

EXTENDED HEIGHT MINI ENVIRONMENTAL CHAMBER FOR TABLE TOP MACHINES

EC1639

Operating Instructions

severn thermal solutions

Innovation in thermal systems



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Electromagnetic Compatibility

Where applicable, this equipment is designed to comply with International Electromagnetic Compatibility (EMC) standards.

To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection (earth).

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1.0 General Safety Precautions

Chambers involve inherent hazards from high temperature and sub-zero temperature surfaces and components. It is important to be aware of all parts which are potentially hazardous, particularly the insides of chambers and components which have been in them.

Wherever it is considered that safety is compromised, press the fan button OFF on the handset or press the mains circuit breaker OFF (O) on the rear panel.

Carefully read the operating instructions and observe all Warnings and Cautions. The term Warning is used where a hazard may lead to injury or death. The term Caution is used where a hazard may lead to damage to the equipment or to loss of data.

Ensure that the system set-up and the test being performed constitutes no hazard to operators or others. Make full use of all safety features as these are supplied for everyone's safety to enable the operation of the equipment within the limits for which it was designed.

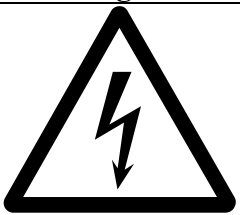

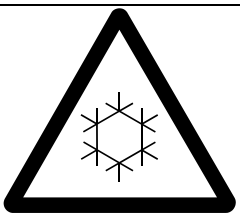
The following pages detail various general warnings that must be heeded at all times. There are more specific Warnings and Cautions in the text whenever a potential hazard exists.

The best safety precautions are a thorough understanding of the equipment by reading the instruction manuals and always using good judgement.

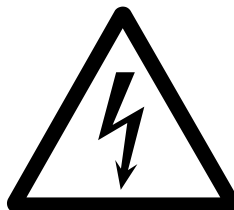
Warning Signs Used

Note: When a symbol is enclosed in a triangle, it becomes a warning sign. A symbol on its own may be a warning, e.g. the "dangerous voltage" symbol, or may indicate the use of a control e.g. "Transfer of heat, general" symbol means that the control switches heating on and off. Chamber controls are shown in the operations chapter.

Table 1, Warning Signs

| Sign | Meaning | Standard |
|---|-----------------------------|---|
|  | Caution - dangerous voltage | Symbol derived from BS6217:1981 (417-IEC-5036-a) "Dangerous voltage" |
|  | Caution – hot surface | Symbol derived from ISO7000-0535 "Transfer of heat, general" Warning sign derived from BS 6217:1981 (417-IEC-5041) |
|  | Caution – cold surface | Symbol derived from ISO 7000:1989 022 – graphical symbol for use on equipment cooling |

Electrical Warning



The chamber must be connected to a suitable earth point before mains electricity is connected to the unit. Disconnect the unit from the mains before removing any panel/cover or changing any fuse.

Disconnect equipment from the electrical power supply before removing any electrical safety covers or replacing fuses. Do not reconnect the power source while the covers are removed. Refit the covers as soon as possible.

Electrical Disconnection Hazard

Warning

This system has been supplied with a mains filter for electromagnetic noise filtration, as a consequence there is a risk of an electric shock due to the residual charge in the filtering capacitor. The customer must leave adequate time for any residual capacitance to discharge before touching the conductors of the mains cable attached to the control unit after disconnection from the mains supply. If in doubt consult a qualified electrician.

This unit incorporates mains filtering which reduces the electrical noise emission to below international standards. The filter has a residual capacitance, which when the equipment is disconnected from the mains supply, can leave the filter charged and the risk of electrical shock if the mains leads are touched. Until the charge has had sufficient time to discharge through the air, do not touch the mains lead conductors even when the unit is disconnected from the mains. Usually the charge dissipates in less than five minutes but the time is strongly dependent on atmospheric conditions. If in doubt consult a qualified electrician before disconnecting the unit mains supply.

Thermal Contact

Warning



Temperatures above 60°C and below 0°C can cause burns and personal injury. Suitable protective clothing and receptacles must be provided when handling or removing hot items from the furnace.

Temperatures above 60°C and below 0°C can cause burns and serious injury. Although this unit has been designed to a high standard of safety, it is inevitable that the points where specimens or processed items leave the chamber, can be at temperatures outside these limits. The illustrated temperature warning symbol is fixed to those points of the chamber where temperatures above 60°C can be expected. Particular care should be taken with items that are removed from chambers whilst still hot or cold. Such items can maintain their temperature for long periods.

Microtherm Insulation

Warning

This environmental chamber contains Microtherm insulation which can cause skin and respiratory inflammation in some individuals. Do not attempt to disassemble the chamber without taking suitable precautions which are identified in the enclosed manufacturer's safety sheet.

Microtherm insulation is used in the construction of the test chamber. As delivered all insulation is sealed and contained by covers. If, during service or, for example, when replacing elements, the insulation becomes exposed, it is essential that protective clothing is worn.

Glass Fibre Insulation

Warning

This chamber contains glass fibre insulation which can cause skin, eye or upper respiratory tract irritation in some individuals. Operators must read the attached manufacturer's health and safety information before disassembling the chamber insulation.

The glass fibre insulation used in the 3119 series chambers is retained within painted mild steel panels and does not represent a hazard. The above precautions must be taken when the chamber is disassembled to the point where the insulation is exposed.

Cryogenic Gases: Asphyxiation, Frostbite and Toxicity

Warning

The operator MUST consult their supplier's Material Safety Data Sheet on the particular cryogenic gas being used before using this equipment at sub-ambient temperatures.

