remove the welds surrounding the infill piece/bolt cover.
- O Remove the bolt(s) & nut(s) securing the cap to the breaker bar.
- O Remove the breaker bar cap.



Replacement:

O Prepare breaker bar mounting surfaces. Care must be taken not to damage breaker bar during clean up.

O Locate 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.**

O If applicable, place the new infill piece/bolt cover over the bolt and weld in to position in accordance with **MMD Procedure TO71/TO96/TO128**

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 certified lifting gear where required and wear the appropriate protective clothing and eye wear.

Cleaning Comb Adjustment (Standard Type)

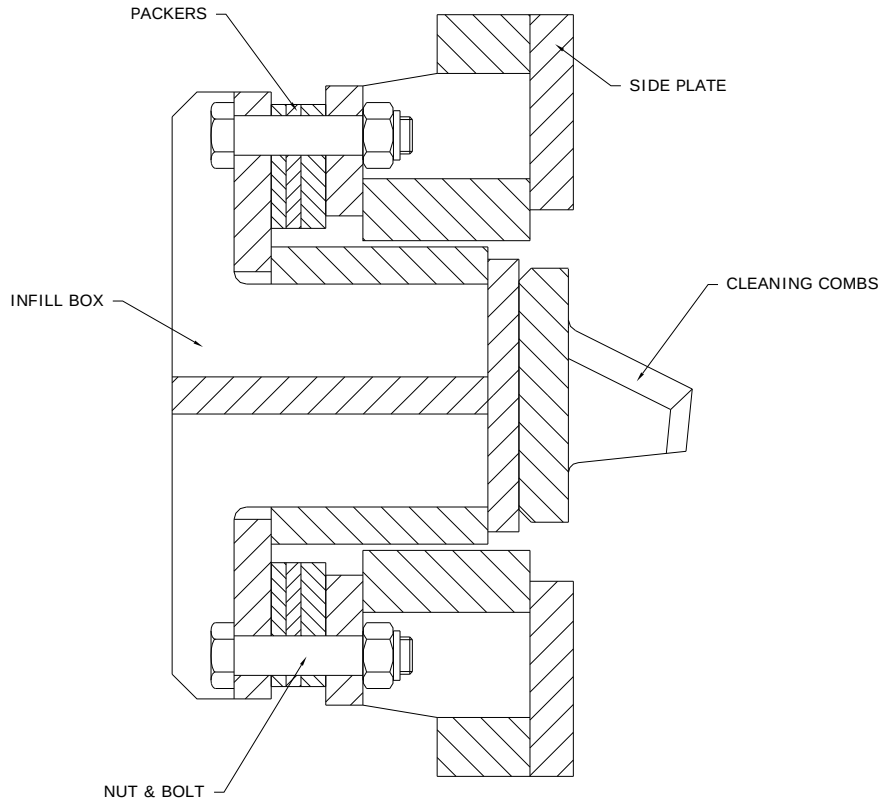
Where specified, on larger machines, adjustable cleaning combs may be fitted to minimise build-up of material between the tooth rings, and to prevent recirculation of any product attached to the shafts. These cleaning combs will need periodic adjustment to compensate for wear. This is achieved by removing 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 procedure T056.**

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 SIZERS™ 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.

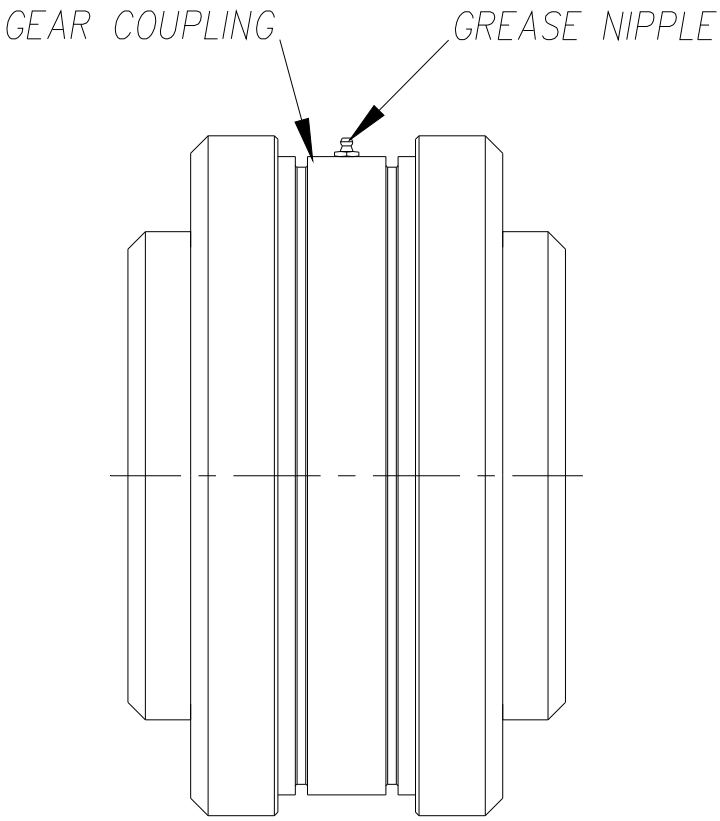
Ensure (where fitted) the Autolube is functioning correctly. The distribution block indicator pin should move up and down on a regular basis, (Speed is dependent on delivery volume).

