MC
OPERATOR'S MANUAL
VERSION 2

This Operating Manual Contains Important Safety Information
Read Thoroughly Before First Use.
Make Available To All Machine Operators.

Constant Systems Ltd
Low March Daventry Northants NN11 4SD
United Kingdom

Tel: +44 (0) 1327 314146

E–mail: support@constantsystems.com
Website: www.constantsystems.com

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REVISION 03

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1.0 INTRODUCTION

1.1 What is Cell Disruption?

Cell Disruptor Systems are designed to selectively break the cell wall allowing intracellular components to be released and harvested. This is particularly for use in Pharmaceutical and Biotechnology companies, Universities, research institutes and agencies.

Cell Disruption is achieved through the use of high pressure which accelerates a sample through a small fixed orifice at high velocity under controlled, contained and repeatable conditions. There are three stages to the effective cell disruption:

1. The operator manually loads the cell disrupter with the sample.

2. The Piston then compresses the sample at a constant pressure, accelerating it through the small fixed orifice at high velocity. The acceleration of the product through this fixed orifice causes cell disruption.

3. When the Jet of sample containing disrupted cells hits the Cup Lid, it is spread radially, then vertically down the cooled heat exchange surface of the Cup. The sample is then contained within the Cup for collection by the user.

1.2 Using the machine

The MC cell disruptor will enable you to work with quantities of material between 1ml and 40mls, depending on the type of Cup being used. On the first stroke, there may be approximately 2mls dead loss with the MC Cup.

The MC cell disruptor will process material in fluid as well as non-flowing samples such as cell paste, plant leaves and tissue.

The equipment is used for bacteria, fungi, yeast, algae, plant and mammalian cells to disrupt cells, extract DNA, manipulate DNA and break down tissue. It is quick and easy to use, contained during operation and simple to clean.

1.3 Using this manual

Before proceeding with installation, please take time to read the information contained in this manual. It contains important safety, operational and maintenance information to help ensure that you get the best performance and long life from the machine.

Operators are required to formally assess any and all risks associated with the processing of any sample materials prior to commencing work and are responsible for their own safety in this respect.

2.0 ALERTS

In accord with common practice, three types of alert are used in this document:

1. Warning (failure to observe could cause death or injury)
2. Caution (failure to observe could cause damage to the equipment or process)
3. Note (hint about how to make the work easier etc.) Each alert declares which type it is.

WARNING - Indicates a potentially hazardous situation, risk of electric shock, which if not avoided could result in death or serious injury (Front panel & Back panel)

WARNING - Indicates a potentially hazardous situation, in this case a biohazard, which if not avoided could result in death or serious injury (Disruption Head)

WARNING - Surface temperature could rise to a potentially hazardous situation (Disruption Head)

WARNING - Potential hazard of fire or combustion (Oil Tank)

CAUTION - Indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury (Control Box)

3.0 SAFETY CONSIDERATIONS

Various safety warning signs are attached to the machine. You must consult this documentation to read about the hazard in question, particularly where the (exclamation mark in triangle) appears.

CAUTION - Be aware that power should be switched off when dismantling parts of the disruption head for maintenance (cleaning). Instructions to switch on the machine and later off again where this is necessary are included in the text.

CAUTION - If any work which involves dismantling any of the disruption head is to be done on the machine, the electrical supply must be isolated from the mains supply.

WARNING - If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CAUTION - The loading and unloading of product into and from the machine is the responsibility of the user and the user is responsible for any controls which may be required to ensure that this loading and unloading is done safely and without undue risk to the health and safety of the user and/or other persons and/or the environment.

CAUTION – This equipment contains 10 litres of ISO32 Grade Hydraulic Oil in a steel reservoir.

CAUTION – This equipment is provided with a detachable mains power cord set must be replaced with the same type of cable and cord set.

4.0 INSTALLATION

4.1 Environment

The machine is suitable only for indoor use in a clean, dry, dust and smoke free environment between +4°C and +40°C. An altitude of up to 2000M is suitable with maximum relative humidity of 80% up to +31°C, decreasing linearly to 50% at +40°C.

4.2 Location

WARNING – Do not locate the equipment in any way that makes it difficult to access the power outlet utilised by the equipment.

The machine must be set on a flat and level surface, positioned to allow access to the power inlet and a minimum space of 60mm each side for ventilation.

4.3 Electrical

Single Phase equipment is provided with a molded cord set appropriate for the destination country's mains supply.

USA and CANADA Single Phase 110V 60HZ

All OS models OS/BA (See rating data plate on side of control box) are supplied with a power cable.

EUROPE / REST OF THE WORLD Single Phase 230V 50HZ

All OS models OS/AA (Europe) (See rating data plate on side on control box) are supplied with a power cable.

4.4 Lifting equipment

Suitable lifting equipment must be used when moving the Cell disruptor.

5.0 VAPOUR AND PRODUCT CONTAINMENT

The liberation of vapours and product into the atmosphere is prevented by internal sealing.

The HP Seal (DRG02701) is subjected to high pressure, and must not leak in order to process the sample.

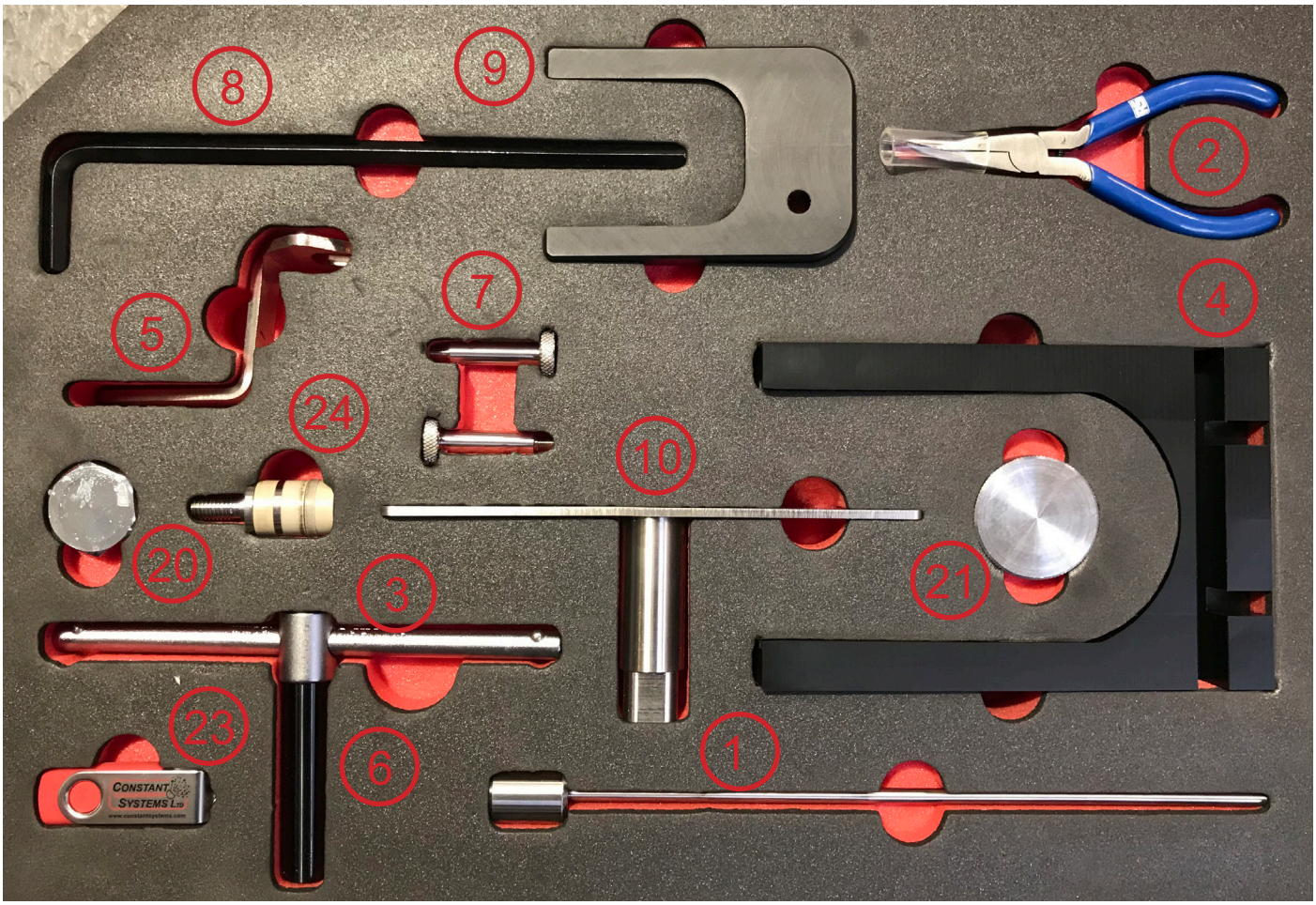
In the event of HP Seal (DRG02701) leaking, the product will pass through a Leak Port and will be noticeable if the leak is significant.