Cryogenic Gases - Asphyxiation

Warning

When cryogenic gases are used with the chamber ensure that all spaces around the pull rods and extensometer are sealed and that the exhaust port is connected to a suitable extraction system. Do not allow operators to work in an environment of <20% oxygen. Atmospheres of <10% oxygen can lead to brain damage and death.

When liquid nitrogen or liquid carbon dioxide are used as cryogenics, large volumes of the gases are formed. Typical expansion volumes from liquid cryogen to gas are of the order of 300 to 600 times. The cryogenic gas will leave the chamber by the exhaust port, through any space around the pull rods and by the extensometer port. Inevitably, even if the exhaust port is connected to an extract, cryogenic gas will disperse into the ambient temperature atmosphere around the chamber.

Large volumes of carbon dioxide or nitrogen will effectively reduce the oxygen level in the air. The normal percentage of oxygen in air is 21%. If the oxygen level drops below 20% symptoms of asphyxiation can occur. These increase in severity from diminution of physical and intellectual performance without the person's knowledge

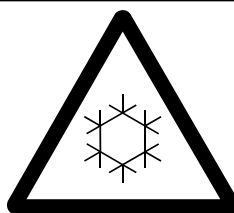
(<18% O₂) to possible fainting (<11% O₂), unconsciousness, brain damage or death (<6% O₂).

When cryogenic gases are being used the chamber exhaust **MUST** be connected directly to a suitable extraction system and the spaces around the pull rod and extensometer port must be sealed. The residual atmospheric oxygen content can be monitored with a suitable oxygen meter.

Note: Extraction systems may need to meet legislative requirements.

Cryogenic Gases - Frostbite

Warning



Temperatures below 0°C can cause burns and personal injury. Suitable protective clothing and receptacles must be provided when handling or removing cold items from the furnace.

Cryogenic liquids and gases, because of the low temperatures involved can cause damage to the skin and lungs as well as hypothermia. Always wear protective clothing when handling parts of the environmental chamber or components below 5°C. Avoid breathing cold air to prevent lung damage and avoid hypothermia by preventing operators working in cold air without adequate protective clothing.

Whenever possible, when opening the chamber door, use the door as a shield. This is to prevent the inhalation of concentrated carbon dioxide or nitrogen gas. Thick gloves, preferably not of woven material, must be worn at all times when reaching into the chamber. The gloves should be a loose fit so that they can be easily removed if liquid coolant or fragments of broken specimen drop onto or into them. For this reason gauntlet gloves are not recommended.

Because of the low temperatures involved, liquid nitrogen or carbon dioxide or even the cold vapours produced by these gases can produce damage to the skin similar to heat burns. Skin coming into contact with cold items may stick fast, causing the flesh to tear upon removal. The immediate treatment is to place the affected part in tepid water (between ambient temperature and blood heat) to restore the body temperature, before applying sterile dressings. If necessary seek hospital attention.

Cold vapours or gases from the cryogenic liquids may cause frost bite given prolonged or severe exposure of unprotected parts. Symptoms are a local pain. Frozen tissues are painless and appear waxy, with a pale yellowish colour. Thawing will cause extreme pain and possible shock.

The immediate treatment for frost bite is to loosen any clothing that may restrict blood circulation and seek immediate hospital attention. Do not apply direct heat to the affected parts, but if possible place the part in tepid water. Sterile dressings should be

used to protect damaged tissues from infection or further injury, but they must not be allowed to restrict blood circulation.

Transient and short exposure to very cold gas or vapour produces discomfort in breathing and can provoke an attack of asthma in susceptible persons. Prolonged inhalation of cold vapours and gases, whether respirable or not, is unlikely to damage the lungs unless the temperature is so cold and exposure so prolonged that the mouth and nose become frost bitten.

Cryogenic Gases - Toxicity

Warning

Do not allow operators to work in atmospheres of greater than 0.5% carbon dioxide. If in doubt measure the carbon dioxide level with a suitable meter.

Whereas nitrogen is not toxic, carbon dioxide is. Concentrations of >0.5% carbon dioxide can give rise to a range of symptoms depending on the level and an individual's susceptibility. These vary from a feeling of suffocation and increased breathing rate (>2%), headaches, dizziness, laboured breathing and impaired judgement (>5%), fatal after 4 hours (>9%), and immediate unconsciousness and death after a few minutes (>12%). Operators must note that carbon dioxide is heavier than air and that the highest concentrations will accumulate at floor level and in pits or depressions in the floor.

2.0 Introduction

EC1639 is an environmental chamber designed for use on the Instron family of 4400 and 5500 tabletop electromechanical testing machines. It is designed for use to +250°C and down to -70°C with an optional cooling package. The door is of a unique diagonal design allowing the user maximum access to the load train and is fitted with a micro-switch which stops both heating and cooling when the door is opened. All of the internal surfaces are stainless steel and are insulated by glass fibre and Microtherm insulation. The chamber is available in both 115V and 230V versions for 50/60Hz operation.

The chamber fits securely on the machine base plate using a simple fixed bracket and is designed so that the Instron test machine control bracket can be transferred to a 'T' slot on the right hand side of the chamber.

The chamber is controlled by a Eurotherm Instruments 2216 controller which has the option of RS232 communications. Two internal alarms, 1FSL normally set at 0°C or -80°C or 2FSH normally set at 260°C, within the instrument provides protection against over or under temperature excursions.