To Ensure a regular flow of grease purging of the Labyrinth's the space between the Breaker Chamber and Bearing capsule should be kept clear. (Check and Clear if necessary)

Check the spur gear oil level, and top up as required, with the correct specification lubricant. Refer to **MMD procedure T0138**.

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 (OPTIONAL)

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

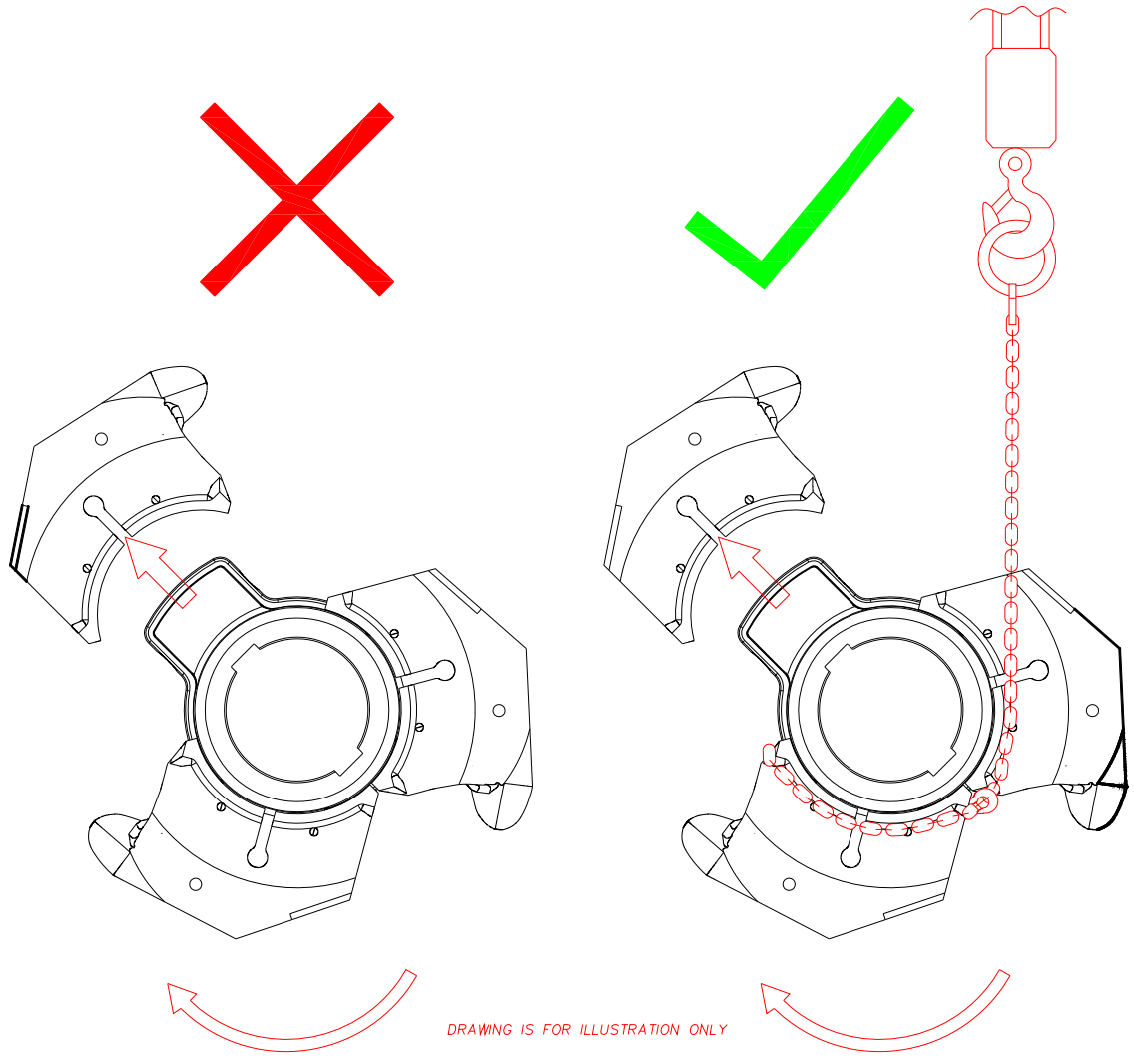
- If the radiator fan motor is operated with a thermostat, the operation of the thermostat must be checked.
- Thoroughly clean the unit.
- If the unit is fitted with a thermostat to control the fan motor, check the thermostat on and off. Setpoints are between 50 & 60°C. The 'on' setting should be higher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

Maintenance inside Sizers cavity on shafts, breaker bar and wear elements

- THE SIZER MUST BE COMPLETELY LOCKED OUT BEFORE ANY PERSON IS ALLOWED TO ENTER INTO THE SIZER CAVITY (AREA AROUND SHAFTS AND BREAKER BAR.)
- FAILING TO ADHERE TO THE SAFETY REQUIREMENTS AS SPECIFIED IN THIS MANUAL MAY RESULT IN SERIOUS INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT

Before any maintenance work can be done on the breaker shafts inside the sizer cavity, the sizer must be electrically locked out in accordance with the site specific lock out procedures.

