

Thermo Scientific  
**Use of Cleaning Kit  
for Mercury**

**Instruction Manual**

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HOME



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# Use of the cleaning kit for mercury (P/N 190 06047)

## 1. Introduction

This kit was developed to perform a mechanical cleaning of mercury after a porosimetric analysis in order to use it again for other measurements .

The kit does not allow to perform a distillation or a mercury chemical cleaning with acids.

The kit must be exclusively used under a suitable fumes hood.

As far as the handling of mercury is concerned, please refer to the instructions reported in Appendix A “*Use of mercury*”.

After a porosimetric analysis, mercury may be used again several times thanks to the procedure described in this manual.

The number of analyses that can be run using the same mercury, after it has been properly treated, depends on the mercury oxidation status. If after some time mercury becomes opaque losing its typical brightness, it means that it is covered with a layer of mercury oxide. In this case a mechanical cleaning is no longer effective, and a process of vacuum distillation or chemical cleaning in an acid medium is required. Also in case of an amalgam being accidentally formed by the reaction of mercury with samples unsuitable to porosimetric analysis, the filtering treatment performed with the kit becomes ineffective to make mercury reusable for other analyses. In this case the only possible treatment is a vacuum distillation.

Absolutely do not carry out these treatments (chemical cleaning with acids or vacuum distillation) using this kit. Contact companies specialized in the treatment and/or recycling of mercury.

In any case, by following the instructions of this manual it will be possible to use the same mercury for several analyses considering that the oxidation speed of mercury is relatively low at room temperature. The oxidation speed, in addition to be a function of the temperature and the time of contact with oxygen in the air, is also a function of the type of materials analyzed in the mercury porosimeter.

In fact some porous materials, typically metal based materials, may accelerate the oxidation process.

During a porosimetric analysis, mercury generally comes in contact with the porous sample (solid or powdered), with the silicone grease present on the dilatometer cone and with the dielectric oil used for pressurization.

Once the dilatometer has been removed from the autoclave, it is necessary to separate and clean the mercury from these substances to make it usable again.

After an analysis, the solid or powdered sample is irreversibly contaminated with mercury. It is not possible to recycle the sample nor to perform a decontamination procedure using this kit. The sample, once separated from mercury, must be placed inside an appropriate sealed container.

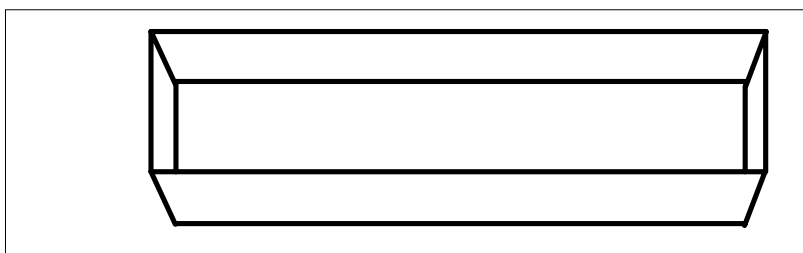
In a porosimetric analysis only a small amount of sample is generally used, and therefore the residues may be stored for a long time in appropriate airtight containers.

Contact specialized firms for the decontamination of the analyzed sample from mercury and mercury disposal.

## 2. Description of the parts constituting the cleaning kit

- *PVC basin*  
(P/N 240 11639)

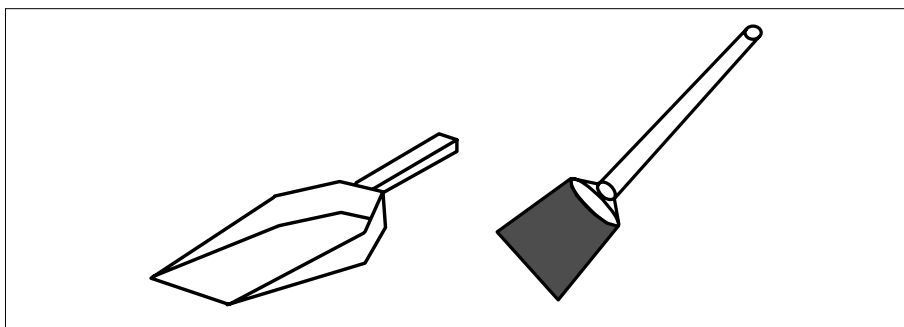
A PVC anti-acid basin, 430x330x95 mm (length x width x height).