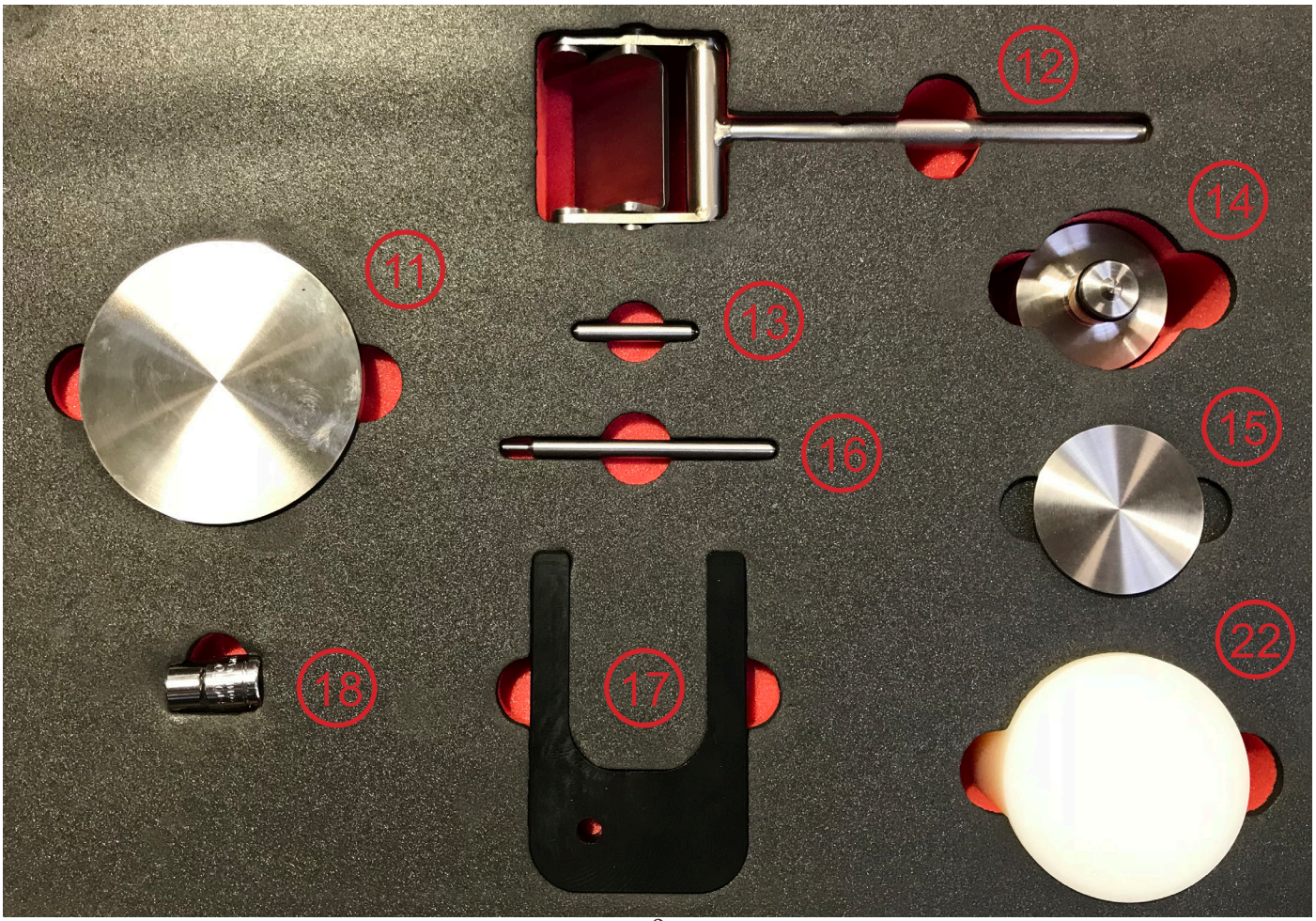
WARNING – If the sample is pathogenic, any vapour released must be contained and directed to a kill tank.

6.0 GLOSSARY OF TERMS

Vapour	That part of the disrupted product that is in the form a gas.
Autoclaving	The process of cleaning/sterilising by application of compressed steam at a temperature of approximately 121°C.
Body	The outer casing of the disruption assembly which must be in place when a disruption cycle is taking place.
Cup	The container which collects the disrupted product.
Cycle	See Disruption Cycle
Dead Loss	The term used in the industry to describe the remnant which is left unprocessed.
Disruption Cycle	The process which begins when the probe is pressed and ends when the machine fires (audibly). Usually approximately 20 seconds.
Disruption Pressure	The pressure at which the sample is forced through the jet. This pressure persists for only a few seconds in each disruption cycle.
HP Seal	High pressure seal which forms the bottom of the cavity which holds the sample. It is driven upwards during a disruption cycle by the piston.
Input Cavity	A cylindrical cavity formed by the inside surface of the cylinder and the HP Seal at the bottom.
Jet	A sub-assembly in which a sapphire with a drilled hole of 0.18mm dia. is mounted in a stainless steel holder. The jet is fitted into the bottom of the cup.
Piston	The part which drives the HP Seal upwards to compress the sample during the disruption cycle.
Pressure	The word ‘pressure’ can have different meanings in this context. For operational use it is always qualified by the term ‘Disruption Pressure’
Pressure Adjustment Knob	The circular knob on the front of the cabinet which adjusts the Disruption Pressure.
Probe	The rod which passes through the body to illuminate the green ring light.
Piston Down (Amber)	The ‘’PISTON DOWN’’ button provides a means of moving the piston, under manual control, to the bottom of its travel, usually for maintenance. The piston moves while the button is held pressed. When the piston has reached the bottom, the amber ring light illuminates, and the piston stops moving
Piston Up (Blue)	The ‘PISTON UP’ button provides a means of moving the piston, under manual control, to the top of its travel, usually for maintenance. The piston moves while the button is held pressed. It is used only when the HP Seal is visible. When the piston has reached the top, the blue light illuminates, and the piston automatically stops moving.
Start (Green)	The green ‘Start’ button starts the disruption cycle. The Green light comes on when the safety probe is inserted.

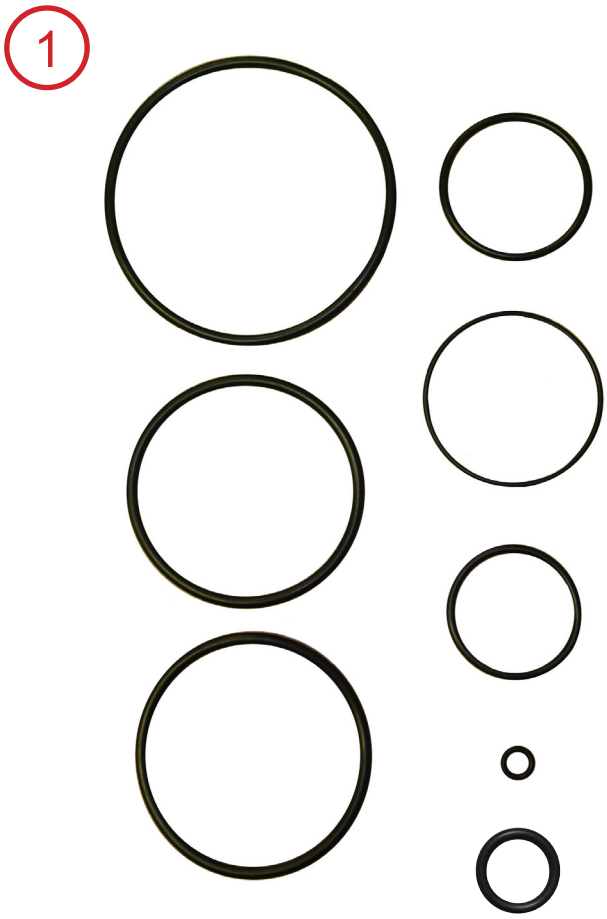
7.0 MACHINE TOOLBOX:





ITEM	DESCRIPTION	PART NUMBER
	TOOLS	
1	Operating Probe	DRG03026
2	Jet Removal Pliers	BOF00153
3	3/8” Drive Tee Bar	BOF00229
4	Multi-Tool	DRG02931
5	Bent Piston Spanner	DRG01313
6	11mm A/F Extended Socket	DRG03027
7	Cylinder Bolts x 2	DRG02942
8	8mm A/F Hexagon Wrench	BOF00662
9	Inner Cup Lid Removal Tool	DRG02966
10	Extended Square Drive Socket	DRG03025
11	Multi-Cycle Solid Lid	DRG03020
12	One Shot Cup Removal Tool	DRG01324
13	One Shot Anti-Foam Pin	DRG02900
14	One Shot Cup	DRG02939
15	One Shot Cup Lid	DRG01110
16	One Shot Jet Removal Tool	DRG02839
17	One Shot Cup Lid Removal Tool	DRG02935
18	11mm A/F Short Socket	BOF00232
19	Filler Breather	BOF00899
20	1/2 “ Blank	BOF00832
21	Pressure Adjust Knob	BOF01338
22	One Shot Space Reducing Block	DRG03038
23	USB-Memory Stick	BOF01441
24	40K HP Seal	DRG02701

7.2 One-Shot:



ITEM	DESCRIPTION	PART NUMBER
O-RINGS LIST: DRG01486		
1	Inner Cup O-Ring	BOF01569
1	Inner Cup Lid O-Ring	BOF01570
1	One Shot Cup Lid O-Ring	BOF00078
1	Seal Housing O-Ring	BOF00186
1	Jet Retainer O-Ring	BOF00221
1	Outer Cup Lid O-Ring	BOF00653
1	Multi-Cycle Solid Lid O-ring	BOF00653
1	2 x Outer Cup O-Ring	BOF00073

8.0 OPERATION

CAUTION – Continuous intermittent operation (pressing the up / down or start / stop buttons) can cause damage to the motor capacitors. This type of activity should be limited to 20 start / stops per hour.

8.1 Overview of Operation

As the name implies, the “MC” machine requires all the samples to be loaded and removed from the machine individually.

An overview of the operational sequence would be as follows:-

1. Ensure that the Amber LED ring light is illuminated (If the LED is not illuminated press and hold the down button).
2. Insert the Inner Cup into the Outer Cup (If multiple passes is not required).
3.Pipette the sample into the large Outer Cup.
4. Fit the Inner Cup Lid & Outer Cup Lid.
5. Fit the Main Lid and rotate to lock.
6. Insert the MC Probe.
7. Adjust the pressure as required using the Pressure Adjust Knob.
8. Ensure the Green LED ring light is illuminated and press the Green button.
9. Once the MC has stroked, remove the Probe and remove the Main Lid. The sample can be collected from the Inner Cup.

8.2 MC Detailed Sequence of Operation.

This is a complete list of all operations although the ones that are indicated as “Start Only” (or similar) will not need to be repeated for every sample if the machine is in constant use.

1. Switch the machine ON (“Start Only”)

2. Remove the Main Lid (this is fitted in place when the machine is not in use to prevent foreign particles falling into the Outer Cup)

3. (Only if necessary) The Dead Loss remains in the input cavity after the disruption cycle. If it is important that the input cavity is cleaned before the next disruption, follow the procedure entitled “Removal of the HP Seal” on P36-P37. Clean the HP Seal, HP Cylinder,
Outer Cup and Inner Cup.

4. Ensure the Amber light is ON. (Press and hold the down button until the Amber light does come ON).

CAUTION - It is the responsibility of the user to ensure the cleanliness of the input cavity, the cup and the lid. Observe any local or in-house regulations concerning cleanliness and autoclave or sterilise the HP Seal, cylinder, cup and lid as necessary.

5. (Only if necessary) Adjust the pressure using the Pressure Adjust Knob on the front of the machine.

6. Pipette an appropriate volume of the sample (Up to 40mls) into the Outer Cup in the top of the Cylinder.

7. Fit both Cup lids (Outer & Inner).

8. Place the Main Lid over the Spacer & Cups then lower it down. Rotate it until it drops to the surface where it will rest and rotate it again to align the Probe hole. This last step is necessary to be able to insert the Probe.

9. Insert the Probe and ensure the Green LED ring light illuminates.

10. Press the Green button once and release to start the cycle. The machine will build up pressure and stroke 6 times, after the 6th stroke the machine will automatically stop.

11. Remove the Probe. The Piston will have automatically returned to its lowest point and the disruption cycles are complete.

12. Remove the Main Lid by rotating it and lifting it clear of the Spacer & Cups.

13. Remove the Inner Cup from the Outer Cup.

14. Remove the Lid from the Inner Cup using the Inner Cup Lid removal tool. The disrupted sample can now be removed from the Cup.

8.3. Overview of Operation

An overview of the operational sequence would be as follows:-

1. Ensure that the Amber LED ring light is illuminated (If the LED is not illuminated press and hold the down button).
2. Pipette the sample into the top of the HP Cylinder.
3. Fit the Cup (with the anti-foam plunger in place, and the Lid on) into the top of the Cylinder to collect the output.
4. Place the space reducing block on top of the one cycle cup
5. Fit the Main Lid and rotate to lock.
6. Insert the MC Probe.
7. Adjust the pressure as required using the Pressure Adjust Knob.
8. Ensure the Green LED ring light is illuminated and press the Green button.
9. Once the MC machine has stroked, remove the Probe and remove the Main Lid. The sample can be collected from the One-Cycle Cup.

8.4 One-Cycle Detailed Sequence of Operation.

This is a complete list of all operations although the ones that are indicated as “Start Only” (or similar) will not need to be repeated for every sample if the machine is in constant use.

1. Switch the machine ON (“Start Only”)

2. Remove the Main Lid (this is fitted in place when the machine is not in use to prevent foreign particles falling into the Cylinder) and space reducing block.

3. (Only if necessary) The Dead Loss remains in the input cavity after the disruption cycle. If it is important that the input cavity is cleaned before the next disruption, follow the procedure entitled “Removal of the HP Seal” on page37 - page39.
Clean the HP Seal, Cylinder, Cup and Lid and anti-foam pin.

4. Ensure the Amber light is ON. (Press the down button until the Amber light does come ON).

CAUTION - It is the responsibility of the user to ensure the cleanliness of the input cavity, the cup and the lid. Observe any local or in-house regulations concerning cleanliness and autoclave or sterilise the HP Seal, cylinder, cup and lid as necessary.

5. (Only if necessary) Adjust the pressure using the Pressure Adjust Knob on the front of the machine.

6. Pipette an appropriate volume of the sample into the open top of the Cylinder. Ensure that the chamber is not overfilled as this would prevent the One-Shot Cup and Lid from fitting properly. e.g. 8mls for a 40KPSI head.

7. Fit the Cup (with the anti-foam plunger in place, and the Cup Lid on) into the top of the Cylinder to collect the output.

8. Place the space reducing block on top of the one cycle cup (This stops the cup from lifting up during the cycle process).

CAUTION – Do not fit the cup without the lid and anti-foam pin.

9. Place the Main Lid over the Spacer & Cup then lower it down. Rotate it until it drops to the surface where it will rest and rotate it again to align the Probe hole.

10. Insert the Probe and ensure the green ring light illuminates.

11. Press the Green button once and release to start the cycle. The machine will build up pressure and stroke 6 times, when using the One –Shot Cup after the first stroke the probe can be removed and the machine will stop.

12. Remove the Probe. The Piston will have automatically returned to its lowest point and the disruption cycle is complete.

13. Remove the Main Lid by rotating it and lifting it clear of the Spacer & Cup.

14. Remove the space reducing block

15. Remove the Cup from the top of the Cylinder using the One-Shot Cup Removal Tool.

16. Remove the Lid from the Cup using the One-Shot Cup Lid Removal Tool. The disrupted sample can now be removed from the Cup. Be careful not to let the anti-foam pin fall out.