When working on the breaker shafts for maintenance purposes, such as changing caps or segments it is important to either lock the shafts or restrain them against uncontrolled rotation. This is because whilst removing the teeth or segments a situation may arise where the shaft reaches a state of imbalance. This could cause the shaft to rotate without control resulting in severe injury to the person working on the shaft. This must be prevented at all cost.
This can be done by using chain blocks/pull lifts and slings around the shaft to either brake or rotate the shaft when necessary. The method of restraint is preferred to completely locking the shaft because it allows full access for maintenance all around the shaft.



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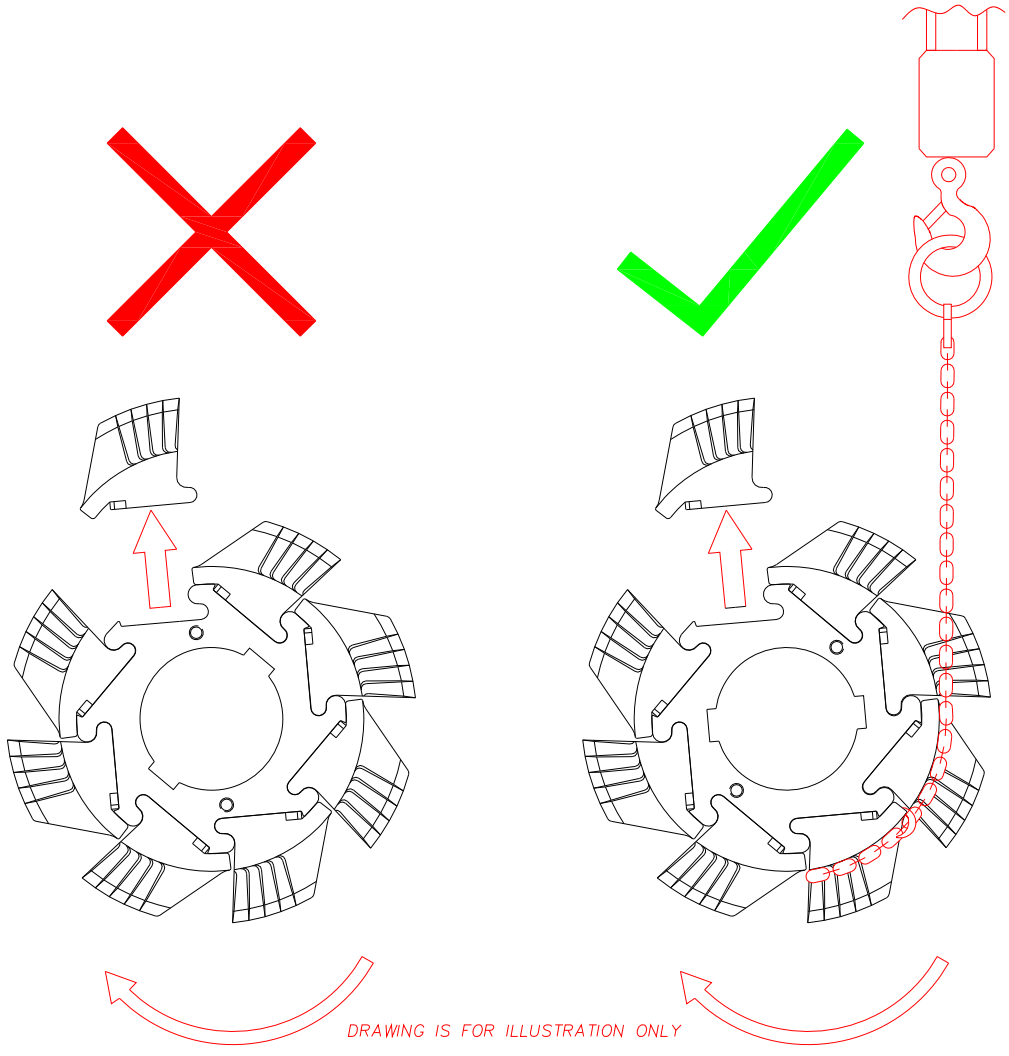


MMD MINING MACHINERY DEVELOPMENTS LIMITED

TECHNICAL SPECIFICATIONS

ALWAYS CHECK WITH MMD FOR LATEST T.O. SPECIFICATION

T.O. CORRECT AT TIME OF MANUAL COMPILATION

REVISION	MODIFICATION	DATE
1.0 2.0	FIRST ISSUE TO56 UPDATED	03 - 10 - 11 13 - 02 - 12

1) **Bolt Torques** - For approximately 85% proof stress in unlubricated coarse pitch bolts.

Size	8.8 GRADE Nm	10.9 GRADE Nm	12.9 GRADE 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

If Greasing fastenings (Mobil Temp 78 or equivalent) the following applies:

If Greased x 0.65
If Greased Cap Bolts x 0.75

NUT AND BOLT COMBINATIONS

Bolt Grade	8.8	10.9	12.9
Nut Grade	8	12	12

2) **Hydraulic tool pressure settings (PSI)** this applies to the Tentec 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.

3) Bolt torques for Jacket type tip assemblies shank type 150m19 material in 'r' condition.

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

Torque up bolts dry.

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

4) Spill Plate Bolts

Bolt torques for M24 Spill Plate Bolts used for the securing of segments should be 822 Nm.

