English

Original Instructions

Installation, Operation and Maintenance Instructions

Macerator

OMMP/077/01
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Index

Revisions

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EC Declaration as defined by Machinery Directive 2006/42/EC.

The following harmonised standards are applicable: BS EN ISO 12100: 2010

EC Declaration of Incorporation

This declaration is only valid when partly completed machinery has been supplied.

In this case, the machinery meets the requirements of the said directive and is intended for incorporation into other machinery or for assembly with other machinery in order to constitute relevant machinery as defined by the said directive including any amendments, which are valid at the time of supply.

IMPORTANT

This machinery must not be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity to the said directive.

This declaration is only valid when the machinery has been installed, operated and maintained in accordance with these instructions and safety guidelines contained within as well as instructions supplied for equipment assembled with or intended for use with this equipment.

EC Declaration of Conformity

This declaration is not valid for partly completed machinery that has been supplied.

In this case the machinery meets the requirements of the said directive including any amendments which are valid at the time of supply.

We further declare that, where applicable, said machinery also meets the requirements of:

The EMC Directive 2014/30/EU
The Low Voltage Directive 2014/35/EU
The Pressure Equipment Directive 2014/68/EU

IMPORTANT

This declaration is only valid when the machinery has been installed, operated and maintained in accordance with these instructions and safety guidelines contained within as well as instructions supplied for equipment assembled with or intended for use with this equipment.

Mr A. Morris - Director of Pump Technology for NOV PFT UK Ltd., Greengate Way, Middleton, Manchester, England, M24 1SA.

GRINDERS

Due to the nature and design of grinding and macerating equipment it is possible that certain objects may enter the cutters, from the process stream, with the potential to cause sparking or jamming of the cutter assembly.

Where a grinder unit is to be installed in a potentially explosive atmosphere ensure that this has been specified at the time of purchase and that the equipment has been supplied accordingly and displays an ATEX nameplate or is supplied with a certificate of conformity. If there is any doubt as to the suitability of the equipment please contact your Supplier before commencing with installation and commissioning.

Process liquids or fluids should be kept within specified temperature limits otherwise the surface of grinder or system components may become an ignition source due to temperature rises. Where the process liquid temperature is less that 90ºC (194ºF) the maximum surface temperature will not exceed 90ºC (194ºF) provided the grinder is installed, operated and maintained in accordance with this manual. Where the process fluid temperature exceeds 90ºC (194ºF) the maximum surface temperature will be equal to the maximum process fluid temperature.

Cavities that could allow the accumulation of explosive gases, such as under guards, should where possible, be designed out of the system. Where this is not possible they should be fully purged before any work is carried out on the grinder or system.

Electrical installation and maintenance work should only be carried out by suitably qualified and competent persons and must be in accordance with relevant electrical regulations.

All electrical equipment, including control and safety devices, should be suitably rated for the environment in to which they are installed.

Where there may be a risk of an accumulation of explosive gases or dust non-sparking tools should be used for installation and maintenance.

To minimise the risk of sparking or temperature rises due to mechanical or electrical overload the following control and safety devices should be fitted. A control system that will shut the grinder down if the motor current or temperature exceed specified limits or a jam of the cutter stack occurs. This may include a system that reverses the machine in order to clear any such jam. An isolator switch that will disconnect all electrical supply to the motor and ancillary electrical equipment and be capable of being locked in the off position. All control and safety devices should be fitted, operated and maintained in accordance with the manufacturer's instructions.

It is important that the grinder rotates in the correct direction to give an efficient grinding operation. This must be checked on installation and commissioning and after any maintenance has been carried out. Failure to observe this may lead to mechanical or electrical overload.

When fitting drives, couplings, and guards to a grinder unit it is essential that these are correctly fitted, aligned and adjusted in accordance with the O&M instructions. Failure to do so may result in sparking due to unintended mechanical contact or temperature rises due to mechanical or electrical overload.

Mechanical seals should be suitably rated for the environment. The seal and any associated equipment, such as a flushing system, must be installed, operated and maintained in accordance with the manufacturer's instructions.