9.0 PRESSURE DISPLAY METER & START BUTTON

FIGURE 1

Pressure Display Meter & Start Button

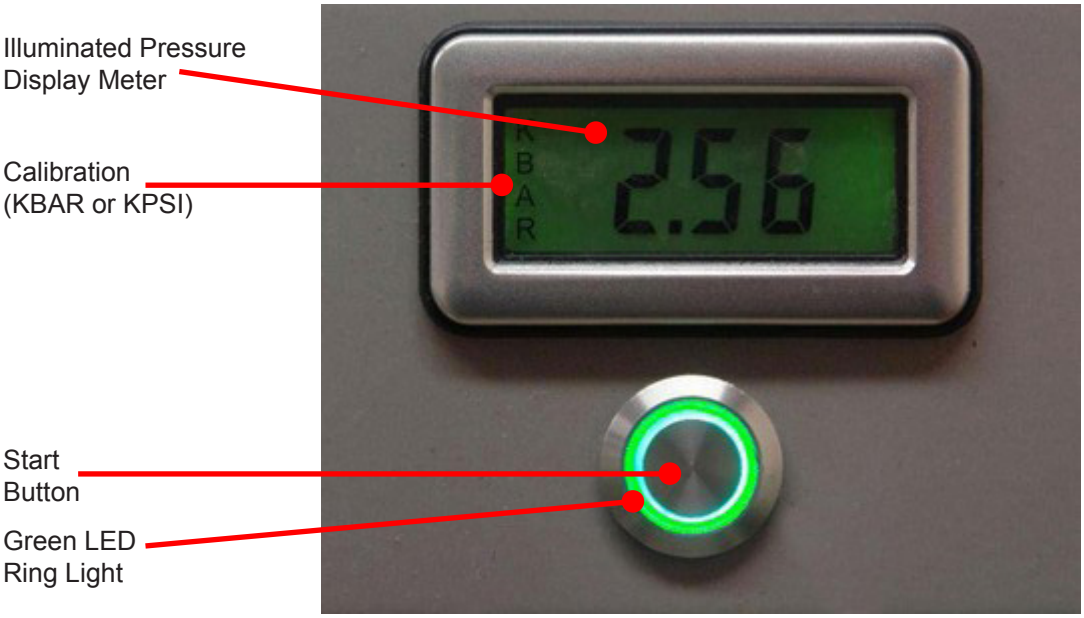
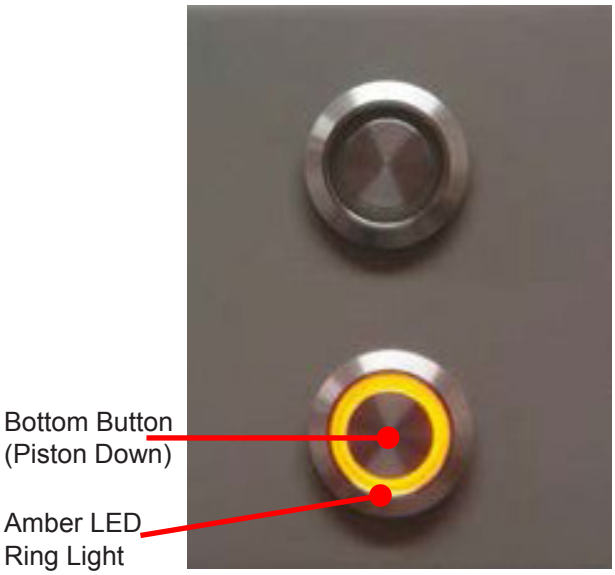


FIGURE 2

FIGURE 3



10.0 MAINTENANCE

All the following maintenance procedures are routinely carried out at the recommended 6 or 12 monthly service of the machine. Additionally any of them can be carried out on site for cleaning and decontamination purposes (for example when changing samples).

10.1 To Remove the HP Cylinder

1.Ensure the Probe is not in the machine.

2. Remove the Main Lid.

3. At the end of the last disruption cycle the HP Piston will have returned to the bottom of its travel. Press and hold the Piston Up button (Blue LED), the HP Piston will lift the HP Cylinder & Outer Cup up to the top of its travel and the blue LED will illuminate.

4. Insert the Multi-Tool (DRG02931) then press and hold the Piston Down button until the Amber LED illuminates.

5. The Outer Cup is now free to be lifted from the machine.

6. The HP Piston will have returned to the bottom of its travel. Press and hold the Piston Up button (Blue LED), the HP Piston will lift the HP Cylinder up to the top of its travel and the blue LED will illuminate.

7. Screw the HP Cylinder Bolts (DRG02942) into the top of the HP Cylinder.

8. Slide the Multi-Tool (DRG02931) over the HP Cylinder Bolts (DRG02942) then press and hold the Piston Down button until the Amber LED illuminates.

9. This is illustrated on page34 - page35.

NOTE: When the HP Piston is at the top of its stroke, the Piston Down button has to be pressed twice before the HP Piston will move down.

10. This will pull the HP Piston downwards out of the Cylinder which can then be lifted away from the machine.

NOTE: The machine will stop automatically once the bottom proximity sensor is activated.

CAUTION - Take great care not to have fingers near to the HP Cylinder or Seal Housing.

10.2 To Remove the HP Seal

1. When the HP Cylinder has been removed (Follow instructions in 10.1), loosen and remove the 8 bolts securing the Spacer to the Lower Seal Housing with an 8mm Hexagon Wrench (BOF00662 provided). Lift the Spacer off the Lower Seal Housing by hand.

2. The HP Seal (DRG02701) and HP Piston (DRG01166) are visible. Drive the HP Piston up using the Piston Up button. Release the button when the blue LED ring light illuminates. (The machine will stop automatically).

3. Remove the split PEEK caps from the top of the HP Seal (DRG02701).

4. Fit the 14mm Bent Spanner (DRG01313) on the flats on the HP Piston shaft.
You will later need to hold this spanner to prevent the HP Piston shaft from rotating.

5. The T-bar (BOF00229) and 11mm A/F socket (DRG03027) can now be fitted on to the HP Seal hexagonal bolt, holding the 14mm Bent Spanner (DRG01313) turn the T-bar anti-clockwise to unscrew the HP Seal (DRG02701) from the HP Piston shaft. When the HP Seal (DRG02701) is loose re-fit the split PEEK caps (to keep safely together)

6. The HP Seal (DRG02701) can now be removed from the Piston shaft.

7. The HP Seal (DRG02701) can now be cleaned, sterilised or renewed according to requirements.

NOTE: Be careful not to let the O-ring & PTFE Glass-filled ring come off.

10.3 To Replace the HP Seal

1. Ensure the mating faces of the HP Piston and the underside of the HP Seal (DRG02701) are clean and dry.

2. Screw the HP Seal (DRG02701) back into the HP Piston by hand until the faces meet.

3. Carefully remove the HP Seal (DRG02701) split PEEK caps.

4. Fit the 14mm Bent Spanner (DRG01313) onto the flats on the HP Piston. Whilst holding the 14mm Bent Spanner (DRG01313), use the 11mm A/F socket (DRG03027) and T-bar (BOF00229) to tighten the HP Seal (DRG02701) securely.

5. Remove 14mm Bent Spanner (DRG01313) and 11mm A/F socket (DRG03027) and T bar (BOF00229).

6. Re-fit the split PEEK caps.

10.4 MC Jet

The Jet (DRG03002) consists of a 0.18mm diameter hole machined into a Stainless Steel body, which is mounted in stainless steel holder. This can wear out after a period of time, and becomes blocked only when solid matter (for example glass shards or particles of plastic) obstruct or partially obstruct the orifice by becoming lodged in it. A blocked Jet (DRG03002) must be replaced with a new one.

Blocked Jet – Maximum Pressure:

The Jet (DRG03002) may be cleared by operating the machine at maximum pressure (40KPSI) using water. If the blockage is a glutinous material, the high pressure may blow it through to unblock the Jet (DRG03002). If this does not work, leave the system for 10-15 minutes to allow the pressure to dissipate.

Sonication:

If operating the machine at maximum pressure does not unblock the Jet (DRG03002), follow the below instructions.

1. Remove the:

- Probe (DRG03026).
- Main Lid (DRG02939).
- Outer Cup Lid (DRG03020).
- Inner Cup (DRG02964).
- Inner Cup Lid (DRG02965).

2. The Jet Retainer is now visible in the Outer Cup.

3. Place the Extended Square drive socket (DRG03025) over the Jet Retainer (This will locate into the square cut out in the bottom of the Cup) fit the 11mm A/F Socket (DRG03027) & T-bar (BOF00229) into the Extended Square drive socket (DRG03025). Whilst holding the Extended Square drive socket (DRG03025) turn the 11mm A/F socket (DRG03027) & T-bar (BOF00229) anti clockwise, this will loosen the Jet Retainer.

4. Unscrew the Jet Retainer from the Outer Cup, using the Jet removal Pliers (BOF00153) remove the Jet (DRG03002) from the Outer Cup and decontaminate the parts as required.

5. Place the Jet (DRG03002) into a container with liquid and sonicate the Jet (DRG03002). If this does not unblock the Jet (DRG03002) then it must be changed.

NOTE: A blocked Jet must be replaced with a new one.

10.5 One-Cycle Jet

The Jet (DRG03002) consists of a 0.18mm diameter hole machined into a Stainless Steel body, which is mounted in stainless steel holder. This can wear out after a period of time, and becomes blocked only when solid matter (for example glass shards or particles of plastic) obstruct or partially obstruct the orifice by becoming lodged in it.

Blocked Jet – Maximum Pressure:

The Jet (DRG03002) may be cleared by operating the machine at maximum pressure (40KPSI) using water. If the blockage is a glutinous material, the high pressure may blow it through to unblock the Jet (DRG03002). If this does not work, leave the system for 10-15 minutes to allow the pressure to dissipate.

