CPD 030 Critical Point Dryer

Features

Compact bench unit

Space saving design with integrated control and supply units.

Economical

Minimum consumption of the CO_2 transitional fluid because of integrated refrigerator (no cooling agent required).

Easy specimen loading

The top loading system with safety screw-on cover is ideal for fast, easy specimen insertion.

Easy operation

The solenoid high pressure valves are operated from the touchpad keyboard (no difficult-to-use manual valves).

Guaranteed personnel safety

Approved pressure container with bursting membrane and two other independent safety features guarantee absolutely safe operation.

Gentle specimen treatment

Damaging turbulences caused by admitting and draining fluids too fast or heating them too quickly are reduced to a minimum through the use of apertures of varying sizes and because the heating parameters are adjustable.

Automatic cooling / heating system

The integrated cooling / heating system eliminates the need for external supplies such as cold and hot water.

Conveniently arranged control and display elements

Digital temperature and analog pressure displays and a mimic diagram with LED's to indicate the momentary operational status of the unit.

Magnetic stirrer

Can be used for better and faster mixing of the transitional fluids (Not for delicate specimens).

Excellent visual access

Large, safety sight glasses provide excellent viewing of the submerged specimens during the CP process both from above and from the side.

Wide selection of accessories

For the most varied applications.

Universal application

The variable operating parameters allow all commonly used transitional fluids to be used.

Service friendly

Consistent modular design and removable cover panels assure easy access to the individual assemblies.

Applications

Scanning electron microscopy

– Gentle specimen drying for:

Botanical specimens (tissue samples, spores, etc. from lower and higher order plants)

Zoological specimens (tissue samples, cell cultures, etc. from animals and humans)

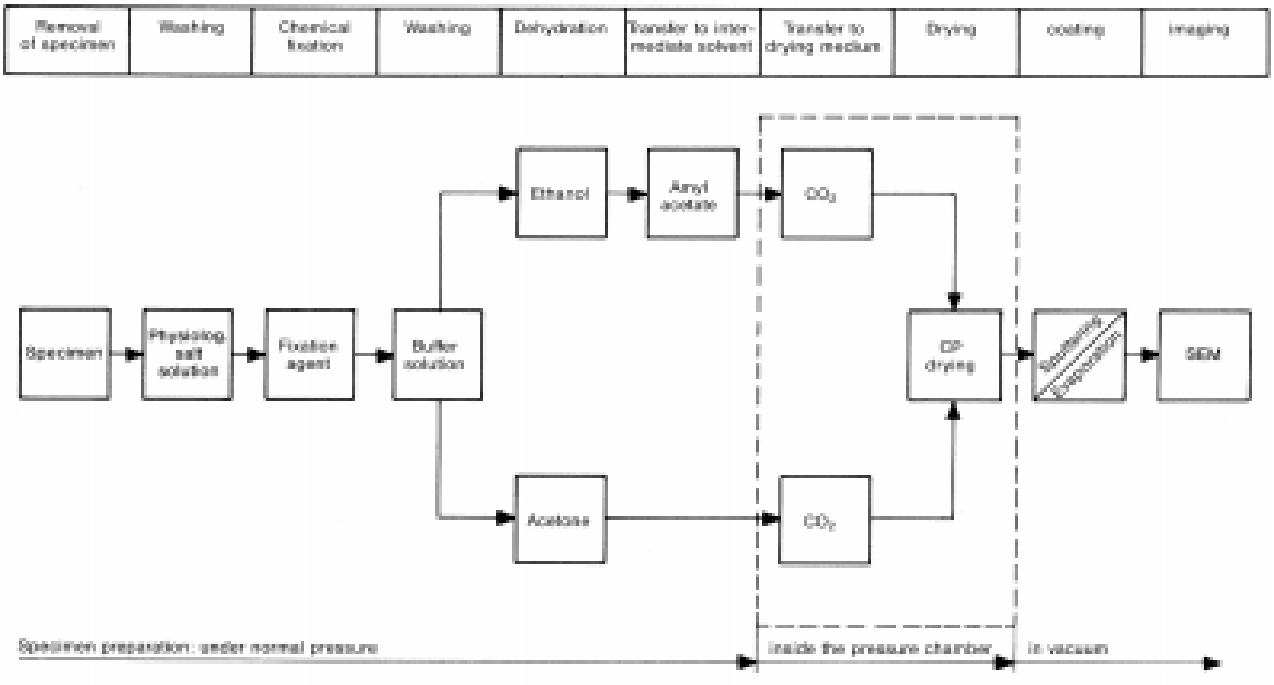
Samples from industrial production (food, etc.)

