

# Hot Cell System



**User-friendly equipment  
for materialographic  
preparation of  
radioactive material in  
hot cells**



**To meet the demand for preparation of radioactive materials, Struers has designed a complete range of sturdy and reliable equipment, which can be operated in hot cells.**

The special hot cell versions are based on the following standard equipment:

- Secotom-10 precision cut-off machine
- Minitom precision cut-off machine
- CitoPress-1 mounting press
- TegraPol-15 grinding/polishing machine
- TegraForce-1 specimen mover
- TegraDoser-5 dosing unit





*The tray can be detached*

## Requirements

The preparation of radioactive materials takes place in so-called hot cells, which are special enclosures, where radioactive specimens are handled with manipulators. Since the radioactivity in the cells will eventually attack plastics and electric parts, their use should be cut down to a minimum. Cleaning and decontaminating the whole system should be easy, and minimal waste should be generated during use.

Also, it must be possible to repair the equipment in the cell using the manipulators only. Considering that all parts in the cell will be radioactively contaminated, the equipment should be dependable in operation, because if not repairable in the cell, it will have to be discarded as radioactive waste. The amount of waste for final disposal must be kept at a minimum.

## Design principles

The special requirements when working in hot cells require a very special design. Struers hot cell equipment is produced according to the following design principles:

### Easy installation in hot cell

The front panel and electronics are placed outside the hot cell. The distance between front panel and the equipment placed inside the hot cell is standard 8 m. Different cables and tubes lengths are available. The equipment is provided with rollers and handles, thus it can be moved around in the hot cell.

### Easy handling by manipulators

The equipment is adapted to allow remote operation and remote handling of specimens. Changing of consumable material between preparation steps is facilitated. The apparatus operates and is controlled just like any other standard model. The use of the MD-System, magnetic fixation of grinding discs and polishing cloths, eliminates changing of grinding/polishing discs and simplifies the manipulation in the hot cell.

## Efficient preparation process

Struers e-Metalog methods ensure short preparation times and the highest degree of reproducibility. Preparation methods for grinding/polishing can be downloaded from the Internet and stored in the system. With the MD-System a grinding process using very little or no water can be carried out.

### Easy to clean and decontaminate

The cabinets are made of stainless steel or aluminium with a suitable shape and surface treatment for easy cleaning. On the grinding/polishing machines, the tray can be detached for well-ordered removal of contaminated debris.

### Radiation resistant materials

Many parts of the standard equipment have been substituted by others more able to resist the radioactive environment: Whenever possible, plastic has been substituted by metal, and electrical parts have been placed outside the hot cell. Gear wheels and belts are as far as possible made of radiation resistant material.

### Easy maintenance in hot cell

A sturdy, reliable design minimizes the need for service and repair. The equipment can be moved and turned in the hot cell for easy access. The cabinet is fastened by screws of cylindrical Allen type and is thus easy to remove. Electrical elements are connected by plugs for individual removal. Maintenance and exchange of vital parts including motors, belts and plastic tubes can be carried out in the cell using manipulators.

### Minimal radioactive waste

Equipment size is as small as possible. With a preparation technique based on the MD-system, very little water is used and contaminated waste per sample prepared is minimized. The tray, being the most contaminated part of a grinding/polishing machine, can be disposed of separately.



*Rear of Secotom-10 for Hot Cell*



*Bottom of Minitom for Hot Cell*



*Bottom of TegraPol-15 for Hot Cell*

## The hot cell materialographic lab

Though based on standard designs, all Struers hot cell equipments are made specifically for use in a radioactive environment:

- Secotom-10 for Hot Cell with its large, movable cutting table and large selection of clamping tools and specimen holders, allows precision cutting of larger and deeper samples.
- Minitom for Hot Cell is used for precision cutting of all types of materials with a specimen size up to 30 mm diameter.
- CitoPress-1 for Hot Cell is the option when hot mounting of specimens is required.
- TegraPol-15 for Hot Cell (variable speed 40-600 rpm) is equipped with TegraForce-1 for Hot Cell for automatic grinding and polishing. The use of Struers standard MD-system facilitates handling and reduces considerably the amount of radioactive waste.
- TegraDoser-5 for Hot Cell is very efficient for automatic supply of suspensions, lubricant or water. If download from the Internet or standardizing of preparation methods is desired, a standard Struers LAN module can be installed in TegraDoser-5 for Hot Cell.