3.0 Specification

3.1 Dimensions

| | | |
|-----------------|---|-------|
| Overall Height | - | 650mm |
| Overall Width | - | 400mm |
| Overall Depth | - | 235mm |
| Internal Height | - | 550mm |
| Internal Width | - | 140mm |
| Internal Depth | - | 140mm |
| Weight | - | 31Kg |

3.2 Operating Performance

| | | |
|---|---|----------------------------|
| Maximum Operating Temperature | - | +250°C |
| Minimum Operating Temperature | - | - 70°C (if cooling fitted) |
| Time to Min or Max temperature from ambient | | <30 Minutes |
| Temperature Stability | - | ±2 °C |

3.3 Services

| | |
|---------------|---------------------------------------|
| Rated Voltage | 115 or 230V(Factory Set) 50/60Hz, 1ph |
| Rated Current | 7.5Amps @ 115V or 3.8Amps @ 230V |
| Rated Power | - 860 Watts |

3.4 Control System

| | | |
|----------------------|---|--|
| Control Instrument | - | Eurotherm 2216 |
| Alarm | - | Internal to the 2216 |
| Control Thermocouple | - | Type K |
| Circuit Diagram | | 19095A3 Issue A (115V) 19096A3 Issue A (230V) |

3.5 Control Parameters

| | | | | |
|-------------------|----|------|-------------------------|------|
| Proportional Band | Pb | 2% | Low cutback Lcb | 3.3 |
| Integral Time | ti | 16 s | High cutback Hcb | 12.4 |
| Derivative Time | td | 2 | Relative cool gain relc | 0.26 |

3.6 Fuses

| | | | |
|-----|-----------------------------|----|-----------|
| CB1 | 12A (115V) | or | 5A (230V) |
| FS1 | 2A(T) Instrument fuse | | |
| FS2 | 2A(T) 24V Circuit protector | | |

4.0 Installation

4.1 Warning

Refer to the SAFETY section of this manual for information on ELECTRICAL SAFETY before installing this chamber.

4.2 Unpacking

Carefully remove all packing material from both the interior and exterior of the chamber.

Position the chamber securely using four M6 bolts on to the machine using the brackets provided. Adjust the vertical alignment of the chamber using the bracing bracket and T-slot nut.

Ensure that the perforations in the top and bottom of the right hand side of the chamber are not obscured.

4.3 Connecting the chamber

Ensure that the earth connections are made before connecting electrical power to the chamber.






Insert the power cable of the chamber into the socket on the right hand side of the chamber and connect to a suitable single phase electrical supply – see the specification section and chamber voltage on the serial number plate.

If a cooling package is included connect the cooling inlet port to a suitable liquid nitrogen or carbon dioxide supply depending which cooling package has been fitted.

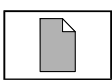



The mini-testing machine controller can be transferred to the 'T' slots on the right hand side of the chamber.

5.0 Operation

5.1 Instrumentation and Controls -

| Indicator/Control | Type | Function |
|--|---|--|
|  | Black O/I switch positioned on right hand side of the chamber | Switches mains power on to the chamber and acts as a re-settable over current circuit breaker |
|  | Switch | Switches fan ON/OFF and allows heating or cooling to be selected. Switching the fan off stops all heating or cooling |
|  | Switch | Switches heating ON/OFF but will only operate when the fan is on |
|  | Switch | Switches cryogenic gas valve ON/OFF if fitted. Only operates if the fan is on. |
|  | Switch | Switches interior light ON/OFF. |



Eurotherm 2216 Controls

| Indicator/Control | Type | Function |
|---|-------------------------------|---|
|  | Membrane pad Page Button | Used to move from column to column of control and configuration functions – see 2216 manual |
|  | Membrane Pad Scroll Button | Used to move down column of control and configuration functions |
|  | Membrane pad Down Button | Used to move set point temperature and all other functions down |
|  | Membrane Pad Up Button | Used to move set point temperature and all other functions up |


Please note that the user should refer to the Eurotherm 2216 manual for a full description of the controller and its operation. The 2216 has been factory set for efficient use with EC1639 with temperature displayed in °C.

5.2 Operation

Operation of the EC1639 mini chamber has been simplified for ease of use and functionality. First check that the chamber is firmly and correctly fixed to the testing machine and that the load train is fully and safely assembled.


Close the chamber door and switch the I/O contact breaker on. Use the up and down buttons on the 2216 to select the desired set point and press the fan  and heat  buttons. The chamber will now begin to heat to the desired set point and control there.

If cooling is required select the cool button  ensuring that the appropriate cryogen is connected and available.

Use the light switch  to control the internal light.

To switch the chamber heating and cooling functions off switch the appropriate switches off. Note that switching the fan off will automatically switch the heating and cooling functions off but it is better practice to switch the heating off whilst the fan is still running to allow the heating element to cool down in an air flow.

Finally switch the circuit breaker I/O switch off.

The 2216 has two internal latching alarms, 1FSH, factory set at 260°C and 2FSL, set at -80°C when a cooling package is fitted, which will protect the chamber from excess temperature rise or cooling by switching off both heating and cooling. Once either of these alarms is triggered the chamber will neither heat or cool and the appropriate alarm code, (1FSH or 2FSL) will flash alternately with the set point. Both alarms can be re-set once the chamber temperature is inside the alarm conditions by pressing the page button () , at which point the chamber will resume heating or cooling.

6.0 Maintenance and Spares

6.1 Maintenance

Little maintenance is required on the chamber EC1639 other than keeping it clean and free from dust and changing the internal light bulb when necessary. The bulb can be removed when the chamber is cool and the electricity supply switched off, by first unscrewing the glass lens and then pulling the quartz halogen bulb out. Note that when replacing the bulb it must NOT be touched with an ungloved hand since the ionic impurities on skin can cause the bulb envelope to degrade at temperature.





6.2 Spares

The Chamber Model Number and Serial Number should be quoted whenever enquiring about spares.