Sonication:

If operating the machine at maximum pressure does not unblock the Jet (DRG03002), follow the below instructions.

1. Remove the safety Probe (DRG03026), Main Lid (DRG02939) and Space reducing block (DRG03038)

2. Press and hold the “Piston Down button” to lower the HP Piston (Ensure the Amber LED ring illuminates, the machine will stop automatically). Press and hold the “Piston Up button” until the Blue LED ring illuminates (The machine will stop automatically).

3. Place the One Cycle Cup removal tool (DRG01324) in between the One Cycle Cup and HP Cylinder’.

4. Press and hold the “Piston Down button” to lower the HP Piston (Ensure the Amber LED ring illuminates, the machine will stop automatically).

5. The One Cycle Cup removal tool (DRG01324) can now be lifted away from the machine.

6. Using the One Cycle Lid removal tool (DRG02935) push this along the top of the Cup assembly to remove the lid.

7. The One Cycle Cup and Lid may need to be de-contaminated.

8. Along with the Cup Lid (DRG01110) and Anti-Foam Pin (DRG02900). Place the One Cycle Cup in a container with liquid and sonicate the One Cycle Cup and Jet (DRG03002). If this does not unblock the Jet (DRG03002) then it must be changed.

NOTE: A blocked Jet must be replaced with a new one.

Removal of the One-Cycle Jet:

1. Place the One Cycle Lid removal Tool (DRG02966) on a firm workbench, preferably near a support (possibly near the corner).

2. Place the One Cycle Cup on the One Cycle Cup Lid removal tool (DRG02966) so that the Jet (DRG03002) fits into the hole.

3. Insert the Jet Removal Tool (DRG02839) into the center tube in the One Cycle Cup and tap it with a nylon or brass mal- let. Tap it hard enough to push out the Jet.

NOTE: The Jet is an interference-fit in the base of the Stainless Steel Cup.

10.6 Fit a New Jet in a One Cycle Cup

1. Place the One Cycle Cup with the stem facing upwards on the corner of a strong bench.

2. Place the new Jet (DRG03002) part way into the angled hole in the base of the One Cycle Cup. It will fit easily for a short distance.

3. Using the One Cycle Cup Lid removal tool (DRG02966) with angled hole in the side, place this over the Jet (DRG03002), and tap the One Cycle Cup Lid removal tool (DRG02966) as hard as necessary to drive the Jet (DRG03002) into the base of the stem on the One Cycle Cup. It should go fully into the Cup so that no part of the Jet (DRG03002) shank is visible and only the cone angle is visible.

11.0 SPECIFICATION FOR ONE SHOT CELL DISRUPTOR

The One Shot machine incorporates our unique disruption head and hydraulic operating and control components. The disruptor head is mounted in steel tray to contain any spillage. It is easily dismantled for manual cleaning and pre-cooling. It also allows loading of solid sample, cell paste or suspended sample.

QUANTITIES	
Power Rating	**Max Pressure Rating**
0.75KW	**40K PSI**
Volume	**1ml - 40mls**
PROCESS TIME:	Manual loading of each shot takes approx. 2 minutes. Cycle takes approx. 30 seconds per stroke.
POWER REQUIRED:	Single phase.
COOLING:	No provision is made for cooling but the removable parts can be pre-cooled so as to use the cooling capacity of the metal parts.
CONTROL SYSTEM:	Pressure control allows pressure to be accurately pre-set before starting cycle Single push button control of disruption cycle.
SAFETY:	Disruption cycle inactivated if head assembled incorrectly. Secondary pressure containment.
MAINTENANCE:	Jet and Seal easily changed by non-technical personnel with tools supplied.
OPTIONS:	Stainless steel trolley/stand.
SIZE W/D/H/:	510mm, 475mm, 515mm.
MAINTENANCE:	Jet and Seal easily changed by non-technical personnel with tools supplied.
HYDRAULIC OIL: ISO32	Store under cover away from heat and a source of ignition. Wear gloves and eye protection when handling or filling reservoir. Ensure no oil spills on to electrical equipment. Clean up any other spills immediately.
EXTRA OPTIONS:	Stainless Steel Trolley.

12.0 TROUBLESHOOTING FOR OPERATORS

12.1 No power (e.g. digital panel meter does not illuminate and power on light not showing)

- Not plugged in
- Not switched on
- Fuse faulty in the plug
- The circuit breaker has tripped out
- The motor overload has tripped
- Remove the back panel to access 10amp fuse
- Check the fuse near to the power socket of the machine
- Contact Service Agent

12.2 Digital display does not illuminate

- Check power is applied to machine
- 24V DC power supply failed
- Contact Service Agent

12.3 Pressure control knob does not change digital display

- Pressure adjust knob loose on spindle
- Control potentiometer faulty
- 24V Dc power supply faulty
- Display faulty
- Contact Service Agent

12.4 Pressure cycle not completed within 50 seconds of machine being started.

- Blocked Jet - Increase pressure setting to clear Jet, if this does not help:
- Has the Jet, Anti-Foam pin and Cup been assembled correctly?
- Is the Amber & Green LED ring ON? – Contact service agent
- Solenoid faulty – Contact service agent
- Solenoid valve faulty– Contact service agent

12.5 Sample present under Cup or showing at the leak Port

- Replace the BOF00073 O-Ring on the One Cycle Cup.

NOTE: To identify the cause, if the sample is present between the cup and the top of the HP Cylinder, then Replace the HP O-Ring on the One Cycle Cup. Also inspect the Cylinder bore for wear and damage. If the sample is showing in the Lower Seal Housing then replace the HP Seal.

12.6 No throughput of sample and stroke does not complete.

- Try increasing the pressure setting, if this does not help, replace the Jet as it may be blocked.

12.7 Sample showing in lower seal housing leak ports

- Check the HP Cylinder or HP Seal assembly
- No output of sample and the stroke does not complete
- Try increasing the pressure setting, if this does not help, replace the Jet as it may be blocked causing Seals to Leak.
- Contact Service Agent

13.0 ASSEMBLY PARTS

PROBE Assembly (DRG03026)

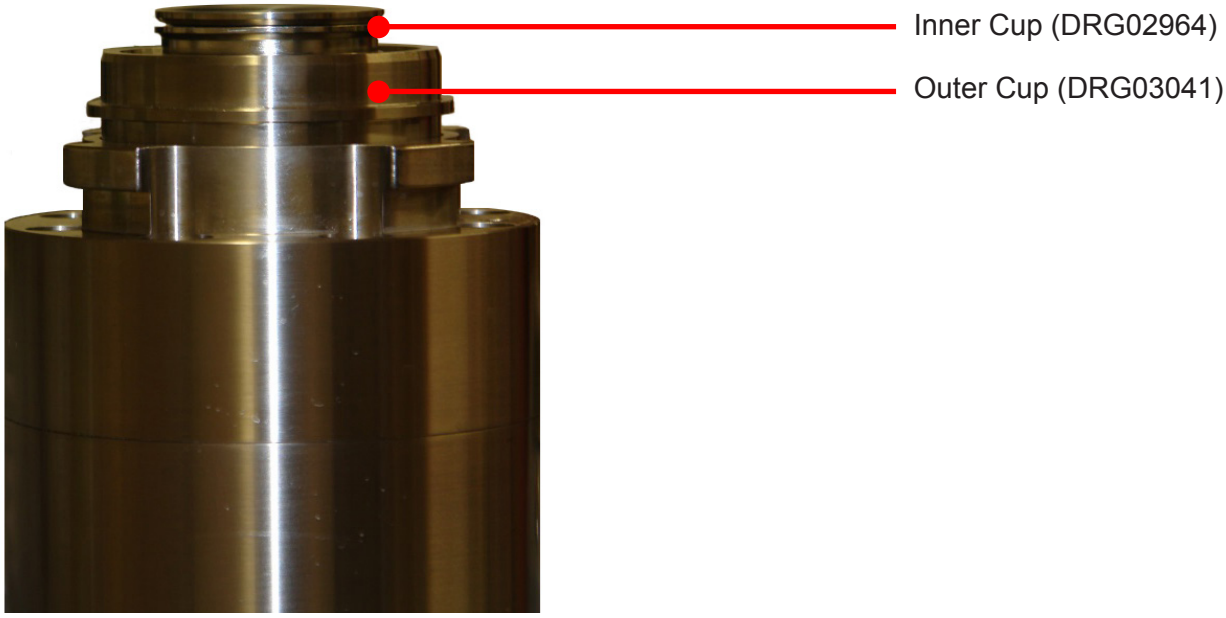
MC Main Lid (DRG02939)

Spacer (DRG02941)

Lower Seal Housing (DRG00831)

Lift and remove Probe.