The hot cell versions of our equipment can work with Struers standard accessories, consumables and software.



Hot cell laboratory.

Photo courtesy: Institute for Transuranium Elements

## Design changes compared with standard equipment

General technical data stated in the brochures for the standard versions of the equipment are also valid for the hot cell versions. However, in relation to this, the hot cell versions imply following modifications:

### Secotom-10 for Hot Cell

Secotom-10 is controlled from outside the cell using touchpad controls and a joystick placed on the front plate of the control box. The data are shown on a LCD display. The wheel for height adjustment of the cut-off wheel unit is placed on the top of the machine and the adjustment can be carried out in the cell using manipulators. Opening/closing of splash guard takes place inside the cell with the manipulators.

The chassis is made of aluminium and the stainless steel cabinet is mounted with screws which are easy to remove. The cabinet appears with a electropolished surface. The tank for cooling water is in stainless steel with connecting pieces for easy replacement of water. It is placed underneath the cutting chamber. The main motor and feed motor are fastened by screws and equipped with cable connectors, thus it is possible to replace the motors directly in the hot cell using the manipulators. The belt for the feed motor, the pump for recirculation cooling and the standard transparent splash guard of plastic can be replaced in the same way.



Secotom-10 for Hot Cell

Compared with our standard version, the hot cell version is about 50 mm higher, the width is about 20 mm smaller and the depth about 100 mm smaller.

All electric parts, except the motors and the cooling water pump, are placed outside the cell. Only cables need to be led into the cell. The electric parts are mounted in a control box with the normal touchpad front plate. This box is made for rack mounting, or it can stand alone.

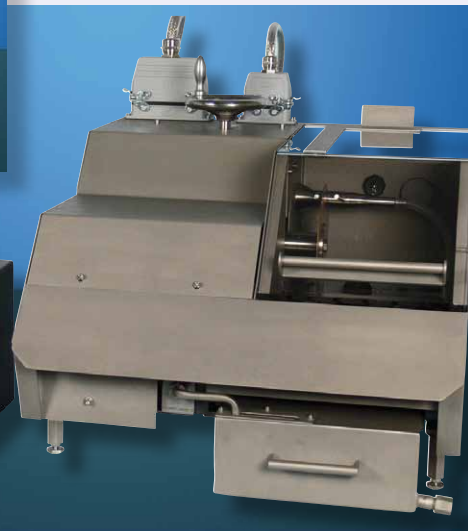
### Minitom for Hot Cell

Minitom is controlled from outside the cell with touchpad controls placed on the front plate of the control box. Operation in the hot cell can be carried out using manipulators.

The cabinet is made of painted aluminium. The tank for cooling water is in stainless steel. The main motor has been fastened with screws and mounted with cable connectors, thus it is possible to replace the main motor in the hot cell.

All electric parts, except the motor, are placed outside the cell. Just a cable needs to be led into the cell.

The electric parts are mounted in a control box with the normal touchpad front plate. This box is made for rack mounting, or it can stand alone.







CitoPress-1 for Hot Cell

### CitoPress-1 for Hot Cell

CitoPress-1 is controlled from outside the hot cell with touchpad controls placed on the front plate of the control box.

The operation can be carried out in the cell using manipulators.

The equipment has been prepared for various cooling options such as water recirculation or air cooling. It can be moved by simply lifting the front end. The cabinet has been designed in stainless steel and fastened with screws which are easy to remove. The cabinet appears with an electropolished surface. The tank for the hydraulic system is also of stainless steel. The top closure elevator has not been installed. Electrical elements are connected with plugs for individual removal.

The electric parts are mounted in a control box with the normal touchpad front plate. This box is made for rack mounting, or it can stand alone.