After drying, the SEM specimens are coated with a metal such as gold, platinum or palladium to make their surfaces electrically conductive. For coating systems please refer to the leaflet for BAL-TEC SCD 005, SCD 050, and MED 020 units.

– Specimen structures can be better preserved by combining critical point drying with fast freezing and freeze substitution [1] [2].

For systems in which these processes can be carried out please refer to the leaflets for the BAL-TEC HPM 010, JFD 030, TFD 010 and FSU 010 units.

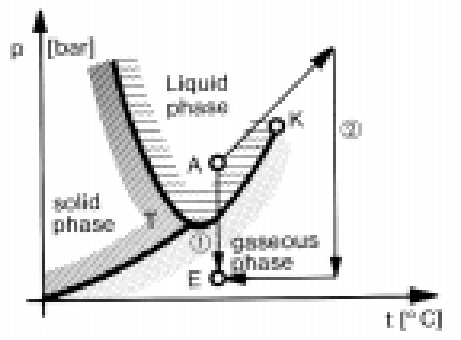
Specimen preparation steps



The critical point drying method

Drying water-containing biological specimens in air or under vacuum can drastically alter their structures or even destroy them completely. They must therefore be dried by a gentler method. One well-known method is "Critical Point Drying".

Phase diagram



K= Critical Point

A= Initial state

E =Final state

T=Triple point

① Air-drying / vacuum-drying

② Critical point drying

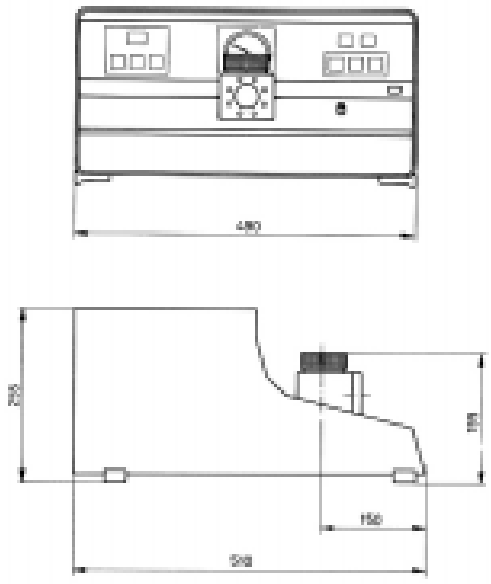
The surface tension of the water in a specimen at the point at which it changes from the liquid phase to the gaseous phase ① can destroy a delicate specimen.

By increasing the pressure and temperature of the specimen it is possible to dry it without crossing a phase boundary ②. This is possible because once the critical point has been passed, the density of the "liquid" and the density of the "gas" are the same. The critical point for water is 228,5 bar and 374°C. However, this high pressure and extreme temperature would normally destroy a biological specimen. For this reason the specimen must first be treated in a suitable transitional fluid such as CO_2 whose critical point of 73,8 bar and 31°C is considerably more advantageous.

Technical Data

Dimensions	See scale drawing
Specimen chamber:	
Usable volume	Ø 40 mm x 36 mm
Fluid filling	approx. 70 ml
Weight	approx. 33 kg
Connection data	
Electrical:	
Voltage	230 V / 240 V / 115 V
Frequency	50 / 60 Hz
Power consumption	220 VA
Main fuse F1 / F2	4 A slow blowing (230 V / 240 V) 5 A slow blowing (115 V)
Transitional fluid:	
Inlet	M 12 x 1.5
Outlet	Ø 6 mm (R1/8")
Gas outlet	Ø 6 mm (R1/8")
Highest permissible pressure	
Safety bursting membrane	approx. 150 bar
Refrigerator	
Cooling capacity	85W
Refrigerant	R12
Quantity	120 g
Temperature measurement	
COOLING range, adjustable	2°C to 12°C
HEATING range, adjustable	30°C to 45°C
Operating parameters	
Cool down time	approx. 2.0°C/min.
Heating time NORMAL	approx. 3.2°C/min.
Heating time SLOW	approx. 0.9°C/min.