The basin must be placed under a suitable hood. All operations involving handling of the dilatometers (opening, emptying and cleaning) must be carried out in the basin in order to avoid accidental spillage of mercury in the environment.

It is recommended to put all the items forming the kit and the materials that have come in contact with mercury into the appropriate basin.

- *Polyethylene scoop and relevant brush*  
(P/N 240 10122)  
*brush*  
(P/N 376 00300)



In case of an accidental spillage of mercury in the basin or on any work surface, it is possible to collect most of it using the brush provided, gently pushing the mercury drops into the scoop. Then pour the mercury into a suitable vessel and perform its filtration.

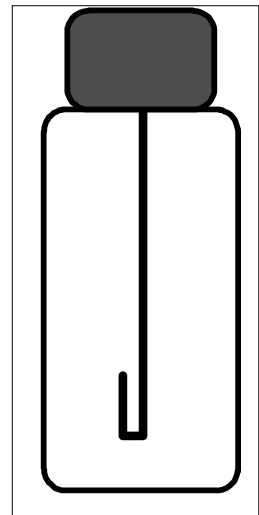
When mercury is spilled accidentally, not wetting the contact surfaces, it separates into many small drops of different sizes. Most of the mercury accidentally spoilt may be collected using the brush and the scoop, but it is difficult to recover very small drops with the brush. In this case, proceed as reported in Appendix A “Use of mercury” or, if the drops to be collected are in a limited amount, the Mercury Collector described below can be conveniently used.

After the use, the brush should be shaken inside the plastic container to eliminate any mercury drops from the brush bristles.

Both the brush and the scoop must be placed inside the basin after the use.

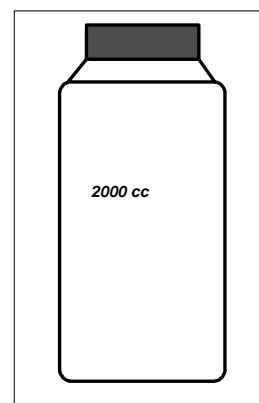
- *Mercury Collector*  
(P/N 240 14547)

The Mercury Collector allows to collect small drops of mercury accidentally spilled. It is not suitable to collect large quantities of mercury. Unscrew the cap of the plastic bottle. A special metal rod is fixed under the cap. Approach its hooked point to the mercury: the small drops will remain attached to the metal and can be removed. Introduce the metal rod into its container and delicately shake it against the internal walls: the mercury drops will fall inside the bottle. Once the operation is over, empty the bottle into the container for mercury. Screw on the cap again and put the Mercury Collector in the basin.

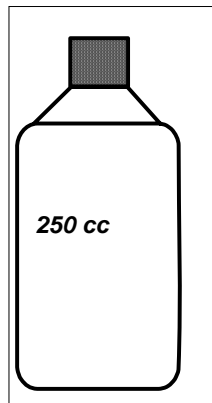


- *Polyethylene large neck bottle of 2 LT*  
(P/N 240 14548)

In this airtight bottle it is possible to collect the samples contaminated with mercury after the porosimetric analysis and the subsequent operation of separation reported later on.



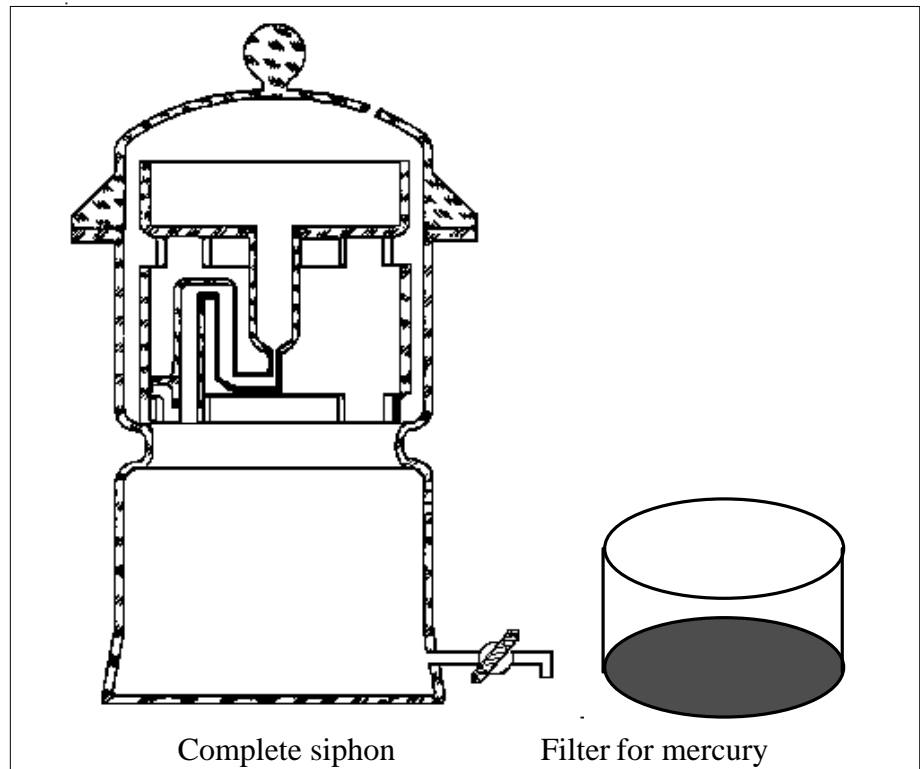
- *Polyethylene small neck bottle of 0,25 LT (P/N 240 14549)*