Where a packed gland seal is fitted this must be correctly fitted and adjusted. This type of seal relies on the process liquid to cool the shaft and packing rings so a constant drip of liquid from the gland section is required. Where this is undesirable an alternative seal type should be fitted.

Failure to operate or maintain the grinder and ancillary equipment in line with the manufacturer's instructions may lead to premature and potentially dangerous failure of components. Regular inspection, and where necessary replacement, of bearings, seals, other wearing parts and lubrication is essential.

The grinder and its components have been designed to ensure safe operation within the guidelines covered by legislation. Accordingly your Supplier has declared the machine safe to use for the duty specified as defined by the Declaration of Incorporation or Conformity that is issued with this instruction manual. The use of replacement parts that are not manufactured by or approved by your Supplier may affect the safe operation of the grinder and it may therefore become a safety hazard to both operators and other equipment. In these circumstances the Declaration provided will become invalid. The guarantee referenced on the Terms and Conditions of Sale will also be invalidated.

Introduction

This information and all the information contained herein, is the exclusive property of NOV, and contains information of a proprietary nature. It is provided for the sole purpose of transmitting the information contained to the designated recipient.

This information is to be used only as specified in the instrument of transmittal. It is not to be reproduced, copied in whole, or in part, nor is information it contains to be disclosed in any manner without the written consent of NOV. Its use for any other reason than the specified shall be a violation of the agreement with the recipient concerning the legal rights of NOV.

NOV reserves the right to make changes, which may obsolete certain parts of this manual.

The manual gives a guide to the operation and maintenance of the Macerator given that all Health and Safety and good engineering practices are observed.

Installation, Operation & Maintenance

GENERAL DESCRIPTION OF MACERATOR

Designed to operate in the waste water industry, the Macerator is a rotating cutter / impeller type grinder operating within a stationary cutter ring. The impeller is of the tri-hammer design with tapped bosses for easy removal. The motor bearings are protected from the ingress of the process liquid by means of an oil lubricated mechanical seal located outside the process fluid.

TYPICAL CONSTRUCTION SPECIFICATIONS

Body:
Cast Iron to BS 1452 grade 220/260

Impeller:
Carbon chromium steel, hardened and tempered.

Cutting Ring:
Carbon chromium tool steel hardened.

Mechanical Seals:
Oil lubricated mechanical seal carbon/ceramic mounted external to process liquid.

Finish:
Standard paint finish is 1 coat primer and 1 coat hammer finish enamel gloss, to provide long term effective surface protection from the environment.

GENERAL SAFETY

Appropriate PPE must always be worn.

All personnel must be suitable qualified / trained prior to carrying out any work and must comply with all safety warnings.

The Operating and Maintenance manual must always be kept close to the machine.

Instructions must be read prior to carrying out any work.

The machine must be installed correctly to ensure satisfactory & safe operation.

The machine must be maintained to a suitable standard to ensure safety of personnel and satisfactory operation of the machine is achieved.

Ensure adequate ventilation is provided to disperse dangerous concentrations of vapours.

Machines operating on high temperature duties should be allowed to cool sufficiently before any maintenance is carried out.

The machine must be installed with provision for adequate lighting to ensure effective maintenance can be carried out.

DANGERS CAUSED BY THE MACHINE

- Movement of mechanical parts
- Electrical voltages and currents
- Risk of electrocution, shock or burns
- Hot surfaces
- Risk of burns

INTENDED USE

Use machine only if it is in good condition and in compliance with these instructions.

This machine must be installed in accordance with statutory regulations and these instructions.

Machine must only be run in accordance with data supplied. Before making any changes, approval must be sought from your Supplier.

FORESEEABLE MISUSE

- Incorrect use of machine
- Incorrect installation of machine

NOISE LEVEL

The Airborne noise emission of the Macerator does not exceed 70 dB(A).

