

# FERROVAC

ULTRA HIGH VACUUM TECHNOLOGY

---

## EXSICA3S, EXSICA2W, EXSICA3P Vacuum Exsiccator Cabinet

### Instruction Manual

---

*Version 1.3*

*11 January 2024*

---

THURGAUERSTR. 72, CH-8050 ZÜRICH, SWITZERLAND  
TEL. +41 44 273 16 38, FAX. +41 44 273 16 30  
[WWW.FERROVAC.COM](http://WWW.FERROVAC.COM), [SALES@FERROVAC.COM](mailto:SALES@FERROVAC.COM)

## **Warranty**

Ferrovac AG warrants this product to be free of defects in material and quality for 12 months from the date of shipment.

In case of proof of any defective parts in the product, at our discretion, we will either repair the product or replace it.

## **Warranty Limitations**

The warranty for this product does not apply to defects resulting from the following:

- non-observance of operational and safety instructions
- natural wear of components
- modifications to our products without our written consent
- misuse of any product or part of the product

*This warranty stands in place of all other warranties, implied or expressed, including any warranty of merchant-ability implied or fitness for a particular use.*

*Neither the company Ferrovac AG nor any of its employees shall be liable for any direct, indirect, incidental, consequential or special damages arising out of the use of its products, even if the buyer advises the company Ferrovac AG in advance of the possibility of such damages. Such excluded damages shall include but are not limited to: Costs of removal and installation, losses sustained as the result of injury to any person, or damage to property.*

## **Copyright**

Copyright 2014, Ferrovac AG. All rights reserved. All information in this document is the sole property of Ferrovac AG, protected by Swiss copyright laws and international conventions.

**Ferrovac AG grants the right for reproduction for the purchasers own use. No part of this manual may be reproduced or transmitted by any third party in any form or by any means and for any purpose without the written permission of Ferrovac AG.**

## Content

<b>WARRANTY</b>	<b>2</b>
<b>WARRANTY LIMITATIONS</b>	<b>2</b>
<b>COPYRIGHT</b>	<b>2</b>
<b>CONTENT</b>	<b>3</b>
<b>TERMS AND SYMBOLS</b>	<b>4</b>
<b>SAFETY PRECAUTIONS</b>	<b>4</b>
<b>1. INTRODUCTION</b>	<b>5</b>
<b>2. UNPACKING AND INSPECTION</b>	<b>5</b>
<b>3. PUMPING</b>	<b>6</b>
VARIANT 1 (SIMPLE CONFIGURATION)	6
VARIANT 2 (CONTINUOUS VACUUM CONDITIONS, SELF-MADE EXTENSION)	7
VARIANT 3 (INERT GAS ATMOSPHERE)	7
<b>4. VENTING</b>	<b>8</b>
EXSICA3S, EXSICA2W	8
EXSICA3P	9
<b>5. SPECIFICATIONS</b>	<b>10</b>
EXSICA3S	10
EXSICA2W	12
EXSICA3P	13
<b>6. SERTO INSTALLATION INSTRUCTIONS</b>	<b>15</b>

## Terms and Symbols

The information in this document represents the state of the product at the date of print. Technical changes may be made without notice. Ferrovac AG makes no guarantees concerning the accuracy or completeness of the contents of this publication. Figures and photos are not binding. The product names used are for identification purposes and may be trademarks of their respective companies.



A triangle with an exclamation mark indicates a passage in the manual with information that is crucial for the operator. READ THESE PARAGRAPHS CAREFULLY, or damage to the product can ensue through misuse.



Exsiccator



Non-return valve



Orthogonal valve, manual operation



Pressure reducing valve



Straight valve, manual operation



Diaphragm vacuum pump  
 Swagelok/KF-Adapter



Gas pressure bottle



Three way stop cock



Pressure gauge



Alarm



Gauge with control unit



Tee-union (SERTO) with  
 Swagelok

## Safety precautions

Observe the following safety precautions at all times, before using the product described in this manual and any associated instrumentation.

**Responsible body** is the individual or group of persons responsible for the proper use and maintenance of the product, ensuring operation of the product within its specifications and limits. The responsible body must ensure that users of the product are adequately trained.