Scale drawing



Specification

1. Housing

Attractively shaped console housing containing the pressure chamber, inlet and outlet system for the preparation fluids, cooling system and plug-in power supply and control unit.
The display and control panel can be removed without using tools. The side and back panels can also be easily removed. The connections for the preparation fluids inlet / outlet are located on the back of the unit. The cooling fan is installed in the housing cover.

2. Pressure chamber

Pressure chamber made of stainless steel with safety screw-on cover, large sight glasses in both the front chamber wall and lid, welded-on cooling pipes.
Inlet and outlet ports for preparation fluids.
Hole for heating cartridges and thermal sensor.
The pressure chamber is heat-insulated with special materials.
The drive motor for the stirrer is installed in the chamber base.

3. Preparation fluid inlet / outlet system

Inlet (M12 x 1.5), outlet (∅ 6 mm) and gas outlet (∅ 6 mm) are located on the back panel.
The preparation fluid inlet / outlet system consists of:

- 3 solenoid high pressure valves
- 1 non-return valve
- 1 bursting membrane
- 1 glycerin cushioned pressure gauge
- 1 gas dosing valve for the gas outlet

These elements are connected via copper tubing and clamping ring couplings.

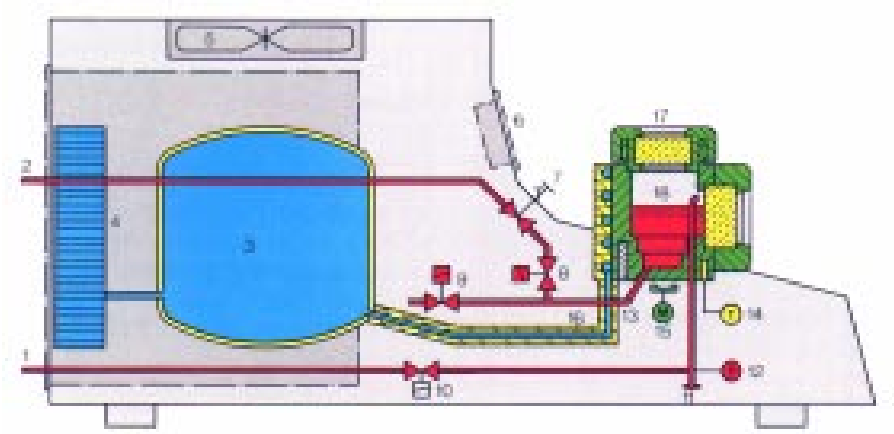
4. Cooling system

Closed cooling circuit that consumes no refrigerant, consisting of :

- Compressor (85W)
- Liquifier
- Dryer
- Filling port
- Insulated cooling circuit

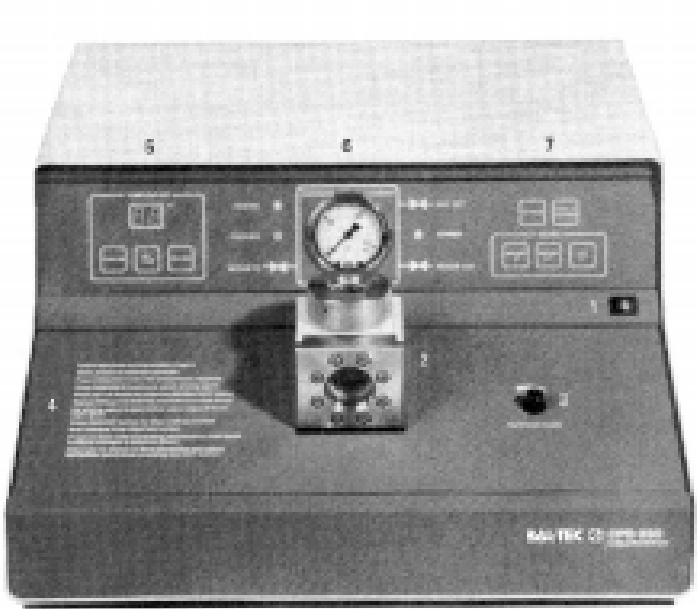
The system is designed to cool the pressure chamber in the range from +2°C to +12°C.
A cooling fan prevents the refrigerator from overheating.
For easier maintenance, the cooling system has been mounted on a separate, easily removable base-plate.