ENVIRONMENTAL

These must be taken into account at the place of installation such as:

- abnormal temperature
- high humidity
- corrosive atmospheres
- explosive and/or fire danger zones
- vibrations
- flooding

Type of liquid to be pumped / properties while being pumped:

- flammable
- toxic
- corrosive
- abrasive

Operating System Fluctuations:

- temperature
- pressure
- flow rate
- dry running

TRANSPORT

Comply with any instructions on packaging and/or paperwork.

1.0 INSTALLATION

1.1 INSTALLATION AND SAFETY RECOMMENDATIONS

In common with other items of process plant, a Macerator must be correctly installed to ensure satisfactory and safe operation. The Macerator must also be maintained to a suitable standard.
Following these recommendations will ensure that the safety of personnel and satisfactory operation of the Macerator is achieved.

1.2 SYSTEM DESIGN AND INSTALLATION

At the system design stage, consideration must be given to the provision of filler/drain plugs and adequate maintenance space. Where Macerators are installed horizontally, they should be mounted on a flat surface and bolted down, ensuring a firm fixing to reduce noise and vibration.

1.3 ELECTRICAL CONNECTIONS

Electrical connections should only be made using equipment suitable for both ratings and environment. Where any doubt exists regarding the suitability of equipment your Supplier should be consulted before proceeding. All electrical work must be carried out in accordance with any local and IEE Regulations by suitably qualified personnel.

1.4 GENERAL SAFETY REQUIREMENTS

When handling harmful or objectionable materials, such as raw sewage, suitably rated motors should be specified for the environment concerned, together with the provision of ventilation adequate to disperse dangerous concentrations of vapours. It is recommended that, wherever possible, Macerators should be installed with provision for adequate lighting, thus ensuring that effective maintenance can be carried out in satisfactory conditions. A hosing down facility with adequate drainage is also recommended to simplify maintenance and prolong component life. Care must be taken when hosing down to protect electrical equipment from splashing and ingress of water. May contain substances from the ECHA SVHC Candidates List (REACH - Regulation (EC) No. 1907/2006)

1.5 EXPLOSIVE ATMOSPHERE

When installed in a potentially explosive atmosphere always ensure it complies with all Local Health and Safety and Factories Act requirements.

1.6 SYSTEM START-UP

All nuts, bolts, securing flanges and base mounting fixtures must be checked for tightness before operation. Ensure oil is present in the mechanical seal oil bath (level should be halfway up the sight glass). When commissioning the plant, all joints in the system must be checked thoroughly for leakage. If, when starting, the Macerator does not appear to operate correctly, the plant must be shut down immediately and the cause of the malfunction established before operations are recommenced.

WHERE YOUR SUPPLIER HAS SUPPLIED A MACERATOR UNIT ONLY, THE RESPONSIBILITY IS ON THE PURCHASER TO ENSURE INSTALLATION IS IN COMPLIANCE WITH THE RECOMMENDATIONS OF THE LOCAL HEALTH & SAFETY REGULATIONS APPLICABLE.

2.0 LUBRICATION SCHEDULE

See routine maintenance 3.1

3.0 MAINTENANCE (125mm UNIT AND 180mm UNIT)

3.1 ROUTINE MAINTENANCE

The use of a self-adjusting mechanical seal and few moving parts result in little routine maintenance for the NOV Macerators; however, certain preventative measures may be taken: Periodically check oil level in the mechanical seal oil bath. Oil level should be halfway up sight glass. Top up if necessary using Shell Talpa 30 oil or equivalent. Substantial or rapid oil loss may be due to a defective or worn mechanical seal or lipseal.

Dismantle, inspect and replace as necessary. Periodically check cutter ring and impeller for signs of excessive wear. Replace as necessary to reduce absorbed power and possibility of clogging.

NOTE: It is recommended that the castings and pipework are inspected periodically when used with abrasive/corrosive mediums.

4.0 DISMANTLING PROCEDURE (125mm UNIT AND 180mm UNIT)

WARNING: ENSURE ELECTRICAL SUPPLY IS ISOLATED AND PADLOCKED BEFORE DISMANTLING THE UNIT.

INLET TRANSITION

(1) Disconnect the inlet casing (20) by removing the bolts and washers (14, 15, 16) and the ‘O’ ring seal (5).