### Mounting Unit for Hot Cell

The mounting unit has been redesigned to allow remote handling. Opening/closing as well as replacement of mounting unit can be carried out directly in the cell using the manipulators. Cooling can be done by water or air. The plastic parts of the top closure are made from radiation resistant plastic.

### TegraPol-15 for Hot Cell

TegraPol-15 is controlled from outside the cell with touchpad controls placed on the front plate of the control box. The data are shown on a display. The operation in the hot cell can be carried out using manipulators. The machine can be moved by lifting the front end where a handle is placed. Three lifting eyes also facilitate the relocation.

The machine is supplied without a water tap, solenoid valve and water hoses. Lubrica-

tion takes place through TegraDoser-5. The cabinet has been made of stainless steel and is mounted with screws which are easy to remove. The cabinet appears with an electropolished surface. The tray surrounding the disc and the drain pipe are made of stainless steel. The tray is detachable for easy removal of contaminated debris. The drain pipe is sloping and taken through the side of the machine. It is threaded at the end for easy connection. The splash ring, which protects against splashing from the rotating disc and specimen mover, is made of ABS, and the opening can be adapted to match the shape of the manipulator, reducing splashing to a minimum. The splash ring can easily be discarded, if the plastic deteriorates after long use. The bottom of the cabinet is open, so that the drive belt easily can be replaced by placing the machine on its side. The whole cabinet can be removed. The main motor has been fastened with screws and mounted with cable connectors, thus it is possible to replace the main motor directly inside the hot cell.

All electric parts, except the motor, are placed outside the cell. Only a cable, supplying power to the motor, needs to be led into the cell. The electric parts are mounted in a control box with the normal touchpad front plate. This box is made for rack mounting, or it can stand alone.

### TegraForce-1 for Hot Cell

The pressure and rotation are controlled from outside the cell with touchpad controls placed on the front plate of the control box for TegraPol-15. The force and other data are shown on a display.

The release handle for lifting the specimen mover plate has been extended, thus it can be operated by manipulators. The specimen mover is supplied with a handle for easy lowering of the specimen mover plate using the manipulators. The horizontal position of the specimen mover plate is fixed.

TegraForce-1 can be installed on and separated from TegraPol-15 using the manipulators.

The cabinet is made of stainless steel and is mounted with screws which are easy to remove. The cabinet appears with an electropolished surface. The force on each specimen

*TegraForce-1 for Hot Cell. Since the radioactivity in the hot cells will eventually attack plastics and electric parts, the use of these materials is cut down to a minimum*



*TegraPol-15 and TegraForce-1 for Hot Cell*

is applied with compressed air or by mechanical springs in the high-radiation edition. A belt, exchangeable with manipulators, takes care of the transmission from the motor to the shaft of the specimen holder plate. The gear motor is mounted with cable connectors and it is possible to replace the gear motor directly inside the hot cell.

All electric parts, except motor and sensors, are placed outside the cell in the control box for TegraPol-15.

#### **TegraDoser-5 for Hot Cell**

TegraDoser-5 is placed outside the hot cell. The liquids are taken into the cell through 7 plastic tubes: 6 diamond suspensions or lubricants and 1 for water.

The tubes are placed in an outer flexible plastic spiral hose. The 7 tubes are connected to a nozzle block with 7 nozzles supplying the liquids to the grinding/polishing disc. The block has been manufactured in aluminium and placed on the side of TegraForce-1, thus it easily can be exchanged by manipulators together with the 7 tubes. In the hot cell version, the pumps can only supply liquid to the grinding/polishing disc. As they are not able to reverse, they will not lead the liquid back out of the hot cell.

The optional standard network card for Struers LAN module can be installed in TegraDoser-5.



*The power supply for the TegraForce-1 is detachable. It can either be placed at the back of the TegraPol or at any other suitable place.*

*The TegraPol is equipped with 3 hooks for easy lifting and positioning of the machine*



*TegraDoser-5.  
Placed outside the hot cell*

## TECHNICAL DATA

General technical data are stated in the brochures for the corresponding standard versions of the equipment.