'CAT' Undercarriage Bolts

These bolts are actually made to SAE grade 8, though the head markings do not conform. For reference their Mechanical Properties are approximately 88% of 10.9 grade metric bolts, and higher than 8.8 grade. So it could loosely be said they are about 10.9 grade

Per SAE grade 8, Mechanical Properties are;
Minimum Tensile Strength 1034 MNm^{-2}
Minimum 0.2% Proof Stress 827 MNm^{-2}
Minimum Yield Strength 896 MNm^{-2}

Correct Tightening Torque is given by;

Torque = $1.35582 \times 10^{b+m \times \log(d)}$

With b = 2.983, m = 3.095, d = bolt dia (inches), the log function is base 10.

Tightening Torques per above are as follows, bolt sizes in inches;

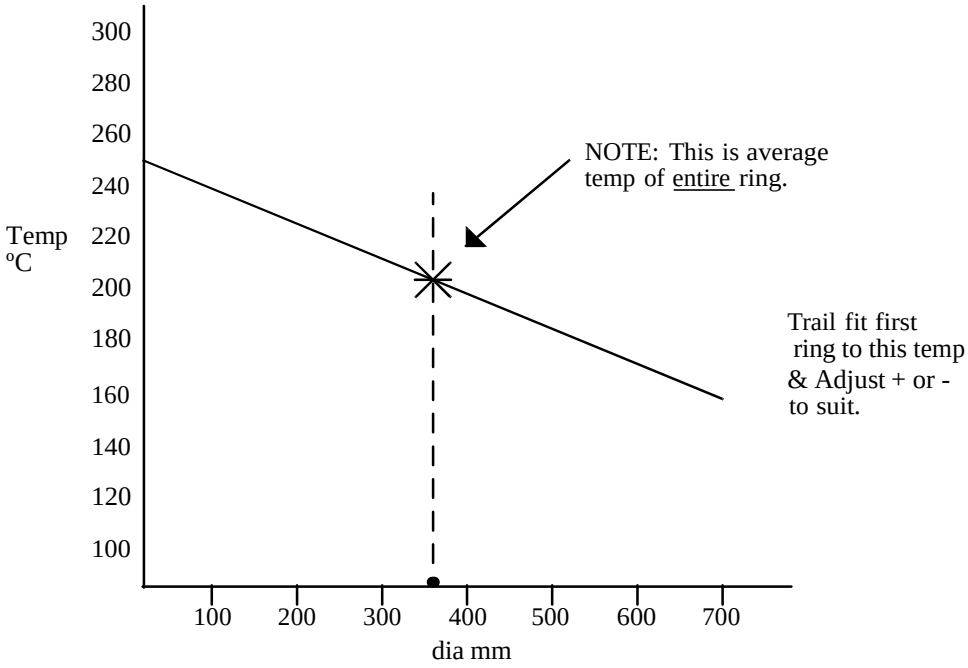
$\frac{1}{2}$	153 Nm
$\frac{5}{8}$	304 Nm
$\frac{3}{4}$	535 Nm
$\frac{7}{8}$	862 Nm
1	1304 Nm
$1\frac{1}{8}$	1877 Nm
$1\frac{1}{4}$	2601 Nm
$1\frac{3}{8}$	3493 Nm
$1\frac{1}{2}$	4573 Nm
$1\frac{5}{8}$	5859 Nm
$1\frac{3}{4}$	7369 Nm
$1\frac{7}{8}$	9123 Nm
2	11140 Nm

Prepared By.: M.Duthie		Approved By.: R. P. Barber	
Procedure.: T056	Page.: 3 of 3	Issue No.: 16	Date: 02/02/12

1 SCOPE

Temperature for shrink fitting all rings to shafts.
See graph below for instructions.
If in doubt consult design.

Max allowable 300ºC This must not be exceeded.



GRAPH BASED ON H 7 r6 Fits.
T(°C) = -0.13 x Bore Dia(mm) + 250

Prepared By: G R Nowell		Approved By: R Barber	
Procedure: T0 72	Page 1 of 1	Issue No. 1	Date 13-10-2003

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.

