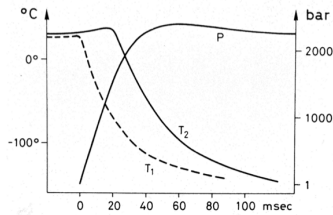


- ❑ **The Original and Proven High Pressure Freezing Machine**
- ❑ **Over 100 Installations World-Wide**
- ❑ **More Than 400 Scientific Publications**
- ❑ **Well Frozen Specimens up to 200µm Thickness and 2mm Diameter, Without the Use of Cryoprotectants**

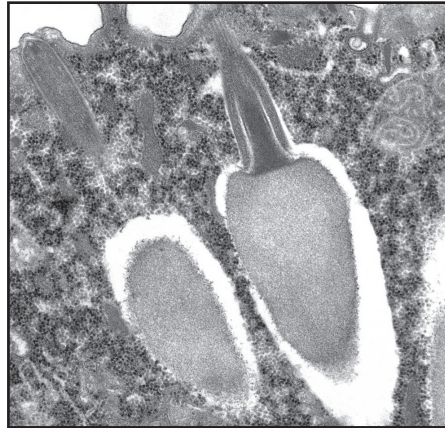


High pressure freezing is the only method, that allows vitrification of samples up to 1mm³. The HPF method uses LN₂ under high pressure (2100 bar). At 2100 bar, water is 1500 times more viscous than at atmospheric pressure, which drastically reduces the crystal growth.

HPM 010 High Pressure Freezing Machine Features

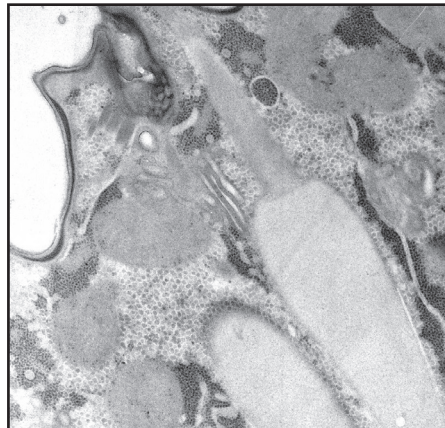
- Freezing of specimens up to 200µm thickness and 2mm dia. without visible ice crystal damage using standard type A or B 6mm diameter specimen carriers
- Cryo-fixation of suspensions, monolayer cell cultures and tissues
- Large base of application know-how available
- Shortest handling time before freezing
- Suited for suspension and tissue samples
- Reproducible freezing
- Easy one button operation
- In situ real time measurement of temperature and pressure.
- Fast 90 second process cycle allows expeditious application.
- Automatic, microprocessor controlled operation for routine work.
- Compact, sturdy unit with soundproof and vibration-free housing.
- Simple and safe operation due to quick-locking action of specimen holder and clearly arranged operational controls.
- Processing data is recorded on digital display, such as the actual temperature, time and pressure, thus allowing the user to exactly evaluate current operational status (sample quality control).
- Simple maintenance with removable cover plates and rack system for control units.
- Extensive accessory program.

Comparison of Chemically Fixed and High Pressure Frozen(using HPM 010) Paramecium Cells



Cross section of cells after chemical fixation

Trichocyst bodies (TB) is detached all round from the matrix. Glykogengranula is mixed with the Ribosomes.



High pressure frozen, freeze substituted Preparation in Cellulose Capillary tubes

No discernible shrinkage of the Trichocysts. Bodies and tips are firmly connected. Glykogengranula (GLY) is delimited from the Ribosome-areas (RI).

HPM 010 High Pressure Freezer



**RMC
Boeckeler**

A division of Boeckeler Instruments, Inc.
4650 S. Butterfield Drive , Tucson, Arizona 85714 USA

**RMC™
Boeckeler**

Contact us at:
800-552-2262 or 520-745-0001
Fax 520-745-0004
rmcboeckeler.com

TECHNICAL DATA

Dimensions and Weight

Dimensions	see diagram below
Weight, approx.	450 kg

Working Data

Working pressure	2300 - 2600 bar
Maximum pressure	2800 bar
Duration of working pressure, at least	500 ms
Cooling time from 0°C to -50°C (measured between 3 mm copper disc)	10 ms

Specimen Dimensions

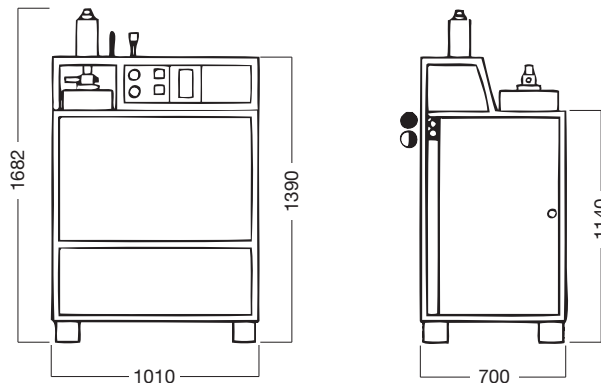
Sample size, up to max. of	200µm thickness and 6mm diameter
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Connection Data

Voltages, frequencies	3 x 380/220 V, 50 Hz 3 x 208 V, 60 Hz
Power input, approx.	3kVA
Compressed air (5 bar)	G 1/4" outer thread
LN ₂ (1 bar excess pressure)	G 1/4" outer thread
Heating water (rubber hose)	Ø 7/14 mm