Design



1 Transitional fluid inlet
2 Gas outlet
3 Refrigerator
4 Refrigerant liquifier
5 Cooling fan
6 Temperature / pressure display
7 Manual gas dosing valve
8 Gas outlet valve, solenoid
9 Transitional fluid outlet valve, solenoid
10 Transitional fluid inlet valve, solenoid
11 Safety bursting membrane
12 Pressure gauge
13 Heating cartridge
14 Temperature sensor
15 Stirrer motor
16 Refrigerant circuit
17 Safety screw-on cover
18 Specimen pressure chamber

Front view of the unit



1 Mains power switch
2 Pressure chamber
3 Gas dosing valve for gas outlet
4 Directions for use
5 Temperature selection controls and display
6 Pressure and operational status displays
7 Control panel

5. Heating system

Automatically controlled system consisting of:

- 2 heating cartridges
- 1 thermal sensor (Pt 100)
- 1 temperature display and adjustment panel
- 1 temperature control electronics card

6. Power supply and control unit

The power supply consists of the CP 010 power supply card and the power supply input block. Both parts are inserted into the back of the unit for installation. The control electronics card mounted directly on the back of the front panel.

7. Safety devices

The safety devices consist of the following:

- Approved specimen pressure chamber (min. 200 bar)
- Bursting membrane (responds at 150 bar)
- Precisely dimensioned heating system (heating power limitation)
- Safety screw-on cover
- Approved safety sight glasses made of special glass

8. Set of tools and accessories

Consisting of:

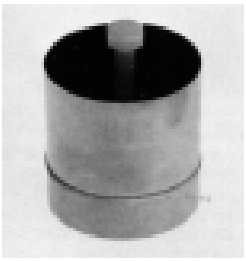
- Mains power cable
- Fuses
- Spare seals (B 8010 114 75)
- Tubing (BU 011 471 -T)
- Rod for magnetic stirrer (B 8010 114 76)
- Hose nipples R1/8", Ø 6 mm.
- Wrench (N 5701 144)
- Perforated disk Ø 30 mm (BU 011 618)

Ordering information

CPD 030 basic unit per specification item 1-9.

	Order No.
230 VAC 50/60 Hz	BU G03 500
115 VAC 50/60 Hz	BU G03 501

Accessories



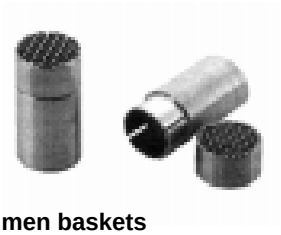
Specimen transfer container

For transferring specimens submerged in transitional fluid to the pressure chamber in the critical point dryer.

Dimensions: Ø 30 x 32 mm

With mechanism for draining and rinsing the container.
Holds max. 5 specimen baskets.
(BU 011 126 -T)

Order No.	BU 011 121 -T



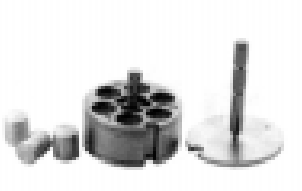
Specimen baskets

Made of stainless steel, snap-on lid with wire mesh (10/cm).

Dimensions: Ø 10 x 21 mm

Five of these baskets fit in specimen transfer container (BU 011 121 -T).

Order No.	BU 0 11 126 -T



Universal Specimen container

Made of stainless steel with 9 numbered chambers.