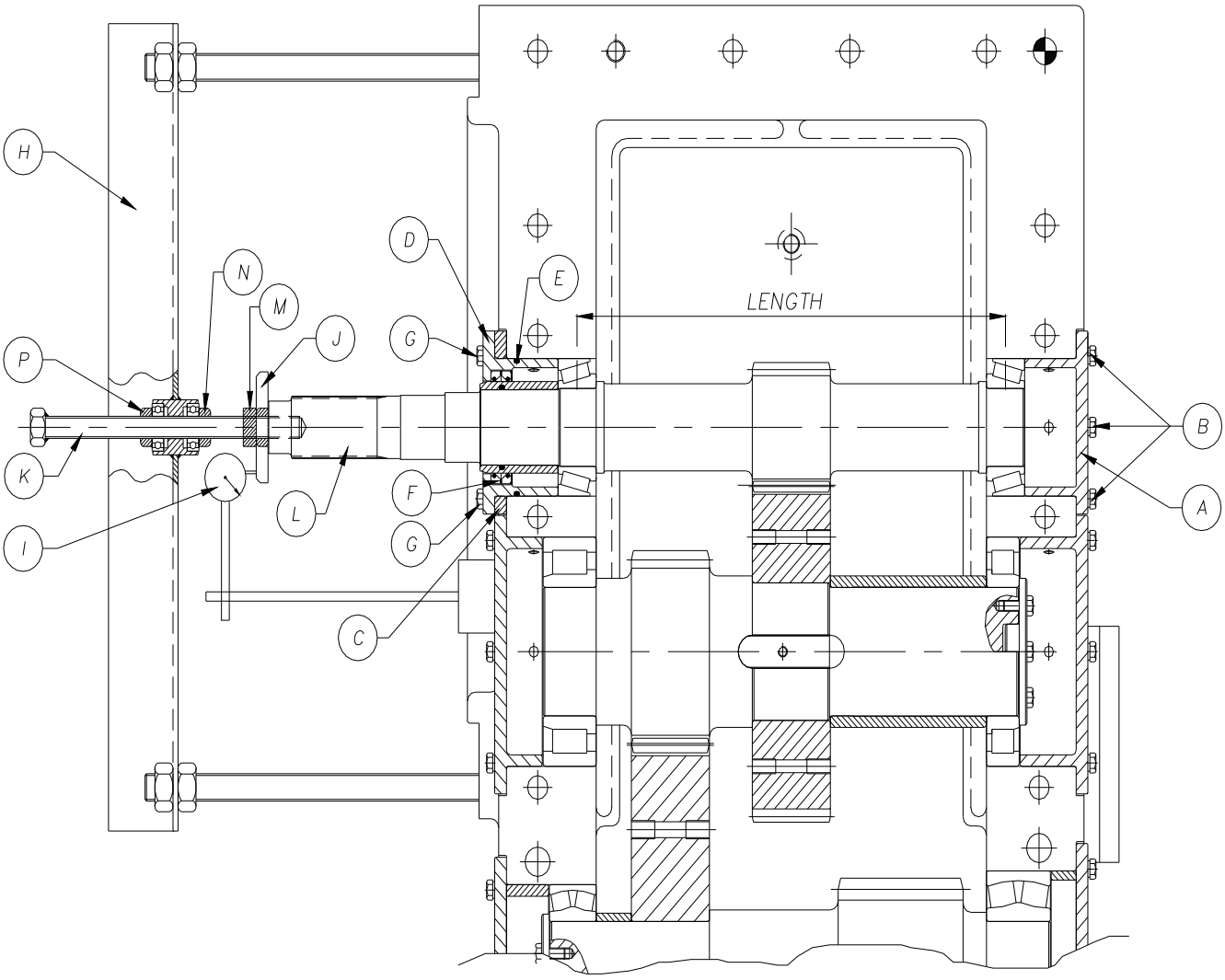
$a = \frac{D1 + D2}{2}$ D1 and D2 = Outer Diameter of bearings 1 and 2

b = (a x 4) +(Length x 2) Length = Distance Between Centre of each Bearing (See drawing)

Minimum Clearance = b x 0.00024
Maximum Clearance = 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 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.



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.

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

NLGI EP1

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

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	
Sizer Shaft ctrs (m)	cc/Hour	Sizer Shaft ctrs (m)	cc/Hour	Sizer Shaft ctrs (m)	cc/Hour
0.5	30	0.5	15	0.5	3.5
0.625	40	0.625	20	0.625	5
0.75	50	0.75	25	0.75	6
0.85	60	0.85	30	0.75	8
1.0	75	1.0	37.5	1.0	9.5
1.15	90	1.15	45	1.15	11
1.25	100	1.25	50	1.25	12.5
1.3	110	1.3	55	1.3	14
1.4	120	1.4	60	1.4	15
1.5	130	1.5	75	1.5	16

Feeder D4	10
Feeder D7	20
Feeder D9	50

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

Prepared By: M.Duthie		Approved By: R.P.Barber	
Procedure: T0132	Page: 1 of 2	Issue No: 8	Date: 08/12/2010

Notes

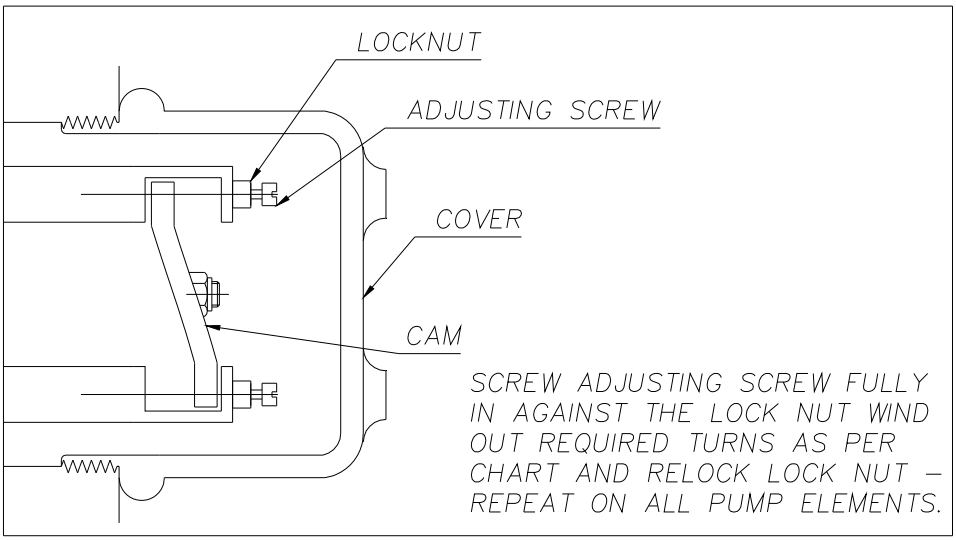
When grease is fed by an autolube system, the grease must be fed continuously whenever the machinery runs. It is also strongly recommended to run the grease feed for 2 hours after each running period.