The following spares are available :

- Element
- Thermocouple
- Fuses
- Fan Motor
- Light Bulb

7.0 Fault Finding

| Fault | Possible Cause |
|------------------------------------|---|
| Eurotherm 2216 fails to illuminate | <ol style="list-style-type: none"> 1. Check chamber connected to mains supply 2. Check mains circuit breaker switch on right hand side of chamber is on (I) 3. Check Fuse F1 |
| Chamber fails to heat | <ol style="list-style-type: none"> 1. Check that the Eurotherm set point is above ambient temperature 2. Check door is closed 3. Check fan is on  4. Check heating is selected,  5. Contact an Instron service engineer |
| Chamber fails to cool | <ol style="list-style-type: none"> 1. Check a cooling accessory is fitted (CO2 or LN2) and that it is connected to a cryogenic source which is switched on. 2. Check that the Eurotherm set point is below ambient temperature 3. Check door is closed 4. Check fan is on  5. Check cooling is selected,  6. Check F2 <p>Contact an Instron service engineer</p> |
| Light does not operate | <ol style="list-style-type: none"> 1. Check F2 2. Check bulb (see maintenance section) |
| | |

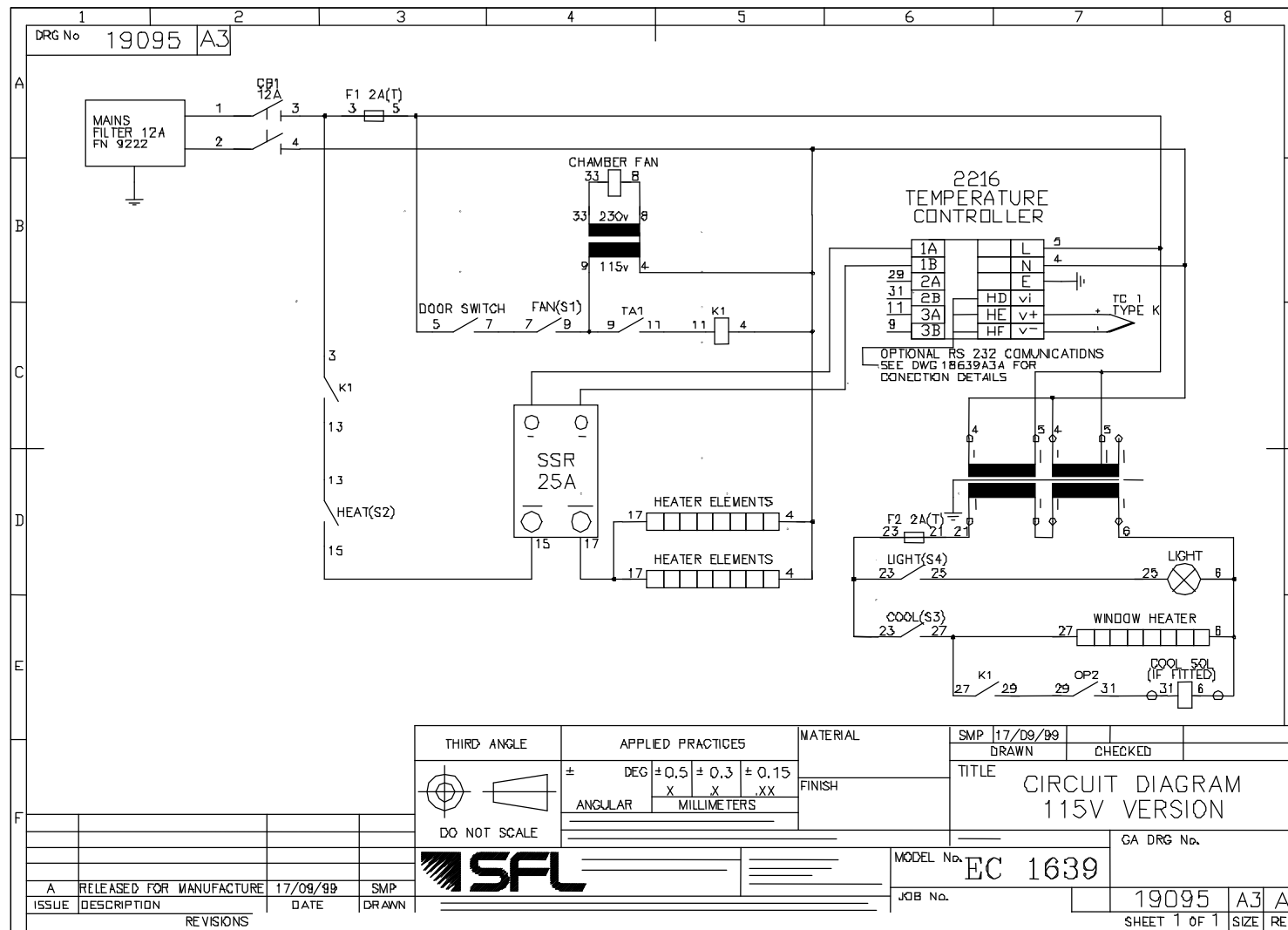


Figure 1 EC1639 Circuit Diagram - 115V version

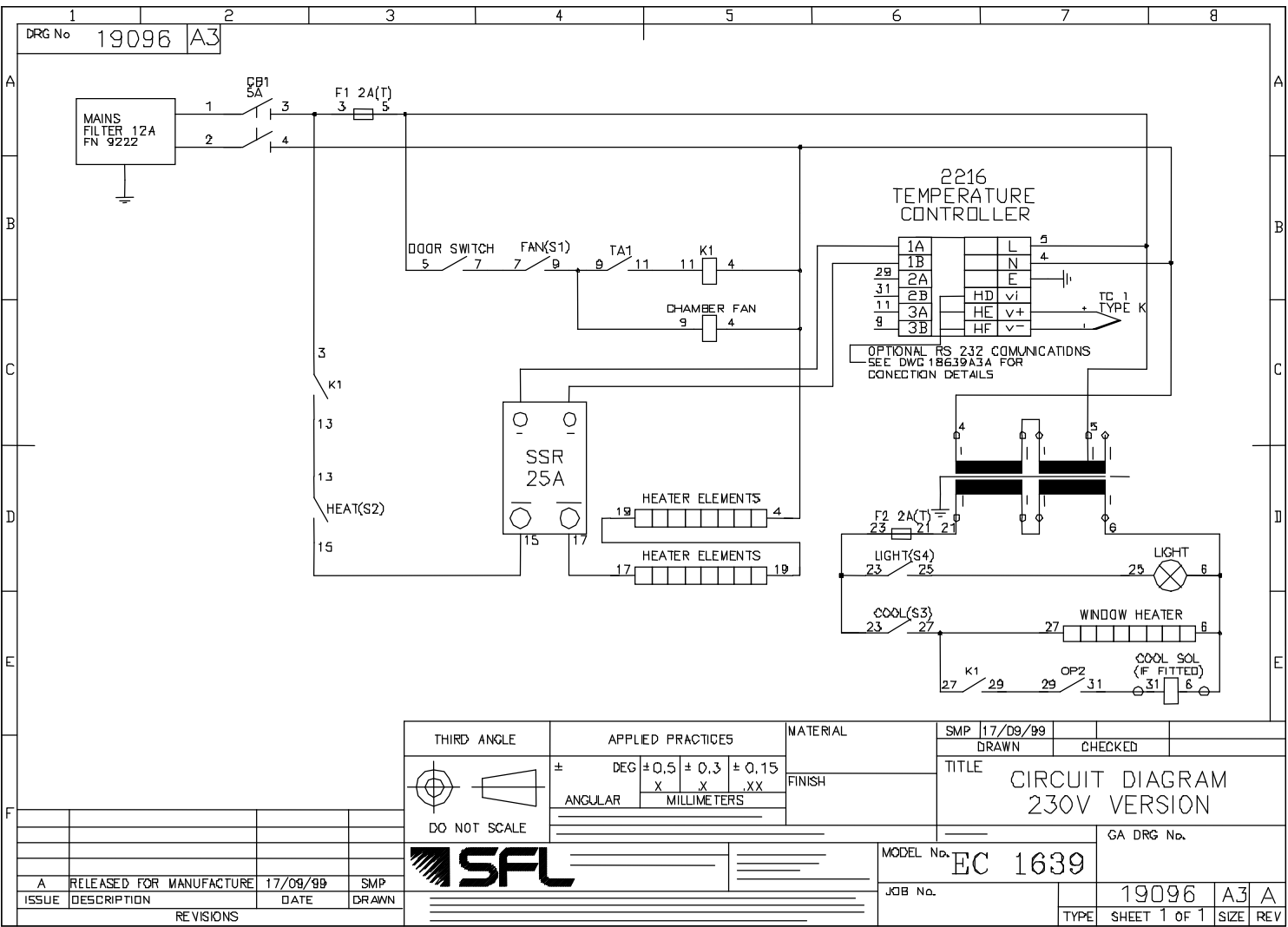


Figure 2 EC1639 Circuit Diagram - 230V version

Microtherm Safety Data Sheet



SAFETY DATA SHEET

MICROTHERM Silica Based Thermal Insulation Products

ISSUE NUMBER: 4

DATE: 29/5/97

Zortech International Limited

1) IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY

TRADE NAME(S)

Microtherm

Grades – **G, Super G, Super G Hydrophobic.**