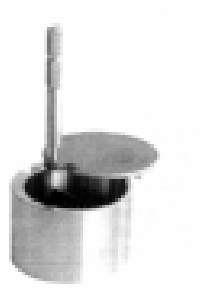
6 chambers Ø 10 x 14 mm
3 chambers 4 x 6 x 14 mm

Consisting of:

- 1 Specimen basket
- 1 Base with wire netting (60 M/cm)
- 1 Cover with wire netting (60 M/cm)
- 1 Transfer cover
- 3 Spare inserts

When using the smallest specimens or suspensions, the wire netting may be replaced by filter gauze or filter paper.

Order No.	BU 011 127 -T



Cover slip holding basket

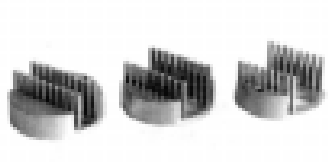
Made of stainless steel.

Consisting of:

- 1 Sample basket
- 1 Base with wire netting
- 1 Insert for cover slips
- 1 Transfer cover

The transfer cover allows a wet transfer of specimens in the dehydration liquid.

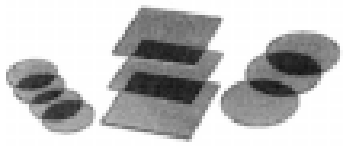
With inserts for	Order No.
9 Cover slips Ø12mm	BU 011 131 -T
8 Cover slips Ø18mm	BU 011 128 -T
7 Cover slips 22x22mm	BU 011 132 -T



Inserts for cover slips

The inserts can easily be integrated in the cover slip holding basket.

Inserts for	Order No.
9 Cover slips Ø12mm	BU 016 775 -T
8 Cover slips Ø18mm	BU 016 776 -T
7 Cover slips 22x22mm	BU 016 777 -T

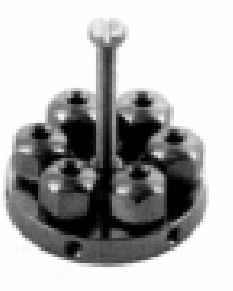


Cover slips

Suited to fit various inserts.

50 pieces per pack.

Dimension	Order No.
Ø12 x 0.15mm	B 8010 140 97
Ø18 x 0.15 mm	B 8010 030 75
22 x 22 x 0.15 mm	B 8010 030 74



Sample holder for grids

To receive 6 specimen grids Ø2.3 mm.

Suited for drying cell suspensions applied to film-coated grids.

Order No.	BU 011 122 -T

Like BU 011 122 -T, but for support grids measuring Ø 3.0 mm.

Order No.	BU 011 123 -T

Specimen baskets

Made of stainless steel whith screw-on fine wire netting cover (20 M/cm).

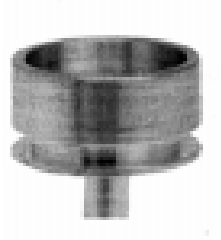
Dimensions: Ø16 m, height of 12mm

Order No.	B 8010 170 37

Like B 8010 170 37

Dimensions: Ø23mm, hieght of 12mm

Order No.	B 8010 170 38



SEM specimen stub

Specimen stubs to fit SEM made by Cambridge, Etec, Philips and LEO.
Suitable for drying suspensions which are subsequently analysed by SEM.

Order No.	BU 011 125 -T

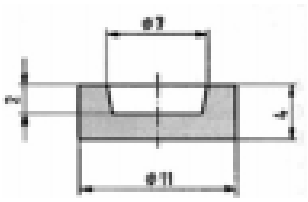
Holder for filter discs

To receive 6 filter discs pairs.

Consisting of:

- 1 Apertured disc with twist lock
- 1 Apertured disc with grip handle

Order No.	BU 011 130 -T



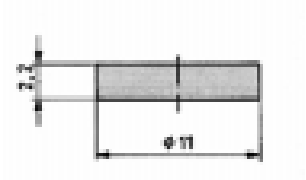
Filter discs

Serve to receive extremely small specimens or suspensions.

After critical point drying, the specimens are directly examined under the SEM together with the filter discs.

6 pieces per pack.