The small neck bottle may be used to store mercury after the cleaning procedure described below. The bottle must be closed with the appropriate cap and kept in the basin under the hood.

- *Mercury Cleaner (P/N 408 00302) and metal filter (P/N 281 13407)*

The Mercury Cleaner is a special pyrex glass siphon device allowing to eliminate by controlled decantation both solid and powdered sample residues from the mercury previously filtered by means of the proper filter. Moreover it is possible to remove from mercury any trace of dielectric oil.



The siphon consists of three main parts:

- pyrex cover
- pyrex container
- pyrex separating siphon

The siphon must always be used inside the appropriate basin. First of all spread some silicone grease for vacuum on the frosted surface of the cover; this operation is just the same as that of spreading silicone grease on a common laboratory desiccator.

Make sure that the tap present at the bottom of the container is closed and fill the bottom of the container with a proper solvent (n-hexane or acetone) up to about 1,5 cm from the bottom.

Introduce the separating siphon with the small basin turned upwards into the container and pour clean and distilled mercury into the siphon until a few drops escape from the lower section of the siphon and drop on the bottom of the container into the solvent.

The Mercury Cleaner is now ready to be used.

Still operating inside the basin, open carefully the dilatometer containing the mercury. In case the dilatometer is stucked, absolutely do not force its stem, but use the proper extractor that can be found in the Calibration Kit for Porosimeters separately supplied (P/N 190 06042). For the use of the extractor, please refer to the relevant instruction manual. Once the dilatometer is open, place the metal filter into the siphon container and pour the content of the dilatometer into the filter. Lift cautiously the filter and shake it gently to let mercury pass through the metal screen, the mercury will remain in the siphon container. A first rough mercury filtration has been performed. The sample remained inside the filter can now be transferred into the appropriate large neck airtight bottle. The sample is mercury contaminated and it can be kept inside the bottle for an indefinite time provided the container is maintained airtightly closed. The decontamination of the sample must be carried out by specialized firms.

The partially filtered mercury is furtherly cleaned by slow decantation in the special siphon and will be collected on the bottom of the vessel passing through the solvent layer.

The solvent has the function to remove completely the dielectric oil that impregnated mercury during the analysis.

Decantation generally lasts a few minutes, then the metal filter is removed and the vessel can be closed again using the proper cover previously spread with silicone grease.

The operation of emptying the dilatometer can be performed several times using the same solvent, and when the mercury level is 2/3 cm high from the bottom of the container, it can be discharged through the proper tap.

To discharge the mercury, carefully lift the vessel without removing the cover nor the siphon, then place the appropriate small neck plastic bottle below the tap; pay attention not to empty the container completely in order not to spill any solvent outside. Close airtightly the bottle containing the clean mercury with the proper cap. Now the siphon is ready for the treatment of more mercury.

The solvent can be used for several washings until it turns to a yellow-brownish colour. Then it is necessary to replace it after discharging it through the appropriate tap. Mercury is not soluble in these solvents, and therefore they are not contaminated. If after some time mercury looks opaque, it is necessary to perform a vacuum distillation or washing in acid medium. These operations must be carried out by specialized firms.

