

OPERATING INSTRUCTIONS FOR THE X-PRESS

DESCRIPTION

The X-PRESS is an instrument for disintegrating cells and tissue. Disrupting the cell walls of micro-organisms and other cells makes possible the release and dispersion of the cellular contents and the subsequent separation of soluble material (mainly of protoplasmic origin) from particulate matter (cell walls, unbroken cells and eventual sub-cellular particles).

Cells and tissue are disintegrated in the X-PRESS by taking advantage of the tremendous shearing stresses which occur when ice at -25 to -30°C and at a pressure of about 2000 kilograms per sq.cm (28,000 psi) is forced through a narrow orifice, 1–2 mm in diameter. A pressure-induced transition in the crystal structure of water from ice I (ordinary ice) to liquid or ice III starts the flow of material. The shear stresses, eddying and explosive decompression at flow disrupt the cells.

PREPARATION

Before use, clean all interior surfaces with a lint-free cloth and solvent.

DIRT OR FOREIGN MATTER OF ANY KIND IN THE CYLINDER BORE MAY CAUSE THE PLUNGERS TO BIND AND SCORE THE WALLS.

The plungers are interchangeable and should slide freely in the cylinders. Since the clearance is very small they may not fall through by their own weight. However they should easily be pushed through if the plunger valve is actuated.

Use the tip of the finger of the valve actuator (short plastic rod) for this. If a plunger will not go into the bore or slide easily, check the edges for nicks or dents. Any irregularity should be removed by careful hand sanding with fine emery paper or in a lathe.

As a further precaution against scoring, the plungers are provided with delrin gaskets. In case foreign matter should appear in the cylinder bore these gaskets are usually taking the strain and the damage to the cylinders is thus kept at a minimum. Spare plungers are normally available from stock.

The X-PRESS is made of acid-fast stainless steel and aluminium and has sufficient corrosion resistance for autoclave sterilization. The plastic material of the plungers is slightly hygroscopic, however, and after such sterilization the plungers are to be dried at 90°C for some hours in order to regain their original shape.

ASSEMBLY

Refer to the cross-section diagram (Figure 1).

- Place one cylinder (1) in the body (2).
- Place an O-Ring (3) in the O-Ring seat of the disk (4).
- Place the disk on the disk seat of cylinder.
- Set another O-Ring (5) on the O-Ring seat of the disk.
- Place the second cylinder (6) on the disk.
- Screw the cylinder ring (7) into the body. (Hand tightening is sufficient.)
- Put one plunger (8) into the cylinder.

COOLING

Chill the X-PRESS to about -25°C . (A 60% alcohol, 40% water, dry ice bath will cool the press in about 20 minutes.) If a liquid bath is used, put the rubber stoppers in the cylinder holes to prevent the liquid coolant from entering the chambers. Cool the other plunger (9) and the rod (11) at the same time in a deep-freeze. Cooling the X-PRESS in air takes at least 24 hours. A jar with alcohol in a deep-freeze might be a simple way to get a bath for the higher rate of cooling.

Remove the X-PRESS from the cooler and add the material to be disintegrated (10) to the cylinder which has no plunger (6). This material may be filled in any state – suspension, paste, tissue, or frozen material. When the material has frozen (ordinarily a few minutes) insert the other plunger (9). There will be some resistance due to the air trapped above the frozen material but the plunger should slide freely if the plunger valve is actuated.

Recool the X-PRESS to -25°C , by immersing it in the bath again for ca 20 minutes. Use the rubber stoppers. DO NOT COOL BELOW -35°C . At lower temperatures flow of material might be hampered by freezing in the orifice of the disk.

PRESSING

Remove the X-PRESS from the cooler and remove the rubber stoppers. Place the X-PRESS in the hydraulic press with the cylinder containing the sample on top. Insert the rod (11) into the cylinder. It should go in at least half an inch. Make sure that the X-PRESS has a perpendicular position to the platens of the hydraulic press.

Apply pressure until the material is forced through the orifice. This takes place in steps, which may be accompanied by a loud, cracking sound and a rapid pressure drop. The first step should take place at a pressure of 2000 kilograms per sq. cm (28,000 psi) with the material at -25°C . Subsequent steps require less pressure.

DO NOT EXCEED THE FOLLOWING LOADS:

- 5 ml. X-PRESS - 4 metric tons
- 25 ml. X-PRESS - 12 metric tons

If the above load is reached without any reaction, allow the X-PRESS to warm up while continuing to apply pressure until the reaction occurs. Keep applying pressure until all the material is forced through the orifice.

If more pressings are desired, turn the press over and repeat the above steps. Recooling may be necessary if the ambient air is warm.

UNLOADING

To uncouple the X-PRESS, place it into the vise (fastened to the hydraulic press or other firm support) and unscrew the cylinder ring with the wrench. A light tapping with a mallet on the end of the wrench may be necessary. When several pressings have been carried out, the disrupted material will ordinarily come out as a frozen plug; if only one pressing has been used, the sample may come out as a powder. A plastic rod is supplied with the X-PRESS to assist in sample removal.