**Operators** are using the product for its intended purpose. Users must be trained to handle gas pressure

- **Never** use Acetone or other aggressive chemical solvents to clean any part of the Exsiccator. Recommended solvents are e.g. nonaggressive window cleaner, Ethanol or Isopropanol.
- **Never** operate the Exsiccator in a **pressure above 200mbar** in respect to atmosphere pressure.
- **Never** remove the O-ring with sharp items.
- **Never** bend the orthogonal valves when you connect the Exsiccator.
- **Never** store reactive gases, explosives or aggressive chemicals in the Exsiccator.
- **Always** follow the instructions for installing SERTO/Swagelok tube fitting equipment.
- **Always** use a counter wrench for a proper tightening of the fittings.

equipment. Protection from potentially dangerous situations is essential.

## 1. Introduction

The Exsiccator is equipped with transparent removable shelves, offering a clear view and the possibility of placing neatly ordered boxes. After pumping down using a roughing pump, the Exsiccator holds with closed valves a base pressure of approximately 30mbar for several weeks. This period depends on the outgassing rate of the stored objects as well as the sealing faces for the O-ring and the closure of the valves. A pressure gauge indicates the rough vacuum level. Filling the box with dry Nitrogen, Argon or other inert gases is also possible. For safety reasons, there is an overpressure valve fitted to every Exsiccator. The models EXSICA3S and EXSICA2W are provided with two right angle valves with 6mm tube connections for pumping and venting. The portable version EXSICA3P is equipped with one straight valve with 6mm tube quick connector.

## 2. Unpacking and inspection

EXSICA3S, EXSICA2W and EXSICA 3P Exsiccator are shipped clean and are ready to use. Check for any visible damage of the package and of the Exsiccator. Compare the contents of the box with the specifications in the manual. *(See chapter 5 specifications)*

**Any damage or missing items must be reported to Ferrovac within 48 hours of delivery.**

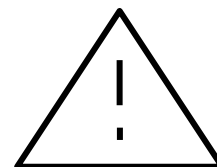


**Fig 1 EXSICA3P and EXSICA3S, a typical application in a laboratory.**

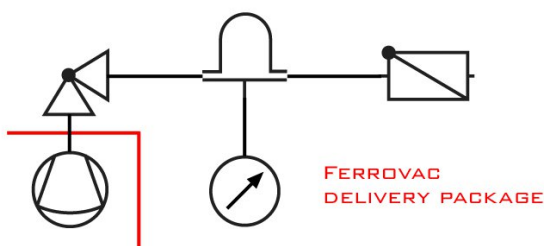
### 3. Pumping

Primarily, the Exsiccator is used for storing clean samples under vacuum conditions or in an inert gas atmosphere. For this purpose, we introduce you to some examples of configurations. The venting valve is not shown in the following schematic diagrams. Accordingly, the diagrams correspond to the models EXSICA3S, EXSICA2W and EXSICA3P. The sole exception, without any influence on the configurations, is that the EXSICA3P has a straight valve instead of an orthogonal one.

- **Always** use dry (oil-free) vacuum pumps such as diaphragm or dry scroll vacuum pumps.
- **Always** use vacuum compatible hoses and tubes, consistent with the SERTO fittings.
- **Always** follow the instructions for the installation of SERTO fittings.



#### Variant 1 (simple configuration)



Variant 1 shows the simplest configuration. It is easy and fast to install. As a roughing pump, use a diaphragm pump as shown or a dry scroll pump. Use tubes which are made for this purpose. Avoid thin-walled PVC-tubes or any other tubes which cannot withstand the vacuum conditions.

Fig 2 Configuration example 1

#### Short pump-down instructions

- After storing the sample, make sure the sealing face is clear from dirt/damage.
- Close and latch the door.
- Run the connected vacuum pump and make sure that the pumping line valve is open.
- Close the valve when the final pressure is reached (usual pump-down time  $t \approx 10\text{min}$ ).

#### Equipment example

Tubes:	Polyamide 6mm/4mm Art. No: 12.0101.0604 (Angst+Pfister)
Fittings:	Reducer 8/6 (SO 41021-8-6, SERTO), Reducer 10/8 (SO 41021-10-8), Tube stub $D=8\text{mm}$ (SO 41300-A8)
Pump:	Roughing pumps: PUM004 for EXSICA3P/3S (4l/min) PUM013 for EXSICA3S/2W (13l/min) PUM060 for EXSICA2W (60l/min)