Twist the Main Lid anti-clockwise to remove.


Inner Cup (DRG02964)
Outer Cup (DRG03041)

13.1 OPERATION – Loading the Sample.

Remove the Probe (DRG03026) and rotate the Main Lid (DRG02939) then lift off of machine with the handle.

NOTE: The main Lid (DRG02816) may be heavy.

Pull the Outer Cup Lid (DRG02965) up and off the assembly..

Pipette the sample into the Outer Cup (DRG03041).

NOTE: maximum sample input is 40mL
The inner cup (DRG02964) must be empty prior to loading sample into the outercup.

Push the Outer Cup Lid (DRG02965) into the Outer Cup (DRG03041).

NOTE: Ensure the Inner Cup (DRG02964) & Inner Cup Lid (DRG02965) are seated correctly on to the Jet Retainer (DRG03022).

Place the Main Lid (DRG02929) over the Cup assembly, then rotate clockwise, locking the disruption.

Place the Probe (DRG03026) into the Probe hole.

Once the Main Lid (DRG02939) and Probe (DRG03026) has been assembled, set the required pressure with the Pressure Adjust Knob. Press the Green start button. The machine will stroke 6 times.

13.2 OPERATION – Removing the Sample.

Remove the Probe (DRG03026) and rotate the Main Lid (DRG02816) then lift off of machine with the handle.

NOTE: The main Lid (DRG02939) may be heavy.

Pull the Outer Cup Lid (DRG02965) up and off the assembly.

Slide the Multi Cycle Inner Cup Lid removal tool (DRG02966) in between the Multi Cycle Inner Cup (DRG02964) & the Multi Cycle Inner Cup Lid (DRG02965), this will remove the Cup Lid from the Cup. Place the Multi Cycle Inner Cup Lid (DRG02965) & Multi Cycle Inner Cup Lid Removal Tool (DRG02966) to one side.

Pipette the sample out of the Inner Cup (DRG02964)

Alternatively, the Inner Cup (DRG02964) can be pulled out hand.

NOTE: The inner cup has a maximum capacity of 40mL and must be emptied at the end of each process.

13.3 OPERATION – Jet Change

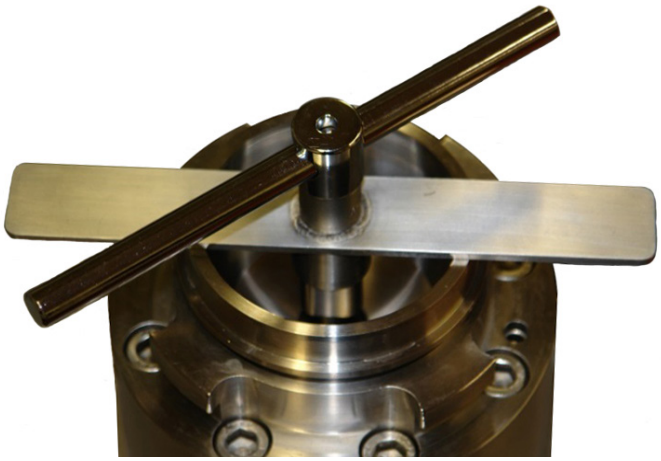
Remove the Probe (DRG03026) and rotate the Main Lid (DRG02939) then lift off of machine with the handle.

NOTE: The main Lid (DRG02816) may be heavy.

Pull the Outer Cup Lid (DRG02965) up and off the assembly.

Lift the Inner Cup (DRG02964) out of the Outer Cup (DRG03041) by hand.

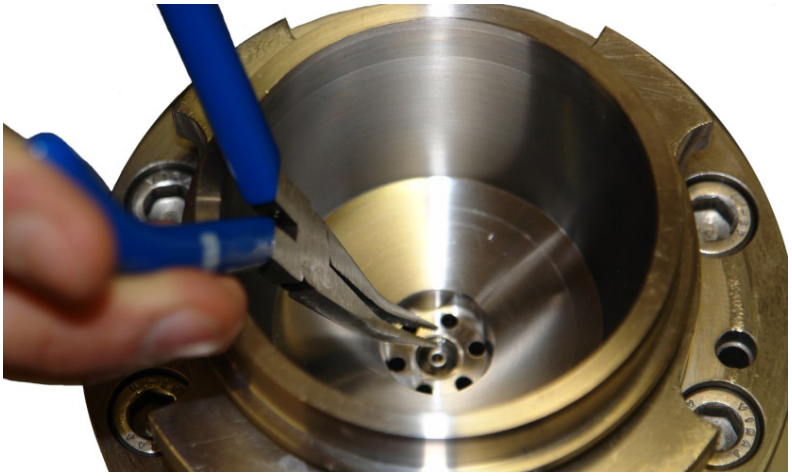
The Jet Retainer (DRG03022) is now visible.



Using the:
• 11 A/F Socket (DRG03027)
• T-Bar (BOF00229).
• Extended Square Drive Socket (DRG03025).

Hold the Extended Square Drive Socket (DRG03025) then turn the 11 A/F Socket & T-bar (BOF00229) anti-clockwise to loosen the Jet Retainer (DRG03022).

NOTE: This will be tight due to the Jet (DRG03002) sealing inside the Outer Cup (DRG03041).



Using the Jet Removal Pliers (BOF00153) remove the Jet (DRG03002) from the Outer Cup (DRG03041).

NOTE: The Jet (DRG03002) can now be replaced or taken for sonication.

13.4 OPERATION – HP Cylinder Removal

Remove the Probe (DRG03026) and rotate the Main Lid (DRG02939) then lift off of machine with the handle.

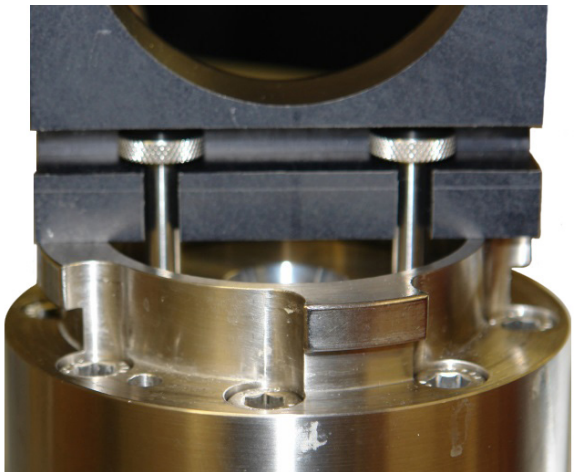
NOTE: The main Lid (DRG02816) may be heavy.

Press and hold the Up button on the control box until the Blue LED illuminates and the motor stops. This will lift the Outer Cup and HP Cylinder up.

Slide the Multi-Tool (DRG02931) in between the Outer Cup (DRG03041) and the Spacer (DRG02941) Press and hold the Down button on the control box until the Amber LED illuminates and the motor stops. The Outer Cup (DRG03041) can now be removed with the Multi-Tool (DRG02931).

Press and hold the Up button on the control box until the Blue LED illuminates and the motor stops. This will lift the HP Cylinder up.

Screw in both HP Cylinder Bolts (DRG02942) into the HP Cylinder.



Turn the Multi-Tool (DRG02931) around and slide the grooves over the HP Cylinder Bolts (DRG02942) Press and hold the Down button on the control box until the Amber LED illuminates and the motor stops. This will loosen the HP Cylinder and allow you to lift the HP Cylinder up and out of the Spacer (DRG02941).

13.5 OPERATION – HP Seal Removal

Follow the instruction for the HP Cylinder removal (See Page34 - page35).

Turning the 8mm Hexagon Wrench (BOF00662) anti-clockwise, loosen and remove the 8 Spacer (DRG02941) bolts.

Lift the Spacer (DRG02941) off the Lower Seal Housing (DRG00831) by hand.

NOTE: This may be heavy.

The HP Seal (DRG02701) is now visible.

Remove the 2 split PEEK caps from the top of the HP Seal (DRG02701).

NOTE: Keep them safe.

Wind in 1 of the 8 bolts securing the Spacer (DRG02941) to the Lower Seal Housing (DRG00831) into the Lower Seal Housing (DRG00831).