CUTTER RING

(1) The cutter ring (2) can be eased out of the Macerator body (1) using a lever. Take care not to damage the ‘O’ ring seal (3) during removal.

(2) Remove the locknut washers (7, 8, 9). N.B. Locknut is right hand thread.

(3) Remove the impeller (4) from the shaft complete with brass washer (6). A special tool can be purchased from your Supplier to ease this operation.

MECHANICAL SEAL

(1) Remove oil bath drain plug (28) and drain oil.

(2) Remove retaining boss (11) and gasket (12).
N.B.
Right hand thread. Take care not to damage the gasket. A special tool can be purchased from your Supplier to ease this operation.

(3) Remove mechanical seal rotating parts (13) complete with pressure spring from shaft seal sleeve (19).

(4) The static seat can be removed from the retaining boss bore for inspection.

REAR OIL SEAL & SEAL SLEEVE

(1) Remove motor to body retaining hardware (22, 23, 24, 25)

(2) Carefully extract the Macerator body (1), taking care not to damage the shaft.

(3) The lipseal (17) can now be pressed from its housing.

(4) The shaft seal sleeve (19) can be removed by slackening off the grubscrew (27) and sliding off the motor shaft.

5.0 ASSEMBLY PROCEDURE (125mm UNIT AND 180mm UNIT)

(1) Ensure seal ring (26) is fitted.

(2) Press on shaft seal sleeve (19) and lock in position using grubscrew (27). Fit thrower (18) onto large diameter of sleeve.

(3) Ensure keys (30) are in position on motor shaft.

(4) Press lipseal (17) into housing bore in body (1).

(5) Carefully fit the body (1) onto the motor flange, ensure no damage occurs to the lipseal (17) and secure using hardware (22, 23, 24, 25).

(6) Fit the rotating element of the mechanical seal to the shaft sleeve and, ensuring that the recess in the static race lines up with the pin within the retaining boss, fit the retaining boss (11) and gasket (12) using a sealant/ adhesive compound such as STAG. (A) on the retaining boss thread.

(7) Fit the impeller (4) and retaining hardware (6, 7, 8, 9, 10) to the shaft end. The locknut (9) should be tightened to a torque of 52Nm.

(8) Fit the seal ring (3) onto the cutter ring (2) and carefully press home into the main casting (1).

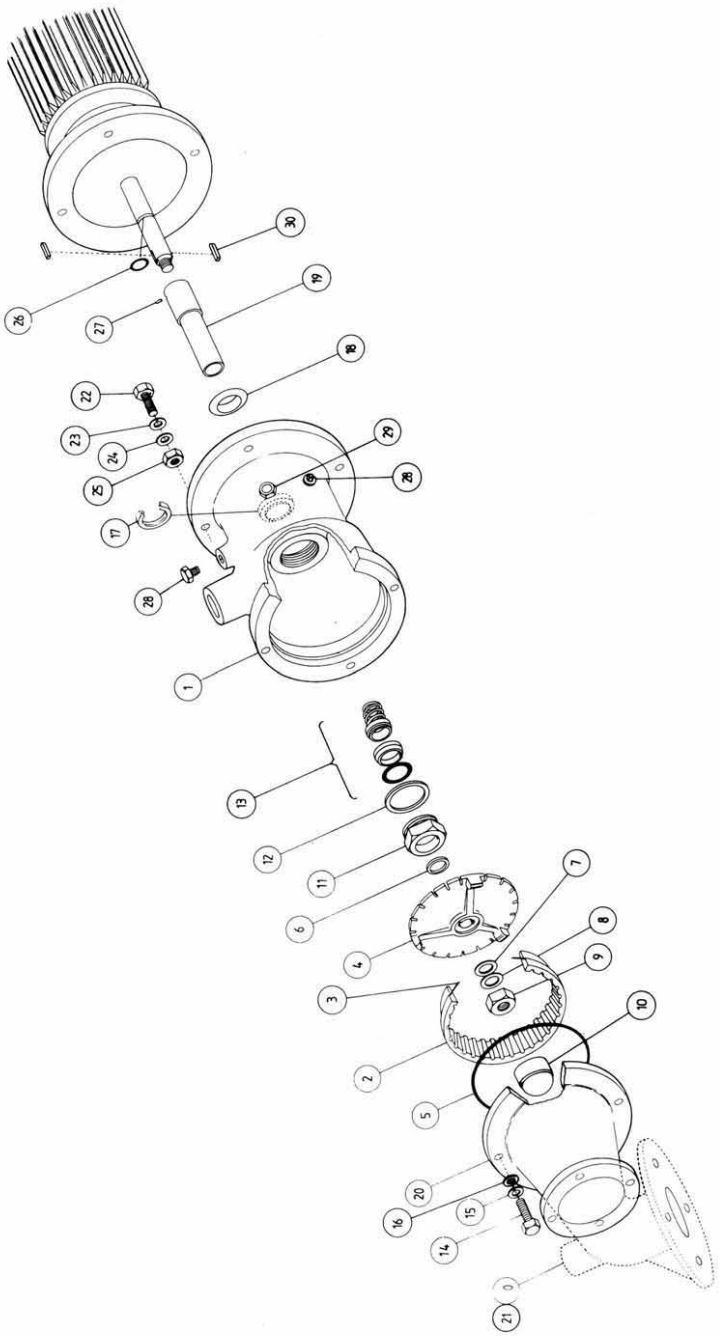
(9) Fit the inlet casting (20) and seal ring (5), using retaining hardware (14, 15, 16).