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.

When seperate 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.



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 properties (minimum FZG load stage 12).

e.g. SHELL OMALA 320

Ambient temperature -20°C to +45°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 properties (minimum FZG load stage 12).

e.g. SHELL OMALA 220

Ambient temperature 45°C to -50°C with heating

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

e.g. SHELL ASX 75W-90

Note: Some gearboxes require cooling under certain circumstances

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 flourocarbon and nitrile rubber.

Prepared By: R.P.Barber		**Approved By: G.R.Nowell**	
Procedure: T0138	**Page: 1 of 1**	**Issue No: 5**	**Date: 16/03/2011**

BEARING OUTER RING ROTATION IN GEARBOX BORES

1. SCOPE

This specification covers all spherical bearings with the W33 feature in spur gear gearboxes.

2. ACTION

An 'O' ring is to be fitted into the W33 feature prior to assembly in the gearcase.

The 'O' ring is to be of a suitable size for the W33 feature as to not impair the fitting of the bearing into the case.

3. REASON

The gearcase bore is of an H7 tolerance allowing theoretical clearance with the bearing.

The 'O' ring will provide a friction grip on the outer race of the bearing preventing rotation of the outer race in the gearcase bore.

Prepared By: M. L. Duthie		Approved By: R. P. Barber	
Procedure No.: TO139	Page: 1 of 1	Issue No.: 1	Date: 05-08-99

CARLO GAVAZZI
SHAFT ROTATION SENSOR
OPERATION AND INSTALLATION

The shaft rotation sensor provided is a Carlo Gavazzi pulse continuity timer. This multi function control timer operates as a shaft rotation monitor. The timer receives a pulse from a Carlo Gavazzi namur proximity sensor, Carlo Gavazzi part number 1A 18 ELN 08 UC which monitors the shaft rotation. The control operation of the timer has several selectable modes of operation and time ranges most of which are not required.

The description below gives the settings required to give a time delay of 6 seconds.

SECTION 1 – TIMER SETTINGS

This covers the basic connections and settings of the DIP switches.

SECTION 2 – SOCKET TYPE BASE

This covers the basic connections.

SECTION 3 – NAMUR PROXIMITY SENSOR

This covers the basic settings.

SECTION 4 – TYPICAL SIZER SENSOR CONTROL CIRCUIT

Basic wiring diagram.

SECTION 5 – MMD STRUCTURE NUMBERS

Part number allocations.

SECTION 1 – TIMER SETTINGS

The timer supplied by Carlo Gavazzi is Multifunction Type PMC 01, plug-in with 1 x SPDT Output.

Supply: 24 VDC – PMC 01 C 724
Supply: 24 VAC – PMC 01 C 024
Supply: 115 VAC – PMC 01 C 115
Supply: 230 VAC – PMC 01 C 230

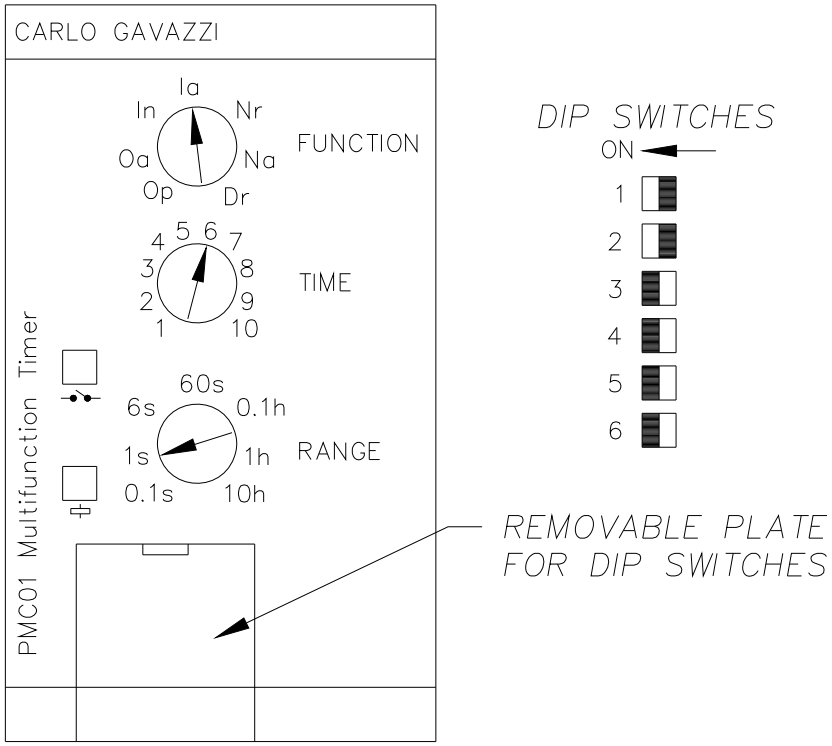
There are 3 dials on the front and behind a cover there are 6 DIP switches.

The TOP dial is to set the FUNCTION.
This should be set at Ia.
Ia – Interval, automatic and manual start.

The MIDDLE dial is to set the TIME.
This should be set at 6.

The BOTTOM dial gives the time RANGE.
This should be set at 1s.
Each increment on the Time dial is then set at 1 second.