Forms – MPS, Panel, Block, Moulded, Quilted, Slatted.

MANUFACTURER(S):

Micropore International Limited

Hazdor Hall, Droitwich, Worcestershire
WR9 7DJ, England
Phone: (01905) 793333 Fax: (01905) 795193

Nippon Microtherm Ltd.

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3-1, Nishi-Shinjuku 2-chome, Shinjuku-ku,
Tokyo, 163-09, Japan
Phone: (003) 342 1789 Fax: (003) 342 1761

Ceramaspeed Inc.

1227 McArthur Road,
Maryville, Tennessee 37804, USA
Phone: 001 423 681 7070 Fax: 001 423 681 0102

Micropore Insulation Limited

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Phone: (0151) 606 6200 Fax: (0151) 606 6216

Microtherm Inc.

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Microtherm Europa NV.

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Belgium
Phone (03) 760 1980 Fax: (03) 777 68 20

Ceramaspeed Limited

Hazdor Hall, Droitwich, Worcestershire
WR9 7DJ, England
Phone: (01905) 794211 Fax: (01905) 79519

2) COMPOSITION/INFORMATION ON INGREDIENTS

| | |
|--|-----------|
| Amorphous silica | 50 to 90% |
| Titanium dioxide | 10 to 59% |
| Glass filaments. nominal diameter greater than 9 microns | 0 to 12% |
| Aluminium oxide | 0 to 25% |

Microtherm G and Microtherm Super G insulation may be supplied encapsulated in borosilicate glass cloth.

3) HAZARDS IDENTIFICATION

The filament reinforcement components can cause irritation of the skin, eyes, and upper respiratory tract. Amorphous silica has a drying action on skin.

Dust produced from Microtherm G or Microtherm Super G insulation products may, like any other dust, aggravate pre-existing upper respiratory and lung diseases.