(10) Ensure oil drain plug (28) is tightened, and fill bath with Shell Talpa 30 oil or equivalent so that oil level is half way up the sight glass (29).

(11) Fit filler plug (28) and check all bolt tightenings prior to operation.

Exploded View & Parts List

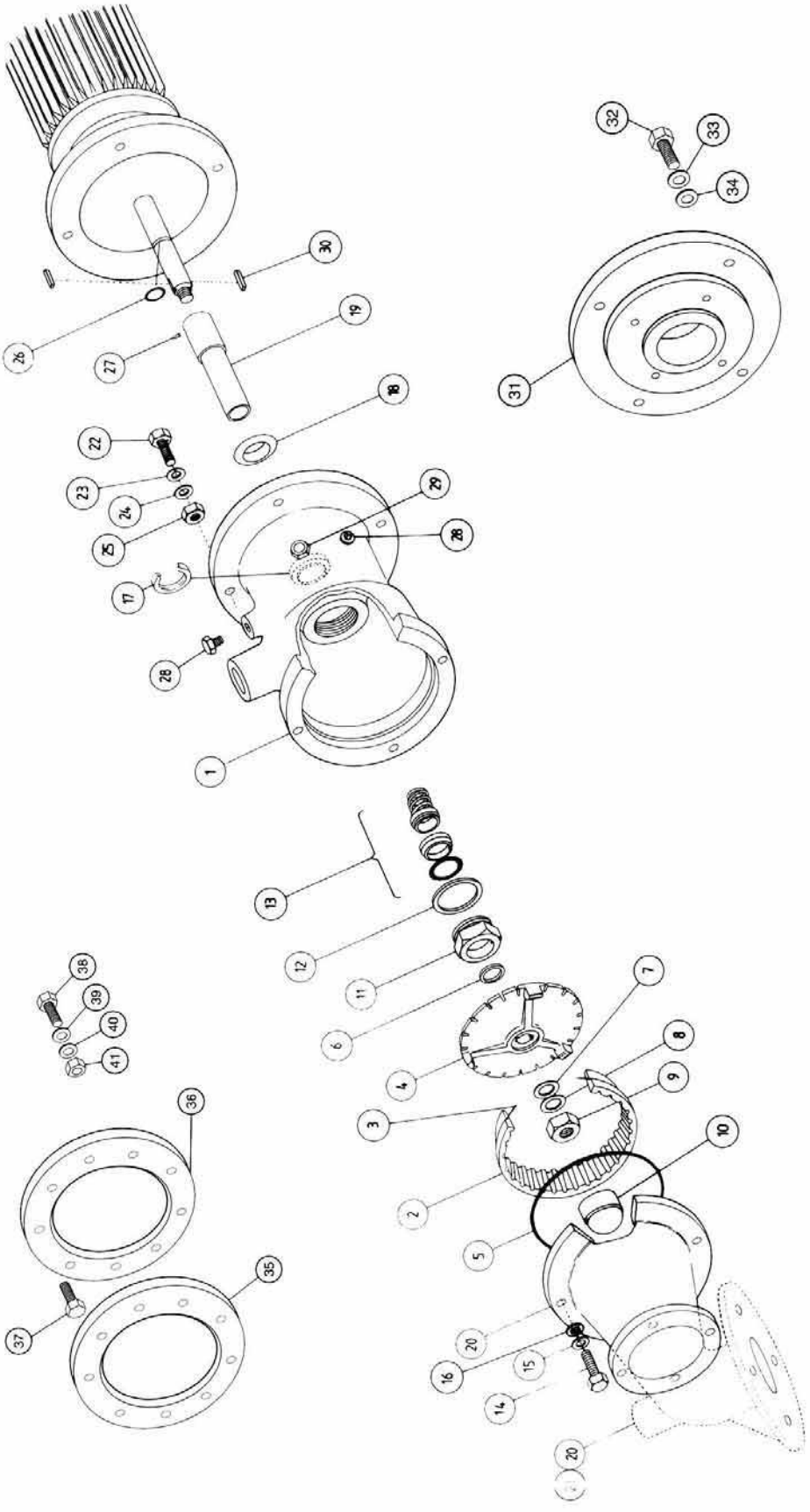
Macerator (125mm)