DIP switches.
Switches 1 and 2 should be set at OFF.
Switches 3,4,5 and 6 should be set at ON.

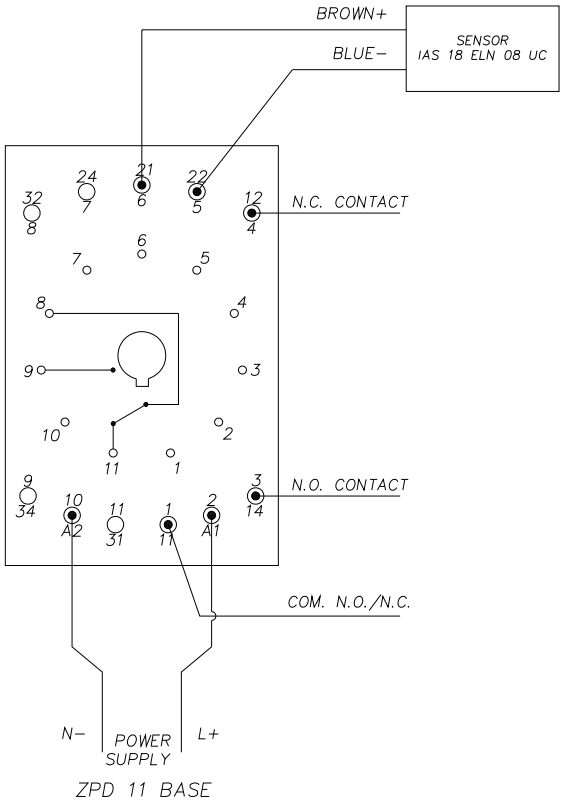


Prepared By: M. Duthie		Approved By: R. P. Barber	
Procedure No: TO 170	Page 2 of 4	Issue No. 4	Date: 04/03/08

SECTION 2 – SOCKET TYPE BASE

A Carlo Gavazzi ZPD 11 Base is used which can be mounted on a DIN-rail (DIN EN 50 022) and to which the Timer can plug into.

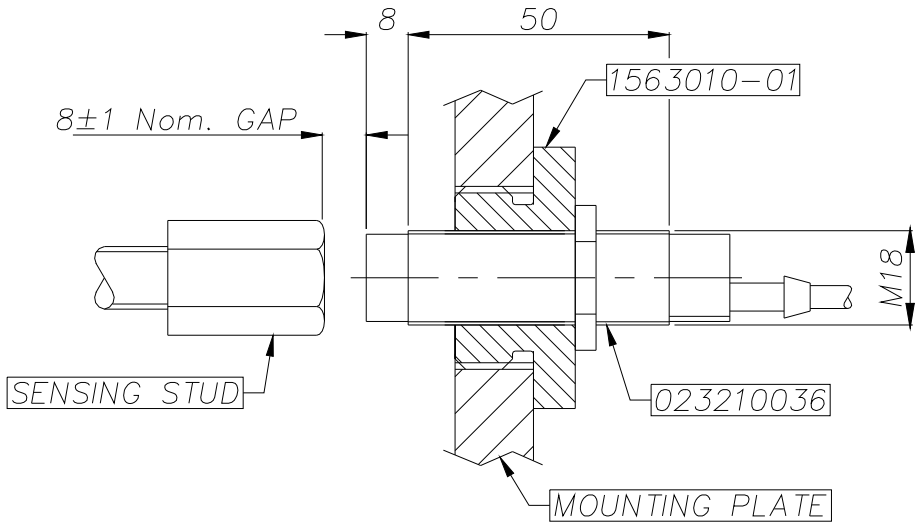
Below is the wiring diagram.