## SPECIFICATIONS

### Secotom-10 for Hot Cell

Tabletop, precision cut-off machine with movable cutting table and variable speed. Automatic feeding with electronic control of feed speed. Motorised positioning system and digital read-out. Complete with control box with electric parts and controls for rack mounting outside the hot cell, recirculation cooling unit, flange set 65 mm dia. Cut-off wheels, specimen holders, additive for cooling fluid and clamping tools are ordered separately. Length of supply cable is 8 m; if other length is wanted, specify when ordering.  
1/3 x 200-240 V / 50-60 Hz.

Cat. no:

05036327

### Minitom for Hot Cell

Low-speed precision cut-off machine. Complete with control box with electric parts and controls for rack mounting outside the hot cell, universal specimen holder (04436901) and flange set 65 mm dia. as well as 42 mm dia. Cut-off wheels and cutting fluid are ordered separately. Length of supply cable is 8 m; if other length is wanted, specify when ordering.  
1 x 100-240 V / 50-60 Hz.

04436316

### CitoPress-1 for Hot Cell

Automatic, electro-hydraulic hot mounting press for one cylinder. Complete with control box with electric parts and controls for rack mounting outside the hot cell. Cooling by water or compressed air. Mounting units are ordered separately. Length of supply cable is 8 m; if other length is wanted, specify when ordering.  
1 x 100-240 V / 50-60 Hz.

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### Mounting Unit for Hot Cell

Consisting of heating/cooling unit, lower ram and top closure with upper ram. For CitoPress-1 for Hot Cell.  
Cyl. dia. 25 mm. 1 x 100-240 V / 50-60 Hz.  
Cyl. dia. 30 mm. 1 x 100-240 V / 50-60 Hz.  
Cyl. dia. 1 1/4". 1 x 100-240 V / 50-60 Hz.  
Cyl. dia. 1 1/2". 1 x 100-240 V / 50-60 Hz.  
Cyl. dia. 40 mm. 1 x 100-240 V / 50-60 Hz.  
Cyl. dia. 50 mm. 1 x 100-240 V / 50-60 Hz.

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### TegraPol-15 for Hot Cell

Grinding/polishing machine with variable speed (40-600 rpm in steps of 10 rpm). For disc 200 mm (8") dia. 370 W motor. Complete with control box with electric parts and controls for rack mounting outside the hot cell. Discs are ordered separately. Length of supply cable is 8 m; if other length is wanted, specify when ordering.  
1/3 x 200-240 V / 50-60 Hz.

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### TegraForce-1 for Hot Cell

Automatic specimen mover with variable speed (50-150 rpm in steps of 10 rpm). For fine grinding and polishing of 1-3 single specimens or grinding and polishing of 3 specimens fixed in a specimen holder. Dosing unit, specimen mover plates and specimen holders are ordered separately. Length of tube for compressed air is 8 m; if other length is wanted, specify when ordering.

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### TegraDoser-5 for Hot Cell

Dosing unit and database for preparation methods. With peristaltic pumps. For automatic dosing of diamond suspensions and lubricants. Can be used for supply of water. TegraDoser-5 for hot cell is placed outside the hot cell. The nozzle block is mounted on TegraForce-1 for hot cell. The peristaltic pumps cannot reverse. The built-in database contains the 10 Metalog Guide methods and has a capacity for additional 190 user-defined preparation methods. With the optional Struers LAN module, TegraDoser-5 for hot cell can be connected to and controlled from the Local Area Network or a stand alone PC. Length of tubes is 8 m; if other lengths are wanted, specify when ordering. With 6 pumps for diamond suspensions or lubricants and 1 pump for water.

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## Warranty

*Not knowing the environment in the hot cell, we shall not be able to guarantee the operation of the parts in the hot cell, but of course the parts placed outside.*

## CE approval

*The equipment is designed to be operated by manipulator in a closed compartment only. The hot cell versions are not CE approved, and they are not allowed for operation in an open laboratory. Struers refer to the CE approvals for the corresponding standard products.*

*Struers' products are subject to constant product development. Therefore, we reserve the right to introduce changes in our products without notice.*



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