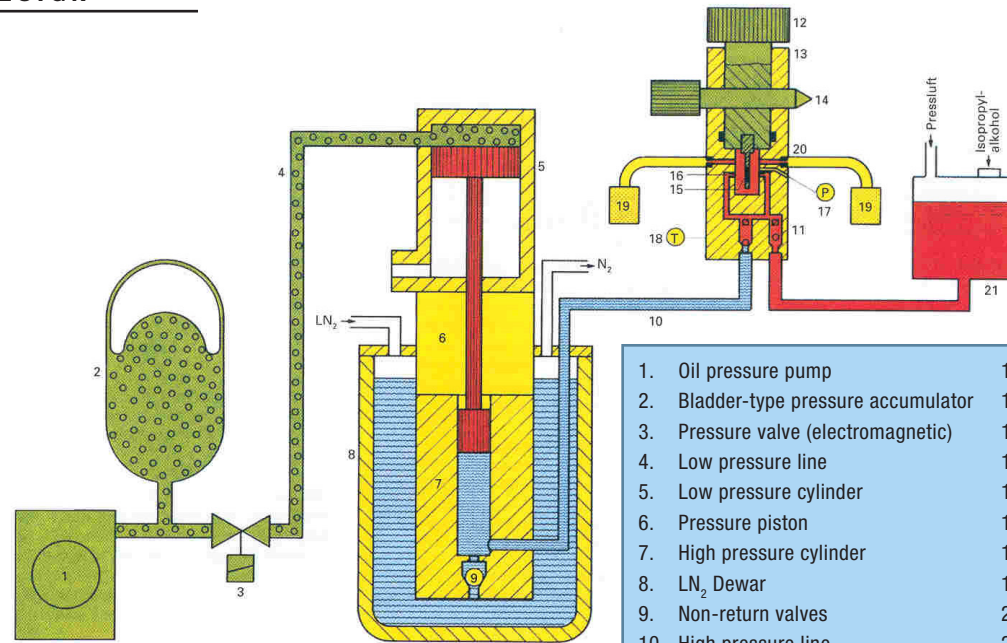
Operational Data

Hydraulic oil reservoir	40 liters
Hydraulic oil bias pressure	140 - 250 bar
LN ₂ Dewar (in system)	7 liters
LN ₂ consumption	10 - 20 liters/hour
Initial system cooling, approx.	15 min.
Max. processing sequence, approx.	40 shots/hour
Isopropyl alcohol reservoir, approx.	0.5 liters



measurements in millimeters

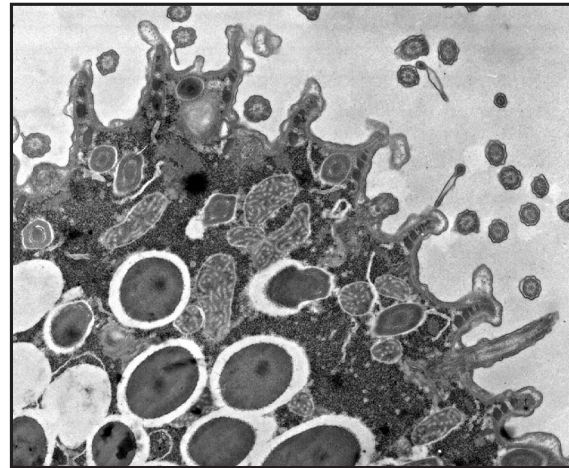
DESIGN



- | | |
|--------------------------------------|--|
| 1. Oil pressure pump | 12. Specimen holder |
| 2. Bladder-type pressure accumulator | 13. Specimen pressure chamber |
| 3. Pressure valve (electromagnetic) | 14. Quick fastening bolt |
| 4. Low pressure line | 15. Specimen |
| 5. Low pressure cylinder | 16. LN ₂ entry apertures |
| 6. Pressure piston | 17. Pressure sensor |
| 7. High pressure cylinder | 18. Temperature sensor |
| 8. LN ₂ Dewar | 19. N ₂ exhaust with silencer |
| 9. Non-return valves | 20. Outlet apertures |
| 10. High pressure line | 21. Isopropyl alcohol reservoir |
| 11. Non-return valves | |

COMPARE

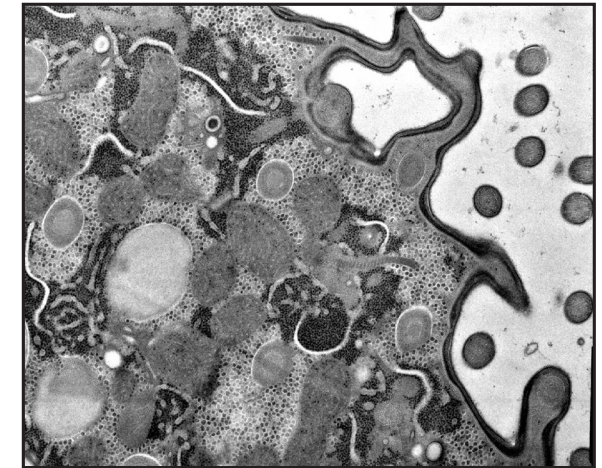
Comparison of chemically fixed and high pressure frozen (using HPM 010) paramecium cells



Chemical fixed, room temperature, dehydrated

Regular distribution of Ribosomes in the Cytoplasm, granular Glycogen is scarcely visible. Trichocystenbodies (TK) and Trichocystentips (TS) exhibit shrinkage. Surface membranes (M) are crinkled.

All Micrograph Photos: Dr. Heinrich Hohenberg, ETHZ Zurich, Lab. For EM1, CH - 8902 Zurich, Switzerland



High pressure frozen, freeze substituted Preparation in Cellulose Capillary tubes

Entire Paramecium cell is adequately cryopreserved. Glycogen granules (GLY) has high density and occurs in delimited areas, as well as the Ribosomes (RI). Surface membranes are smooth and tight arranged.