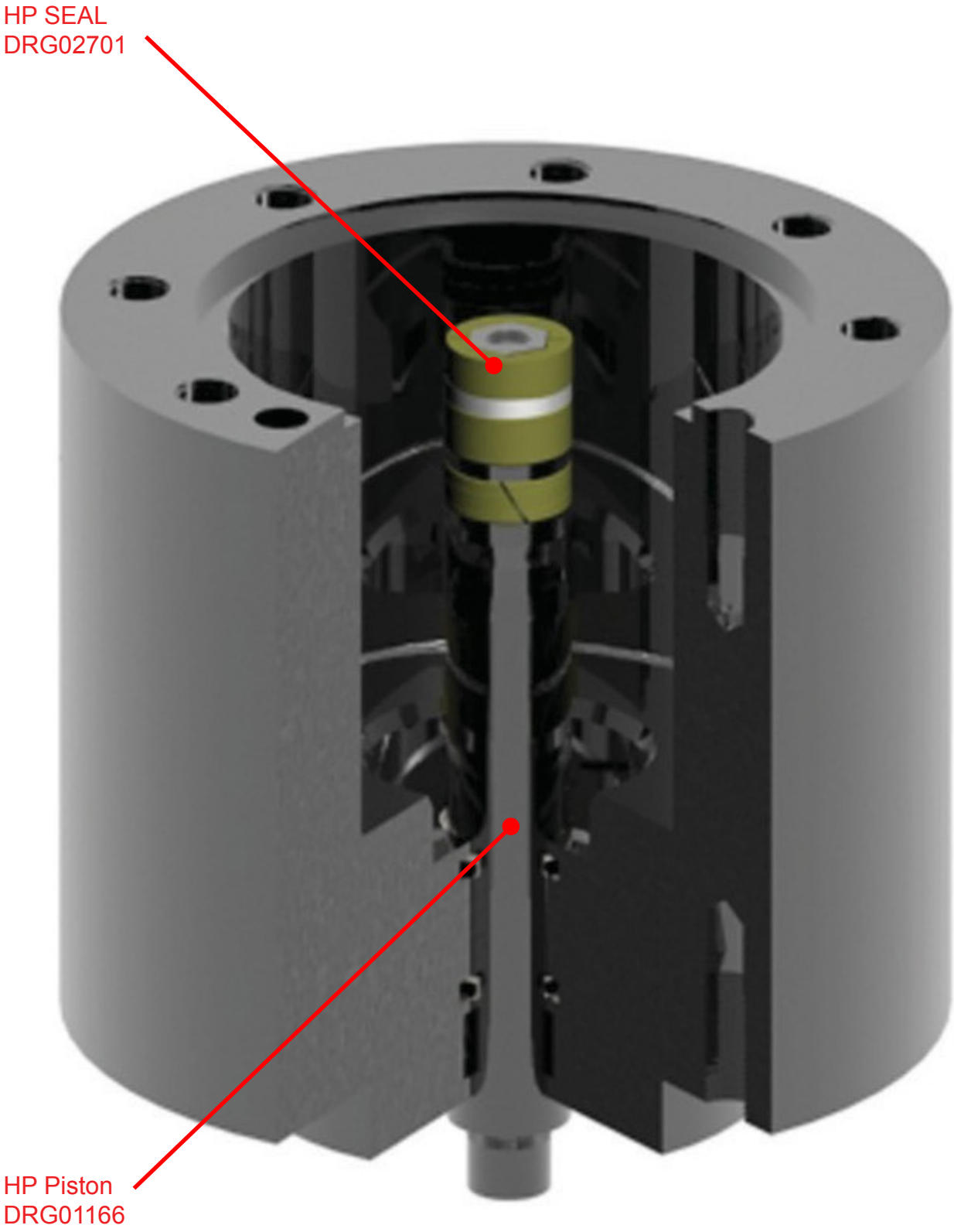
Slide the 14mm Bent Spanner (DRG01313) into the grooves of the HP Piston (DRG01166).
Place the 11 A/F Socket (BOF00232) & the T-bar (BOF00229) over the hex on the HP Seal (DRG02701), turn the 11 A/F Socket (BOF00232) anti-clockwise to loosen the HP Seal (DRG02701).

NOTE: This will be tighten to ensure no HP Seal leak occurs.

Replace the HP Seal (DRG02701) with a new.

Turn the 14mm Bent Spanner (DRG01313) and HP Piston (DRG01166) clockwise until the 14mm Bent Spanner stops against the bolt.
Tighten the HP Seal (DRG02701) by turning the 11 A/F Socket clock wise.

NOTE: The HP Seal MUST be tight.


HP SEAL
DRG02701
HP Piston
DRG01166

13.6 OPERATION – Loading One Cycle Sample.

Remove the Probe (DRG03026) and rotate the Main Lid (DRG02939) then lift off of machine with the handle.

NOTE: The main Lid (DRG02939) may be heavy.

Press and hold the Up button on the control box until the Blue LED illuminates and the motor stops. This will lift the Outer Cup and HP Cylinder up.

Slide the Multi-Tool (DRG02931) in between the Outer Cup (DRG03041) and the Spacer (DRG02941) Press and hold the Down button on the control box until the Amber LED illuminates and the motor stops. The Outer Cup (DRG03041) can now be removed with the Multi-Tool (DRG02931).

Pipette the sample into the HP Cylinder (DRG03039).

NOTE: maximum sample input is 8mls.

Push the One Cycle Cup (DRG02816) into the HP Cylinder (DRG03039).

NOTE: Ensure that the Anti-Foam Pin (DRG02930) is inserted into the One Cycle Cup (DRG02816) and the One Cycle Cup Lid (DRG01110) is pushed onto the Cup.

Place the Main Lid (DRG02929) over the One Cycle Cup assembly, then rotate clockwise, locking the disruption.
Place the Probe (DRG03026) into the Probe hole.

Once the Main Lid (DRG02939) and Probe (DRG03026) have been assembled, set the required pressure with the Pressure Adjust Knob. Press the Green start button. The machine will stroke 6 times, when using the One Cycle Cup (DRG02816) after the first stroke remove the Probe (DRG03026), this will stop the machine.

13.7 OPERATION – Removing One Cycle Sample.

Remove the Probe (DRG03026) and rotate the Main Lid (DRG02939) then lift off of machine with the handle.

NOTE: The main Lid (DRG02939) may be heavy.

Slide the One Cycle Cup Lid removal tool (DRG02935) in between the One Cycle Cup (DRG02816) & One Cycle Cup Lid (DRG01110), this will remove the Cup Lid from the Cup.

Place the Cup Lid and tool to one side.

Pipette the sample out of the One Cycle Cup (DRG02816).

Alternatively, remove the One Cycle Cup (DRG02816) from the disruption head.

13.8 OPERATION – Removing One Cycle Cup

Press and hold the Up button on the control box until the Blue LED illuminates and the motor stops. This will lift the One Cycle Cup (DRG02816) and HP Cylinder up (DRG03039).

Slide the One Cycle Cup removal tool (DRG01324) in between the One Cycle Cup (DRG02816) and the Spacer (DRG02941). Press and hold the Down button on the control box until the Amber LED illuminates and the motor stops. The One Cycle Cup (DRG01324) can now be removed with the One Cycle Cup removal tool (DRG02816).

Once the One Cycle Cup (DRG02816) has been removed, the operator can either change back to a MC Cup (DRG03041) or re-load another One Cycle sample.

13.9 OPERATION – One Cycle Cup Jet Removal

Place the Inner Cup removal tool (DRG02966) onto a bench then insert the Jet (DRG03002) that is protruding out of the One Cycle Cup (DRG02816). Place the Jet removal tool (DRG02967) inside the extended tube and tap it with a nylon or brass mal- let. Tap it hard enough to push out the Jet.

13.10 OPERATION – One Cycle Cup Jet Insertion

Place the One Cycle Cup with the stem facing upwards on the corner of a strong bench.

Place the new Jet (DRG03002) part way into the angled hole in the base of the One Cycle Cup. It will fit easily for a short distance.

Using the One Cycle Cup Lid removal tool (DRG01324) with angled hole in the side, place this over the Jet (DRG03002), and tap the One Cycle Cup Lid removal tool (DRG01324) as hard as necessary to drive the Jet (DRG03002) into the base of the stem on the One Cycle Cup. It should go fully into the Cup so that no part of the Jet (DRG03002) shank is visible and only the cone angle is visible.

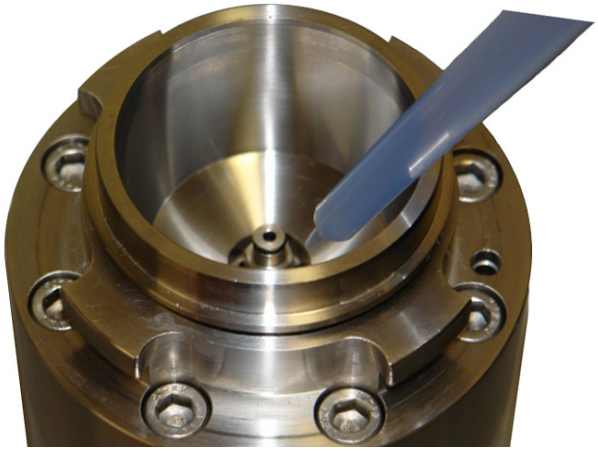
13.11 OPERATION – MC without Inner Cup

Remove the Probe (DRG03026) and rotate the Main Lid (DRG02939) then lift off of machine with the handle.