4) FIRST AID MEASURES

| | |
|--------------|---|
| INHALATION | Signs / Symptoms Irritation or soreness in throat and nose. In extreme exposures, some congestion may occur. First Aid Remove affected person to fresh air if symptoms persist. |
| SKIN CONTACT | Signs / Symptoms Temporary irritation or rash. First Aid Rinse affected areas with water, taking care not to scratch or rub. Seek medical attention if irritation persists. |
| EYE CONTACT | Signs / Symptoms Temporary irritation or inflammation First Aid Flush immediately with copious amounts of water. Do not rub eyes. Seek medical attention if irritation persists. |
| INGESTION | Signs/Symptoms None known. First Aid In the event of suspected problems, seek medical attention. |

Insulation Material Safety Data Sheets

5) FIRE FIGHTING MEASURES

Microtherm insulations are classified as “non-combustible” by tests to BS 476 Part 4: 1970(1984) Fire Tests on Building Materials and Structures: Non-combustibility test for materials [=ISO /R1182]. Use extinguishing agents suitable for the type of surrounding combustible materials.

6) ACCIDENTAL, RELEASE MEASURES

PERSONAL PRECAUTIONS - In the event of high dust levels use approved respiratory protective equipment (see Section 8).

METHODS FOR CLEANING UP - Powder and fragments should be cleaned up using a method that will avoid the creation of dust in the workplace atmosphere. Use of a vacuum cleaner fitted with an exhaust air filter fine enough to trap the dust is recommended. Airborne dust is, also, unlikely to be generated if used Microtherm 3 or Microtherm Super G insulation is thoroughly wetted prior to its removal.

7) HANDLING AND STORAGE

The handling or installation of Microtherm G or Microtherm Super G insulation, especially a form encapsulated in glass cloth, is unlikely to generate significant quantities of airborne dust.

Dust is likely to be generated, however, if Microtherm G or Microtherm Super G insulation products have to be machined, cut to size, broken up, or removed from equipment after prolonged exposure to high temperature. In such circumstances, adequate control of personal exposure can usually be achieved by the use of engineering measures, such as local exhaust ventilation (see Section 8).

Microtherm (3 and Microtherm Super G insulation products should be stored in dry conditions.

8) EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING MEASURES - Engineering controls such as dust extraction at the point of work may be required to keep dust levels to a minimum.

OCCUPATIONAL EXPOSURE LIMITS

UK "E11 40/97 Occupational Exposure Limits 1997 published by the Health and Safety Executive:-

| TOTAL INHALABLE DUST | RESPIRABLE DUST |
|--|--|
| (8-hour time weighted average reference period) | |
| Silica 6 mg/m ³ [OES ^A] | Silica 2.4 mg/m ³ [OES] |
| Titanium dioxide 10 mg/m ³ [OES] | Titanium dioxide 4 mg/m ³ [OES] |
| Glass filament 5 mg/m ³ [MEL ^B] | Glass filament 2 fibres/ml [MEL] |
| Aluminium oxide 10 mg/m ³ [OES] | Aluminium oxide 4 mg/m ³ [OES] |

A) OES = Occupational Exposure Standard

B) MEL = Maximum Exposure Limit

German "List of MAK and BAT Values 1996" for maximum concentrations at the workplace:-

| | |
|------------------|----------------------------------|
| Amorphous silica | 4 mg/m ³ (total dust) |
| Titanium dioxide | 6 mg/m ³ (fine dust) |
| Aluminium oxide | 6 mg/m ³ (fine dust) |

Insulation Material Safety Data Sheets

PERSONAL PROTECTIVE EQUIPMENT - Where sufficient control of exposure to airborne dust cannot be achieved by engineering measures alone, or irritation problems may arise, the following protective equipment may be necessary:

Respiratory Protection: Approved, properly fitting, respirators with the appropriate nominal protection factor.

Hand Protection: Gloves. Moisturising cream may prevent the drying of the skin in contact with silica dust.

Eye Protection: Goggles or safety glasses with side eye shields.

Skin Protection: Overalls that are loose fitting at the neck and the wrist.

9) PHYSICAL AND CHEMICAL PROPERTIES

| | | | |
|-----------------------|---|------------------------|-----------------|
| Appearance: | Beige solid often encapsulated in glass cloth | Odour: | None |
| pH Value: | ca. 4 - 5 (suspension; 40 g/l water) | Boiling Point: | Not applicable |
| Melting Point: | >1700°C (silica) | Flash Point: | Not applicable. |
| Flammability: | Not applicable. | Autoflammability: | Not applicable. |
| Explosive Properties: | Not applicable, | Oxidising Properties: | Not applicable. |
| Vapour Pressure: | Not applicable. | Relative Density: | 0.2 - 0.4 |
| Solubility: | ca. 0.1 g/l (water, 25°C) | Partition Coefficient: | Not applicable. |

10) STABILITY AND REACTIVITY

Prolonged use of Microtherm G at temperatures in excess of 900°C, or Microtherm Super G above 1000°C, may lead to the formation of cristobalite (a type of crystalline silica). The presence of compounds of alkali metals may lower the temperature at which cristobalite is formed.

Repeated exposure to cristobalite may cause silicosis, and the International Agency for Research on Cancer has classified crystalline silica as "probably carcinogenic to humans" (2A).

UK "EH 40/97 Occupational Exposure Limits 1997": Cristobalite, MEL = 0,3 mg/m³, 8-hour time weighted average respirable dust.

German "List of MAK and BAT Values 1996": Cristobalite = 0.15 mg/m³ (fine dust).

Note: Experimental work (undertaken within the Zortech Group) in which Microtherm Super G block was subjected to temperatures up to 1100°C in a furnace, for periods up to 28 days, provided no evidence of the presence of cristobalite. Similar tests conducted using Microtherm G insulation block, however, showed that cristobalite is generated at 1000°C after only 1 day.

The small amounts of organic components applied to the filaments, and some coatings and adhesives used with Microtherm G and Microtherm Super G insulation, will decompose, and may emit toxic products when heated. If sufficiently concentrated, these products can be dangerous to breathe.

11) TOXOLOGICAL INFORMATION

Amorphous silica: Drying action on the skin.