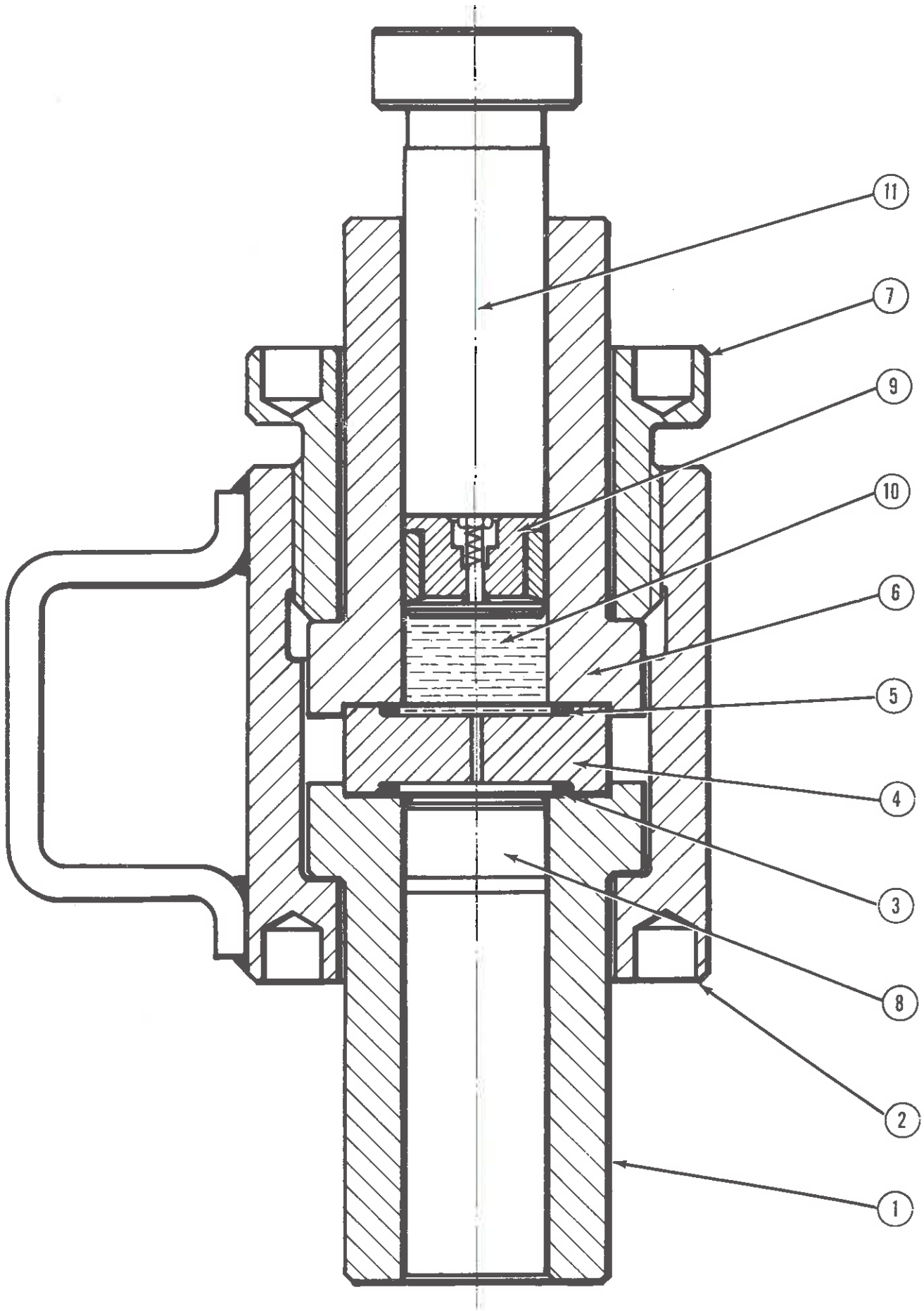
IF EITHER THE ROD OR PLUNGER WILL NOT COME OUT EASILY, RUN WARM WATER OVER THE CYLINDER.

CLEANING

After uncoupling the X-PRESS, the cylinders, plungers, piston, disk and O-rings should be washed in warm water. No oiling is necessary as all parts are made of stainless steel and aluminium.

PARTS LIST

Part Designation	Number of parts in complete unit	Reference no. See Fig. 1	Part number 5 ml. X-press	Part number 25 ml. X-press
Cylinder	2	1, 6	0302	0202
Disk	1	4	0306	0206
Plunger	2	8, 9	0305	0205
Rod	1	11	0301	0201
Body	1	2	0304	0204
Cylinder ring	1	7	0303	0203
Wrench	1		0311	0211
Vise	1		0316	0216
O-ring	2	3, 5	0317	0217
Plastic rod	1		0318	0218
Valve actuator	1		0319	0219



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