NOTE: The main Lid (DRG02939) may be heavy.

Pull the Outer Cup Lid (DRG02954) up and off the assembly.

Lift the Inner Cup (DRG02964) out of the Outer Cup (DRG03041) by hand.



Pipette the sample into the Outer Cup (DRG03041).

NOTE: maximum input is 100mls/

Place the MC Solid Lid (DRG03020) onto the Outer Cup (DRG03041).

Place the Main Lid (DRG02939) over the One Cycle Cup assembly, then rotate clockwise, locking the disruption.

Place the Probe (DRG03026) into the Probe hole.

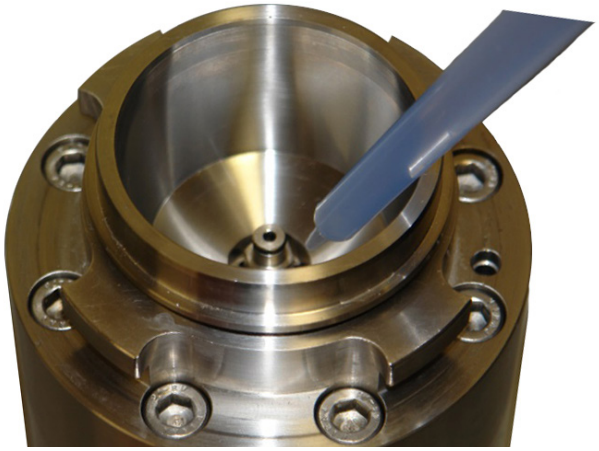
Once the Main Lid (DRG02939) and Probe (DRG03026) has been assembled, set the required pressure with the Pressure Adjust Knob. Press the Green start button. The machine will stroke 6 times.

NOTE: If the operator requires more strokes, lift the Probe (DRG03026) so the Green LED does not illuminate, then place the Probe (DRG03026) back into the Main Lid (DRG02939) so the Green LED illuminates, then press the start button.

Remove the Probe (DRG03026) and rotate the Main Lid (DRG02939) then lift off of machine with the handle.

NOTE: The main Lid (DRG02939) may be heavy.

Remove the MC Solid Lid (DRG03020).

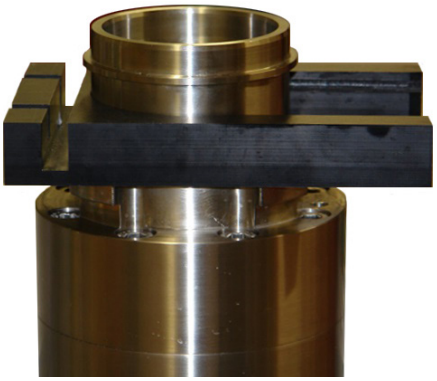


Pipette the sample out of the Outer Cup (DRG03041).

NOTE: Sample will still be left in the HP Cylinder.

To remove the sample in the HP Cylinder.

Press and hold the Up button on the control box until the Blue LED illuminates and the motor stops. This will lift the MC Cup (DRG03041) and HP Cylinder up (DRG03039).



Slide the Multi-Tool (DRG02931) in between the Outer Cup (DRG03041) and the Spacer (DRG02941) Press and hold the Down button on the control box until the Amber LED illuminates and the motor stops. The Outer Cup (DRG03041) can now be removed with the Multi-Tool (DRG02931).

Pipette the sample out of the HP Cylinder (DRG03039).

14.0 STERALISATION & CLEANING

INTERNAL CLEANING AND STERILIZATION

Normal Operation

All components of the One Shot cup should be fully submerged in cleaning fluid, i.e. commercially available detergent, bleach or ethanol, used as recommended by the manufacturers, and soaked for 10 minutes. The sample chamber in the disruption head should be filled to the brim with cleaning fluid and left to soak for the same amount of time. The cleaning fluid can then be removed from the disruption head by pipetting and the cup rinsed with clean water and reassembled. Either 8 mL (One Shot Machine) or 10 mL (One Shot Head Adapter) should then be processed as normal operation with the disruptor set to maximum pressure. This process can be repeated as required.

Note: Correct Personal Protective Equipment (PPE) should be worn.

In the event of the machine being left for long periods without cleaning, or perhaps before a new project, the disruption head can be cleaned by dismantling and then soaking and washing manually in suitable fluids and finally rinsing in clean water.

Typically, a cleaning regime could comprise of:

1) Hot/cold water wash the effectiveness of the wash can be monitored by OD and protein concentration of effluent.

2) Detergent soak (at manufacturers recommended concentration and temperature).

3) Hot/cold water wash.

4) De ionized water wash.

The effectiveness of all steps can be monitored by effluent pH.

The above process has been validated for Escherichia coli and Saccharomyces cerevisiae using both 70% ethanol solution and 1% Virkon solution separately. It is advised that further validation is carried out with selected organisms and detergent if different to above.

Note: All metal used in the product path has been demonstrated to be resistant to corrosion by Virkon at a concentration of 2%.

Steam Sterilization

The whole of the Disrupter Head assembly including HP Cylinder, One Shot Cup & Lid and HP Seal can be disassembled and autoclaved.

Note: Repeated autoclaving of 'O'-rings may lead to loss of elasticity; it is recommended that these are removed prior to autoclaving and soaked in cleaning solution.

For disassembly and reassembly please refer the One Shot Cell Disrupters – Operator's Manual

Further Notice

It should be noted that cleaning by processing 8-10 mL detergent as if normal sample has been shown to have inconsistent results – in most instances determined by foaming properties of the detergent used. It is advised that further validation is carried out if this is your preferred cleaning method.

15.0 APPENDICES

15.1 EC DECLARATION OF CONFORMITY

We Constant Systems Ltd under our sole responsibility declare that the product as listed below

Product Category: CELL DISRUPTER Model: MC

Conforms with principal safety objectives of the European Directive 97/23/EC (Pressure Equipment Directive) in accordance with conformity assessment procedure: **Module A**

The pressure equipment constituting the Pressure Equipment Assembly consists of the following: Disrupter Pump (Category 1), Accumulator (Article 3.3-SEP), & Hydraulic
Operating Circuits (Article 3.3 – SEP)

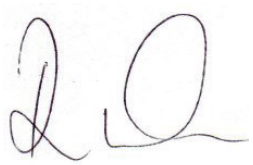
Conforms with principal safety objectives of the **European Directive 2006/95/EC**
('Low Voltage Directive')

Conforms with the protection requirements of **European Directive 2004/108/EC**
('EMC Directive')

This certificate also confirms that all tests specified in our build instructions have been satisfactorily completed.

The machine should at all times be operated as instructed in the Operating Manual.

Signed:



Richard Mallabar

Title: Works Director

On Behalf Of Constant Systems Ltd Date: APRIL 2009

15.2 Intertek Authorization To Mark

AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized to Apply Mark.

Applicant:	Contant Systems Limited	**Manufacturer:**	Contant Systems Limited
Address:	Low March Daventry Northants NN11 4SD	**Address:**	Low March Daventry Northants NN11 4SD
Country:	United Kingdom	**Country:**	United Kingdom
Contact:	Mr. James Amos	**Contact:**	Mr. James Amos
Phone:	+44 (0) 1327 314 146	**Phone:**	+44 (0) 1327 314 146
Fax:	N/A	**Fax:**	N/A
Email:	james.amos@constantsystems.com	**Email:**	james.amos@constantsystems.com

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Leatherhead, UK

Control Number: 3092407 **Authorized by:**

Ulla-Pia Johanss - Nilsson
For Dean Davidson, Certification Manager

Intertek

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Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights. IL 60005 Telephone
800-345-3851 or 847-439-5667 Fax 312-283-1672

Standard(s) :	UL 61010-1: Issued: 2004/07/12 Ed:2 Rev: 2008/ 10/28, Electrical Equipment for Measurement, Control and Laboratory Use; Part 1: General Requirements CAN/CSA C22.2 No. 6 1010-1; Issued: 2004/07/ 12 Ed: 2 (R2009) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements, with general instruction No. 12008/ 10/28
Product:	Cell Disruptor Systems
Brand Name:	Constant Systems

16.0 CONSTANT SYSTEMS CELL DISRUPTOR LOG BOOK

DATE	TIME	OPERATOR	PRESSURE	NOTES (INCLUDE ORGANISMS & PRESSURE)	Stroke Counter