Glass filament: Can cause irritation of the skin, eyes, and upper respiratory tract. Diameter 9 - 11 microns. Does not generate fibres which fall within the WHO (World Health Organisation) definition of respirable fibres.

12) ECOLOGICAL INFORMATION

Microtherm G and Microtherm Super G insulations are inert materials, which remain stable over a considerable time.

Insulation Material Safety Data Sheets

13) DISPOSAL CONSIDERATIONS

Waste Microtherm G or Microtherm Super G insulations (even after use above 1000°C) are not classified as hazardous waste, and may generally be disposed of at a normal landfill site that has been licensed for the disposal of industrial waste. If there is a substantial dust content in the waste then some waste disposal operators may consider it to be difficult to handle and it may require special treatment.

Where Microtherm G or Microtherm Super G waste has been contaminated by products that may be classified as hazardous, expert guidance should be sought.

14) TRANSPORT INFORMATION

No special precautions are required.

15) REGULATORY INFORMATION

Relevant legislation and guidance includes:

United Kingdom

The Health and Safety at Work etc. Act 1974

The Chemicals (Hazard Information and Packaging) Regulations

The Control of Substances Hazardous to Health Regulations

HSE EH40 Occupational Exposure Limits

HSE EH46 Man-made mineral fibres

HSE EH64 Summary Criteria for Occupational Exposure Limits

MDHS 14 General methods for the gravimetric determination of respirable and total inhalable dust

MDHS 59 Man-made mineral fibre. Airborne number concentration by phase-contrast light microscopy.

Germany

Deutsche Forschungsgemeinschaft: MAK und BAT Werte Liste - Maximale Arbeitsplatzkonzentrationen und biologische Arbeitsstoffoleranzwerte (List of MAK and BAT Values - Maximum Concentrations and Biological Tolerance Values at the Workplace).

This Safety Data Sheet must not be construed to be a risk assessment for operations involving this range of products. As with any other material, the user is advised to carry out a risk assessment when working with any Microtherm G and Microtherm Super G insulation product, particularly when dust is being generated.

16) OTHER INFORMATION

Further information and advice on Microtherm G and Microtherm Super G insulation products can be obtained (in the first instance) from the Manufacturer's Technical Service Department.

NOTICE The information presented herein gives a hazard profile of the products named and is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet. It should be read and used in conjunction with the company's relevant literature. No responsibility can be assumed by vendor for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information given here does not constitute a product specification and should not be used as such. No authorisation is given or implied to practice any patented invention without license. MICROTHERM is a registered Trade Mark of Micropore International Ltd.
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Superwool Safety Data Sheet

105-0-EURO

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Thermal Ceramics**MATERIAL SAFETY DATA SHEET**

(Following 91/155/EEC)

SUPERWOOL Fiber Grade X-607
SUPERWOOL Blanket Grade X-607

MSDS NUMBER

015-0-EURO

DATE OF FIRST ISSUE

June 1st 1993

DATE OF LAST REVISION

| |
|--|
| 1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY |
|--|

IDENTIFICATION OF THE SUBSTANCE**TRADE NAMES** : See the above framed title**DENOMINATION** ; Man-made amorphous fibreIDENTIFICATION OF THE MANUFACTURER

FRANCE THERMAL CERAMICS DE FRANCE S.A.
 9 Rue du Colonel de Rochebrune
 91504 RUEIL MALMAISON Cedex
 Tel.: 33 147 49 05 60 1 Fax: 33 147 49 58 24

U.K. THERMAL CERAMICS LIMITED
 Tebay Road, Bromborough
 Wirral, Merseyside L62 3PH
 Tel. : 44 51334 4030 1 Fax: 44 51334 1684

| |
|--|
| 2. COMPOSITION / INFORMATION ON INGREDIENTS |
|--|

COMPOSITION

| COMPONENT | % | EINECS NUMBER | SYMBOL | R PHRASES |
|-------------------------|-----|---------------|--------|-----------|
| Glass, Oxide, Chemicals | 100 | 266-046-0 | N.A. | N.A. |

DESCRIPTION

This product is a soluble amorphous man-made mineral fibre.

Superwool Grade X-607 is above referred to as glass, oxide, chemicals.

| |
|----------------------------------|
| 3. HAZARDS IDENTIFICATION |
|----------------------------------|

MOST IMPORTANT HAZARDS**ACUTE HEALTH EFFECTS**

Product is a mechanical irritant to skin, eyes and upper respiratory system.

CHRONIC HEALTH EFFECTS

Studies on animal exposed to even very high concentration of fibres composing this product didn't show any chronic health effect

PRE-EXISTING CONDITIONS

As with any dust pre-existing upper respiratory and lung diseases may be aggravated.

| |
|------------------------------|
| 4. FIRST AID MEASURES |
|------------------------------|

SIGN / SYMPTOM OF OVEREXPOSURE**INHALATION**

Irritation or soreness in throat and nose. In extreme exposures some congestion may occur,

SKIN CONTACT

Rinse affected areas with water and wash gently with soap. Do not use detergent.

EYES

occur.

Flush eyes with large quantities of water. Have eye bath readily available where eye contact may occur.

INGESTION

Drink plenty of water.

OTHER INFORMATION

Acute irritation and / or inflammation are due to mechanical action

Seek medical attention if symptoms persist.

5. FIRE FIGHTING MEASURES

These materials are non-combustibles.

Use extinguishing agent suitable for type of surrounding combustible materials.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS

If spillage causes unnaturally high dust levels, use RPE as recommended in section 8.

ENVIRONMENTAL PRECAUTIONS

Do not flush spillage to drain and prevent from entering natural water courses.

Do not allow to be wind blown.

METHODS FOR CLEANING UP

Good housekeeping practices, such as planned cleaning, will reduce underfoot debris. Pick up large pieces and use a vacuum cleaner with a high-efficiency filter fitted to the exhaust for smaller pieces or dust; otherwise ensure the area is wetted down prior to brushing.