Pore size	Order No.
16 - 40 µm	B 8010 171 00
10 - 16 µm	B 8010 171 01
1.0 - 1.6 µm	B 8010 171 02

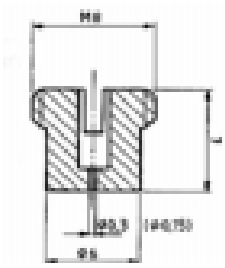


Filter discs cover

To fit on the filter discs.

6 pieces per pack.

Pore size	Order No.
16 - 40 µm	B 8010 171 03
10 - 16 µm	B 8010 171 04
1.0 - 1.6 µm	B 8010 171 05

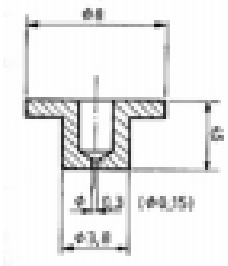


Media inlet diaphragm

Serves to control the inlet flow speed of the drying medium.

Is inserted into the inlet port.

Perforation	Order No.
150 µm (already built-in)	BU 016 994
300 µm	BU 016 995

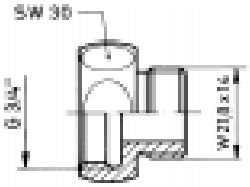


Media outlet diaphragm

Serves to control the outlet flow of the drying medium.

Is innserted into the outlet port.

Perforation	Order No.
150 µm (already built-in)	BU 015 541
300 µm	BU 015 543



Reducing adapter

Adapter for connection of a freon gas bottle (instead of CO_2) to the critical point device.

Made of brass with gasket.

Order No.	B 8010 114 73

Media inlet metering valve

Is used to control inlet speed of the drying medium with infinitely variable setting.

(For extremely sensitive specimens)

Consisting of:

- 1 Metering valve
- 1 Angle bracket mount
- 1 Connection piece kit

Order No.	BU 011 129 -T

Flow meter

Gas flow measuring device with hose connection to the gas outlet. For precision discharge of gaseous drying agent after critical point drying.

Order No.	BU 011 102 -T

Mechanical spare parts

Consisting of:

- 3 Bursting membrane (BU 011 980)
- 10 Fuses (B 4666 448)
- 3 Seals (BU 011 799)
- 1 Seal (BU 011 646)
- 10 O-rings (B 8010 11475)
- 2 O-rings (B 8010 11474)
- 1Magnetic stirrer rod (B 8010 114 76)
- 1 Pt 100 sensor (B 8010 115 63)
- 1 Heater cartridge (B 8010 055 27)
- 1 Needle valve (B 8010 154 10)
- 1 Solenoid valve (B 8010 154 12)