### Variant 2 (continuous vacuum conditions, self-made extension)

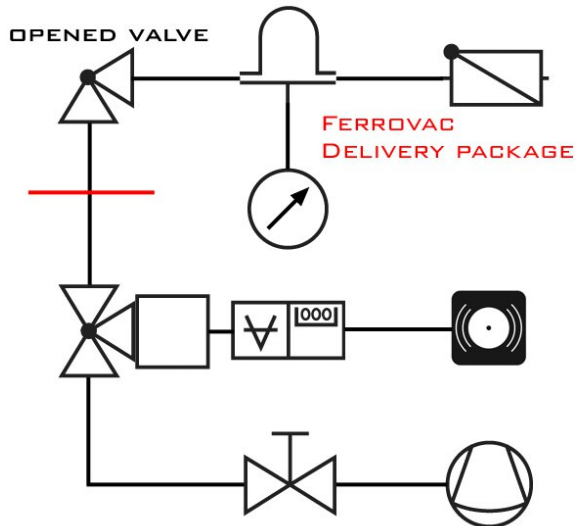


Fig 3 Configuration example 2

If the stored samples have to stay continuously under vacuum conditions, it is recommended to use a vacuum gauge and a control unit with an alarm function. In case of a self-made extension of the standard delivery package from Ferrovac, this variant requires additionally a manual valve and a tee union with a SERTO-KF-adapter which allows a connection to a vacuum gauge (Pirani).

#### Equipment example (see also variant 1)

Gauge: TPR 018, Pirani gauge head and Sensor cable for TPR 018, 80°C (Pfeiffer Vacuum)

Controller: TPG 261, Control unit (Pfeiffer Vac.)

Adapter: KSWA167-316 Swagelok-KF (Vacom) (D=4.8mm -> drill out to D=6.3mm)

Tee: 3x D=6mm SO 43021-6 (SERTO)

### Variant 3 (inert gas atmosphere)

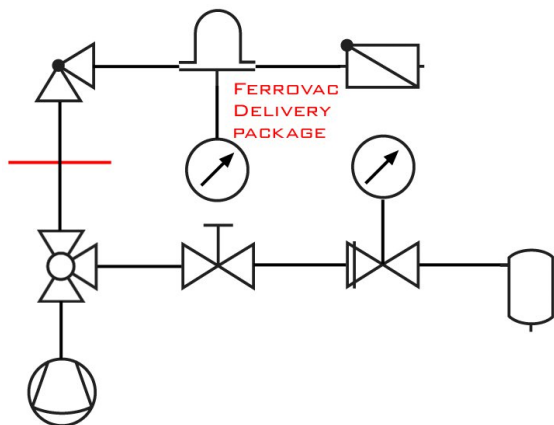
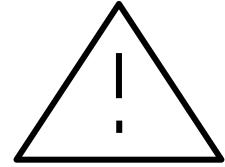


Fig 4 Configuration example 3

The Exsiccator also allows the storage of samples in a protective gas atmosphere. In this configuration example, it is necessary that the operator is well trained in handling pressurised equipment. While holding the pressure in the Exsiccator in a protective gas atmosphere, never exceed an overpressure of more than 200mbar for safety reasons.

(See chapter 4 venting)

- **Never** operate the Exsiccator at an **overpressure above 200mbar** in relation to atmospheric pressure.
- **Never** let reactive gases, explosives or aggressive chemicals flow into the Exsiccator.
- **Never** handle the pressure equipment, if you are not trained to do so.
- **Always** use inert gases for this configuration such as Ar, He or dry Nitrogen gas.
- **Always** follow the instructions for the installation of SERTO fittings.

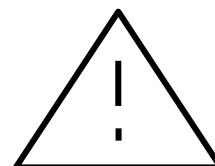




## 4. Venting

The second angle valve is used for venting. As opposed to venting with air, it is also possible to arrange the configuration such that the remaining samples stay clean from air impurities. Similar to the third variation in chapter 3 the venting can be done by flooding the Exsiccator with Ar, N<sub>2</sub> or He. It is useful to mount a quick-connect fitting onto the valve for a straight-forward gas handle.

- **Never** operate the Exsiccator at an **overpressure above 200mbar** in relation to atmospheric pressure.
- **Never** let reactive gases, explosives or aggressive chemicals flow into the Exsiccator.
- **Never** handle the pressure armature equipment, **if you are not trained**.
- **Never** let reactive gases, explosives or aggressive chemicals flow into the Exsiccator.
- **Never** handle the pressure equipment, if you are not trained to do so.
- **Always** use inert gases for this configuration such as Ar, He or dry Nitrogen gas.
- **Always** follow the instructions for the installation of SERTO fittings.
- **Never** breathe in the gas.
- **Never** empty the gas bottle completely (corrosion).