- *Washing of the dilatometer with a brush (P/N 376 00101) and an appropriate detergent (P/N 308 00301)*

The detergent in the kit is concentrated and allows to clean completely the dilatometer from the dielectric oil, that has impregnated it after the analysis, and from the silicone grease used to seal it.

It is a detergent based on biodegradable surfactants, without chrome, non toxic in contact with the skin, non corrosive. It can be used with metals, glass, plastic, rubber, etc.

Dilute the product in cold or hot water (in hot water the cleaning process is accelerated) according to the following ratios:

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0.7 - 3 % in water for water bath washing

0.2 - 2 % in water for ultrasound washing

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The percentage of dilution depends on the quantity of oil or grease to be removed.

Dilute the product in a basin containing cold or hot water (or in an ultrasound bath), immerse all parts of the dilatometer into the solution leaving them there for 10 - 20 minutes, eventually help the removal of silicone grease using the appropriate brush. Abundantly rinse with water and dry.



## USE OF MERCURY

*Data sheet*

<i>Symbol</i>	: Hg	<i>Formula</i>	: Hg
<i>Atomic weight</i>	: 200,61	<i>Atomic number</i>	: 80
<i>Oxidation states</i>	: 0, +1, +2	<i>Specific weight</i>	: 13,6
<i>Boiling point</i>	: 357 °C	<i>Melting point</i>	: -39 °C
<i>Relative density</i>	: 13,6 (H <sub>2</sub> O = 1)	<i>Vapour pressure</i>	: 1,5 x 10 <sup>-3</sup> mmHg
<i>Solubility in water</i>	: none		at 20 °C

- *General*

Mercury can be found in nature under the form of small drops of cinnabar (HgS). Elemental mercury is the only metal that at normal room temperature is found at the liquid state.

It is not soluble in water, and by reaction with different metals, among which gold, it forms an amalgam.

- *Toxicity*



Mercury has an extremely high vapour pressure and therefore it releases vapours even at room temperature.

Its vapour is toxic both inhaled and absorbed through the skin. Continuous exposure to low mercury concentrations may cause poisoning having kidneys as target organs.

The symptoms of mercury poisoning are: trembling hands, insomnia, lapses of memory, irritability, depression and possible loss of teeth accompanied by excessive salivation. The continuous contact of mercury or its vapours with the skin may cause dermatitis. Furthermore, in recent trials on animals a possible cancerogenic activity of mercury was observed as well as adverse effects on the reproductive system. Mercury is not combustible, but the concentration of vapours may rapidly increase with heat.

- *Use and Handling*



Before using mercury, carefully read the indications of hazard and the warnings reported on the labels of the original package as well as the information reported in the Safety sheet supplied by the manufacturer with reference to the CAS number (Chemical Abstract Service) 7439-97-6.



Before starting any operation with mercury, all metal objects, such as watches and jewels, must be taken off, and then eye-protection, gloves and a coat must be worn.

Mercury must be handled under a suitable hood.

- *Accidental spillage in the environment*

In case of accidental spillage of mercury on the work bench or on the floor, the following actions must be immediately taken to prevent exposure of the metal to the atmosphere:

- Suck the mercury drops using a pipette connected to a collecting vessel placed under vacuum. Alternatively, freeze the drops with liquid nitrogen (see *Note* ①) or with a mixture of carbon hydroxide and acetone and collect them on a piece of paper.

The recovered mercury must be stored under a hood in airtightly sealed containers.

Should it not be possible to take the above mentioned immediate actions, cover the mercury drops with water or preferably with a layer of glycerine in order to limit evaporation.

- Chemically treat the surfaces contaminated by tiny mercury drops, hardly recoverable by physical means, by spreading them with a mixture consisting of calcium hydrate, sulphur and little water. Leave the mixture in place to dry in the air for 24 hours and then carefully and abundantly wash the surfaces with water. Alternatively, neutralize the drops with specific decontaminants (e.g. MERCURISORB) following the instructions for use.



*If mercury has flown to water courses or sewage systems, immediately inform local Authorities.*

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*Note* ①



*Before using liquid nitrogen, read the indications of hazard and the instructions reported in the Safety sheet supplied by the manufacturer with reference to the CAS number (Chemical Abstract Service) 7727-37-9.*



*The operator must wear appropriate coat, shoes, gloves and protective screen.*

*Furthermore, the work environment must be properly aired.*

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