ZPD 11 BASE

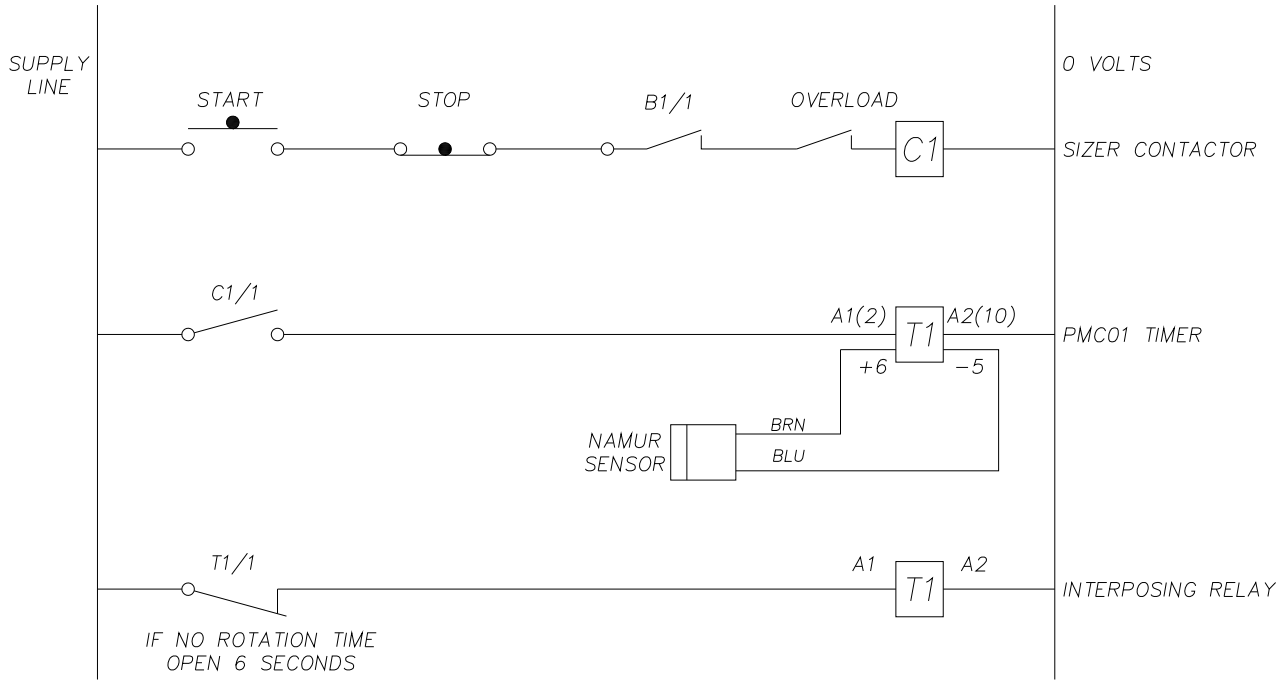
SECTION 3 – NAMUR PROXIMITY SENSOR

The Proximity Sensor (MMD Part No. 023210036) is supplied with the adaptor 01563010 to allow retro fitting in end plates which have been drilled and tapped to 1 3/8" x 12 T.P.I.



Prepared By: M. Duthie		Approved By: R. P. Barber	
Procedure No: TO 170	Page 3 of 4	Issue No. 4	Date: 04/03/08

SECTION 4 – TYPICAL SIZER SENSOR CONTROL CIRCUIT



SECTION 5 – MMD STRUCTURE NUMBERS

MMD Structure Numbers are as follows:-
Structure 143210032 115 Volts AC
Structure 143210033 24 Volts DC
Structure 143210034 230 Volts AC

(**NOTE**: - The M18 x 1P Plug to replace sensor unit in transit is Part No. 1562523-01)

RECOMMENDED TOOLING KIT FOR ASSEMBLY & MAINTENANCE OF MMD SIZERS & APRON PLATE FEEDERS

REVISION	MODIFICATION	DATE
1.0	FIRST ISSUE	27 - 11 - 07
2.0	AMENDED SOCKET LISTINGS	29 - 04 - 08

RECOMMENDED TOOL LIST

500CRS:

O **Allen Keys**
Small set up to 10mm
Imperial Set
12mm
14mm
17mm

O **Reducer**
3/4” Female - 1” Male

O **Flogging Ring Spanner**
46mm

O **Wrench Combinations**
10mm x 2
12mm x 2
17mm x 2
19mm x 2
24mm x 2
30mm x 2
36mm x 2
46mm x 2

O **Hammer**
2lb
4lb
7lb

O **Chisel**

O **Crow Bar - Straight**
18”
4ft

O **Screw Driver Set**
Flat
Phillips

O **Taper Drifts**
Up to 25mm

O **Ratchets**
1/2” Drive set up to 30mm
3/4” Drive set up to 46mm
(To include 36mm deep socket if segment machine)

O **Adjustable Spanner**
6”
12”

O **Pipe Wrench**
12”
24”

O **Hackaw**
12” & Blades

O **File**
Flat File
Round File

O **Torque Wrench**
1/2”
3/4”

RECOMMENDED TOOL LIST

625CRS:

ALSO INCLUDE THE TOOLING EQUIPMENT FOR 500CRS

- O **Allen Keys**
  19mm
  22mm
  27mm
- O **Reducer**
  1” Female - 1 3/4” Male
- O **Flogging Ring Spanner**
  55mm
  65mm
- O **Wrench Combinations**
  55mm x 2
  65mm x 2
- O **Taper Drifts**
  Up to 31mm
- O **Adjustable Spanner**
  18”
- O **Ratchets**
  1”
- O **Sockets**
  65mm Inch Drive
  55mm Inch Drive

RECOMMENDED TOOL LIST

750CRS & UPWARDS:

ALSO INCLUDE THE TOOLING EQUIPMENT FOR 500CRS & 625CRS

O **Flogging Ring Spanner**
75mm
85mm

O **Wrench Combinations**
75mm x 2
85mm x 2

O **Taper Drifts**
Up to 47mm

O **Ratchets**
1”

O **Sockets**
75mm Inch Drive
85mm Inch Drive

RECOMMENDED TOOL LIST

APRON PLATE FEEDERS

ALSO INCLUDE THE TOOLING EQUIPMENT FOR 500CRS & 625CRS

O **Allen Keys**

1/4”
3/8”
1/2”
5/8”

O **Hagglunds Tool**

O **Sockets as per Bolt Size**

D4
D7
D9

O **Voith Tools**

O **TorqueWrench**
As per fixing bolts to equal torque as per MMD T.O.56

O **3/4” Drive Sockets**
24mm
30mm
36mm
46mm
3/4” Swivel
1” Swivel
10mm 1/2” Allen Key Socket Bit
12mm 1/2” Allen Key Socket Bit
14mm 1/2” Allen Key Socket Bit
17mm 3/4” Allen Key Socket Bit
19mm 3/4” Allen Key Socket Bit
6” 1/2” + 3/4” Extension
12”1/2” + 3/4” Extension