Item	Description	Qty	Part Number	Item	Description	Qty	Part Number	Item	Description	Qty	Part Number
1	Main Casting	1	CD M125 0100	11	Retaining Boss	1	SC M125 4000	21	Solid Taper Plug 1-1/2" BSP (90° inlet only)	1	P100832S
2	Cutter Ring	1	TC M125 3000	12	Retaining Boss Gasket	1	ZG M125 4560	22	M10 x 35 Hex Hd Screw	4	F114261F
3	O-Ring I/D 139 x Ø1.78	1	W40529	13	Mech Seal assembly	1	W40533	23	M10 Spring Washer	4	W114251F
4	Impeller	1	LE M125 3500	14	M6 x 16 Hex Hd Screw	4	F112161F	24	M10 Plain Washer	4	W114052F
5	O-Ring 5.75" x 1/8"	1	W40579	15	M6 Spring Washer	4	W112251F	25	M10 Hex Nut	4	N114100F
6	Seal Washer	1	GT M125 4551	16	M6 Plain Washer	8	W113052F	26	O-Ring I/D 20.5 x Ø1.78	1	W40535
7	Seal Washer	1	OO M125 4550	17	Radial Shaft Lipseal 35 x 47 x 7	1	S355351P	27	M5 x 6 Hex Soc Setscrew	1	G111061F
8	M12 Plain Washer	1	SF M125 4700	18	Water Thrower Disk	1	RR E051 4200	28	Solid Taper Plug 3/8" BSP	2	P100342S
9	M12 Hex Nylock Nut	1	N845201F	19	Shaft Seal Sleeve	1	SS M125 4501	29	Window Nut 3/8" BSP	1	W40537
10	Nut Sheath	1	W40527	20	Inlet Transition 90° Straight Through (not shown)	1	CD M125 0201 CD M125 0200	30	Rect. Parallel Key 6 x 6 x 18	1	K150618P

Exploded View

Macerator (180mm)



Parts List

Macerator Parts List (180mm)