Order No.	BU 0 11 650 -T

Consumable materials

Amyl acetate

As intermediate fluid
250 ml

Order No.	B 8010 060 15

Acetone

Dehydrating reagent
(UV spectroscopy quality)
500 ml

Order No.	B 8010 130 43

Methanol

Dehydrating reagent
1 liter

Order No.	B 8010 130 41

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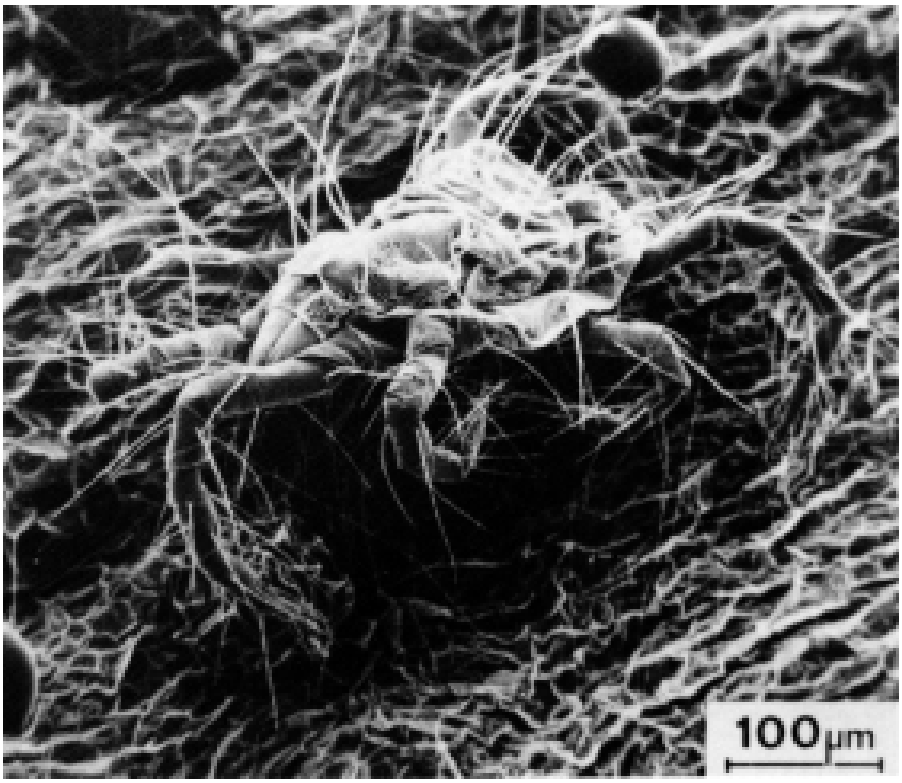
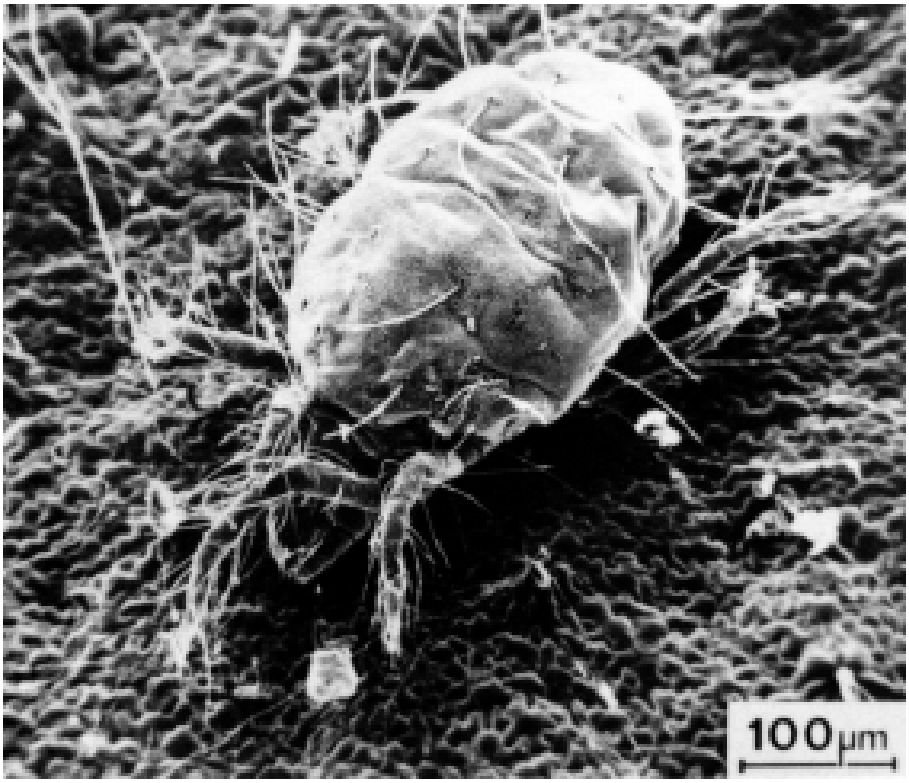
Comparative Results

Air drying



Spider mite
SEM micrography
made after drying in air.
The body of the mite has completely collapsed.
Magnification = 145 x

Critical point drying



Spider mite
SEM micrography
made after critical point drying. The shape of the mite is well preserved.
Magnification = 145 x

BAL-TEC AG
FL - 9496 Balzers
Phone: ++41 75 388 12 12
Fax: ++41 75 388 12 60
E-mail: sales@bal-tec.com
Internet: http://www.bal-tec.com

BAL-TEC GmbH
D - 58579 Schalksmühle
Phone: ++49 2355 9030 73
Fax: ++49 2355 9030 74
E-mail: BAL-TEC@t-online.de