7. HANDLING AND STORAGE

HANDLING

Keep dust level to a minimum and below OEL (Occupational Exposure limit) (See Section 8).

STORAGE

Store dry and cool.

Recommended packaging material : recyclable cardboard and/or Plastic films.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

ENGINEERING CONTROL

Use engineering control such as dust extraction at point of work to keep dust level to a minimum (See also Section 8 Specific Control Parameters). In addition use a vacuum cleaner fitted with HEPA filters to collect debris.

SPECIFIC CONTROL PARAMETERS

| EINECS NUMBER | SUBSTANCE | METHOD | OEL VALUE |
|---------------|-----------------------|-------------------------|---|
| 266-046-0 | Superwool Grade X-607 | PCOM (2) Gravimetric | MEL 2 F.MI (1) MEL 5 mg/m ³ (1) |

(1) U.K. Health and Safety Executive guidance note EH40192 - list of OEL

(2) Phase Control Optical Microscope

PERSONAL PROTECTIVE EQUIPMENTS

GENERAL RECOMMENDATIONS

Maintain high standards of personal hygiene. Keep work areas regularly cleaned

RESPIRATORY PROTECTION

* 0 to 2 F/ml Optional disposable dust respirator (E.G. 3M 8810 or equivalent).

* 2 to 10 F/ml Half-face air purifying respirator equipped with high-efficiency particulate air filter cartridges.

* 10 to 50 F/ml Full-face air purifying respirator with high-efficiency particulate air filter cartridges or a powered air-purifying respirator equipped with similar cartridge filters.

Over 50 F/ml Please contact your manufacturer for assistance (See Page 1).

HAND PROTECTION

Use of gloves is recommended.

EYES PROTECTION

Wear goggles or safety glasses with sideshields. Do not wear contact lenses.

SKIN PROTECTION

Wear overalls which are loose fitting at the neck and wrists.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | | | |
|-----------------------|-------------|-----------------------|------|
| APPEARANCE | White fiber | ODOUR | None |
| BOILING POINT | N.A. | MELTING POINT | > |
| 120°C | | | |
| FLASH POINT | N.A. | FLAMMABILITY | N.A. |
| AUTOFLAMMABILITY | N.A. | EXPLOSIVES PROPERTIES | N.A. |
| OXIDING PROPERTIES | N.A. | VAPOUR PRESSURE | N.A. |
| SPECIFIC GRAVITY | 0.3 | SOLUBILITY | |
| Slight | | | |
| PARTITION COEFFICIENT | N.A. | | |

10. STABILITY AND REACTIVITY

| | | | |
|---------------------|------|--------------------|------|
| CONDITIONS TO AVOID | N.A. | MATERIALS TO AVOID | N.A. |
|---------------------|------|--------------------|------|

11. TOXICOLOGICAL INFORMATION

Toxicological information available on SUPERWOOL GRADE X-607 is as follows:

ACUTE TOXICITY Lethal dose 50 % (LD 50) / Lethal concentration 50 % (LC 50) : N.A.

CHRONIC TOXICITY

EXPERIMENTAL STUDIES

SUPERWOOL GRADE X-607 was designed for enhanced solubility in lung tissues. Rats have been exposed 6 hours a day, 5 days a week during 2 years at an average concentration of 200 F/ml (about 200 to 300 times higher than the concentration found in production plants) without showing any significant adverse effect in relation with SUPERWOOL GRADE X-607.

12. ECOLOGICAL INFORMATION

These products are inert materials which remain stable over the time.

13. DISPOSAL CONSIDERATIONS

Waste from these materials (even after use) is not classified as hazardous waste and may generally be disposed of at a normal tipping site which has been licensed for the disposal of industrial waste. Where such a waste has been contaminated by products which may be classified as hazardous, expert guidance should be sought.

Such a waste is normally dusty (unless wetted) and so should be properly bagged or contained for disposal. At some tip sites dusty waste may be treated differently in order to ensure they are dealt with promptly and to avoid them being wind blown.

14. TRANSPORT INFORMATION

Ensure that dust is not wind blown during transportation.

15. REGULATORY INFORMATION

EEC regulation is implemented in all EEC States through their own existing legislative system.
Some States may have more stringent requirements. Please refer to local regulations as for instance:

UNITED KINGDOM

COSHH Regulations

HSE EH40 - Occupational Exposure Limits – latest issue

HSE EH46 - Man-Made Mineral Fibre guidance note

HSE EH64 Summary Criteria for Occupational Exposure Limits

MDHS 14 General methods for the gravimetric determination of respirable and total inhalable dust

MDHS 59 Man-made mineral fibre. Airborne number concentration by phase-contrast light microscopy.

GERMANY

Deutsche Forstchungsgemeinschaft: Maximale Arbeitsplatzkonzentrationen und biologische

Hauptverband der gewerblichen Berufsgenossenschaften : ZH 1/120.31

france Circulaire du 19 Juillet 1982 relative aux valeurs admises pour les concentrations de certaines substances dangereuses dans l'atmosphère des lieux de travail

Norme AFNOR X43-269 Décembre 1991 - Détermination de la concentration en nombre de fibres par microscopie optique en contraste de phases - Méthode du filtre à membrane.

16. OTHER INFORMATION

When heating these products long enough at temperatures of about 1000 C, crystalline silica could be formed. In such case and until further information is available on long term tests please follow regulations applying to silica products when removing this product.

In order to keep dust emissions to the lowest, workers shall be trained in the safe handling of this product.

NOTA : Reasonable care has been taken in the preparation of the information contained in this Material Safety Data Sheet and is given in good faith. However, no warranty or representation with respect to such information is intended or given.