	Description	M1 8001	M1 8002	M1 8003	M1 8004	M1 8005	M1 8006	M1 8007	M1 8008	M1 8013	M1 8014
1	Main Casting	CD M180 0100	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Cutter Ring	TC M180 3000	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	O-Ring	S211720P	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	Impeller	LE M180 3500	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	O-Ring	S111520P	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	Sealing Washer	GT M180 4551	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Sealing Washer	OO M180 4550	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Lock Washer	SS M180 4700	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Stl. Hex Nut L.H.	N117352F	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	Nut Sheath	W40528	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	Retaining Boss	SC M180 4000	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	Ret. Boss - Gasket	ZG M180 4560	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	Mech. Seal Assy	W40534	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	Hex Hd Screw M10 x 30	F114240F	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A
15	Stl. Spring Washer M10	W114251F	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A
16	Stl. Plain Washer	W114050F	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A
17	Rotary Shaft Lipseal	S361501P	✓	✓	✓	✓	✓	✓	✓	✓	✓
18	Thrower Disc	W40541	✓	✓	✓	✓	✓	✓	✓	✓	✓
19	Shaft Seal Sleeve	SS M180 4500	✓	✓	SS M180 4501	SS M180 4501	SS M180 4501	✓	✓	SS M180 4057	SS M180 4501
20	Inlet Transition	CD M180 0201	CD M180 0200	CD M180 0205	✓	CD M180 0200	CD M180 0205	N/A	N/A	N/A	N/A
21	Solid Taper Plug	P100832S	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A
22	Hex. Hd Bolt M12 x 40	K115282F	✓	✓	N/A	N/A	N/A	✓	✓	N/A	N/A
23	Stl. Spring Washer M12	W115251F	✓	✓	N/A	N/A	N/A	✓	✓	N/A	N/A
24	Stl. Plain Washer M12	W115050F	✓	✓	N/A	N/A	N/A	✓	✓	N/A	N/A
25	Stl. Hex Nut M12	N115100F	✓	✓	N/A	N/A	N/A	✓	✓	N/A	N/A
26	O-Ring	S211190P	✓	✓	S211250P	S211250P	S211250P	✓	✓	S211250P	S211250P

Parts List

Macerator Parts List (180mm)

	Description	M1 8001	M1 8002	M1 8003	M1 8004	M1 8005	M1 8006	M1 8007	M1 8008	M1 8013	M1 8014
27	Hex. Soc Set Screw	G11101F	✓	✓	G111061F	G111061F	G111061F	✓	✓	G111061F	G111061F
28	Hex C/sunk Plug	P130332F	✓	✓	✓	✓	✓	✓	✓	✓	✓
29	Window Nut	W40537	✓	✓	✓	✓	✓	✓	✓	✓	✓
30	Rect. Parallel Key	K100830P	✓	✓	✓	✓	✓	✓	✓	✓	✓
31	Motor Adaptor Plate	N/A	N/A	N/A	MB M180 5000	✓	✓	N/A	N/A	✓	✓
32	Hex. Hd Screw	N/A	N/A	N/A	F115282F	✓	✓	N/A	N/A	✓	✓
33	Stl. Spring Washer	N/A	N/A	N/A	W115251F	✓	✓	N/A	N/A	✓	✓
34	Stl. Plain Washer	N/A	N/A	N/A	W115050F	W115050F	W115050F	N/A	N/A	W115050F	W115050F
35	Adaptor Ring	N/A	N/A	N/A	N/A	N/A	N/A	MB M180 5100	MB M180 5150	✓	MB M180 5150
36	Adaptor Gasket	N/A	N/A	N/A	N/A	N/A	N/A	OO M180 2050	OO M180 2100	✓	MB M180 2100
37	Soc Cap H.D. Screw	N/A	N/A	N/A	N/A	N/A	N/A	A114242F	✓	✓	✓
38	Hex H.D. Screw	N/A	N/A	N/A	N/A	N/A	N/A	F115332F	S144292F	F115332F	✓
39	Stl. Plain Washer	N/A	N/A	N/A	N/A	N/A	N/A	W115050F	W114050F	W115050F	✓
40	Stl. Spring Washer	N/A	N/A	N/A	N/A	N/A	N/A	W115251F	W114251F	W115251F	✓
41	Stl. Hex Nut	N/A	N/A	N/A	N/A	N/A	N/A	N115100F	N114100F	N115700F	✓

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