### EXSICA3S, EXSICA2W

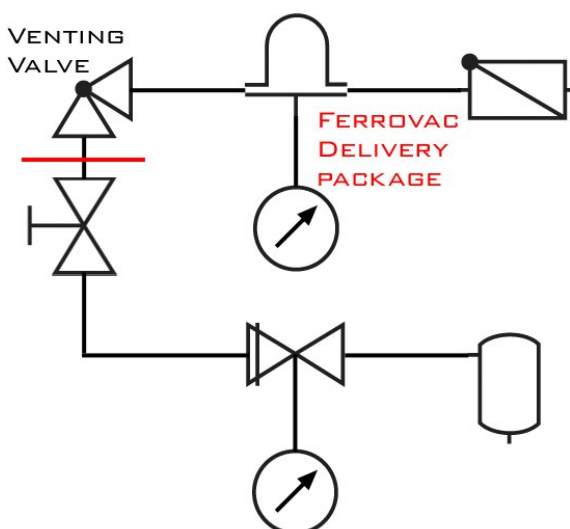
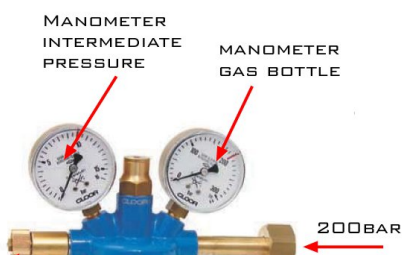


Fig 5 Venting the system

Make sure that the gas pressure regulator (*Fig 6*) is correctly installed by a trained technician and follow the instructions below.

#### Short venting instructions

- First make sure that the adjusting screw of the intermediate pressure chamber is fully relaxed.
- Close the shut-off valve at the end of the pressure regulator and open the gas bottle by its main outlet.
- Adjust the pressure with the mentioned screw to a value of approximately 1000mbar.
- Open carefully the shut-off valve. Only work with a very low gas flow.



- Connect the venting tube to the venting valve on the Exsiccator.
- Make sure that the pumping valve is closed.
- Carefully open the venting valve. Keep an eye on the Exsiccator manometer and vent until atmospheric pressure is reached.

Fig 6 Pressure regulator

- Since technicians tend to help other people at any time, **the running gas still has to stay in mind, else the gas bottle runs empty.**
- Unclip and open the door carefully and let the gas flow run, if you want to keep the remaining samples in almost the same proper atmosphere.
- Close the main valve of the gas bottle after closing the Exsiccator door and its venting valve.
- Close the shut-off valve and relax the adjusting screw.

**EXSICA3P**

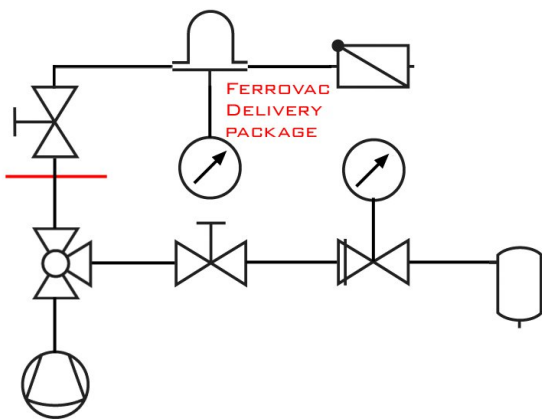


Fig 7 Example for venting the EXSICA3P

As the EXSICA3P is provided with only one valve, a possible configuration is shown in the schematic diagram on the left (similar to the third variation in chapter 3).

The EXSICA3P is already equipped with a quick coupling for an easier gas handle.

## 5. Specifications

### EXSICA3S

Vacuum Exsiccator (desiccator) cabinet with 3 slots to store sensitive items under vacuum or in a controlled atmosphere.

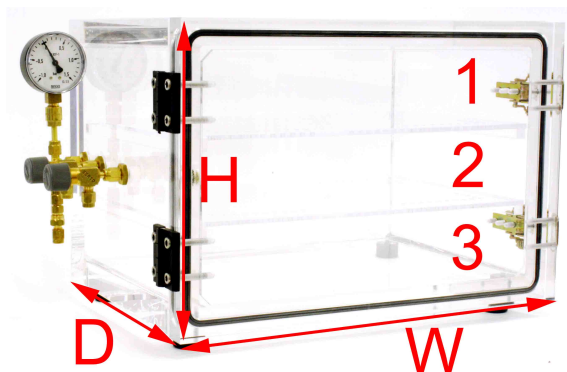
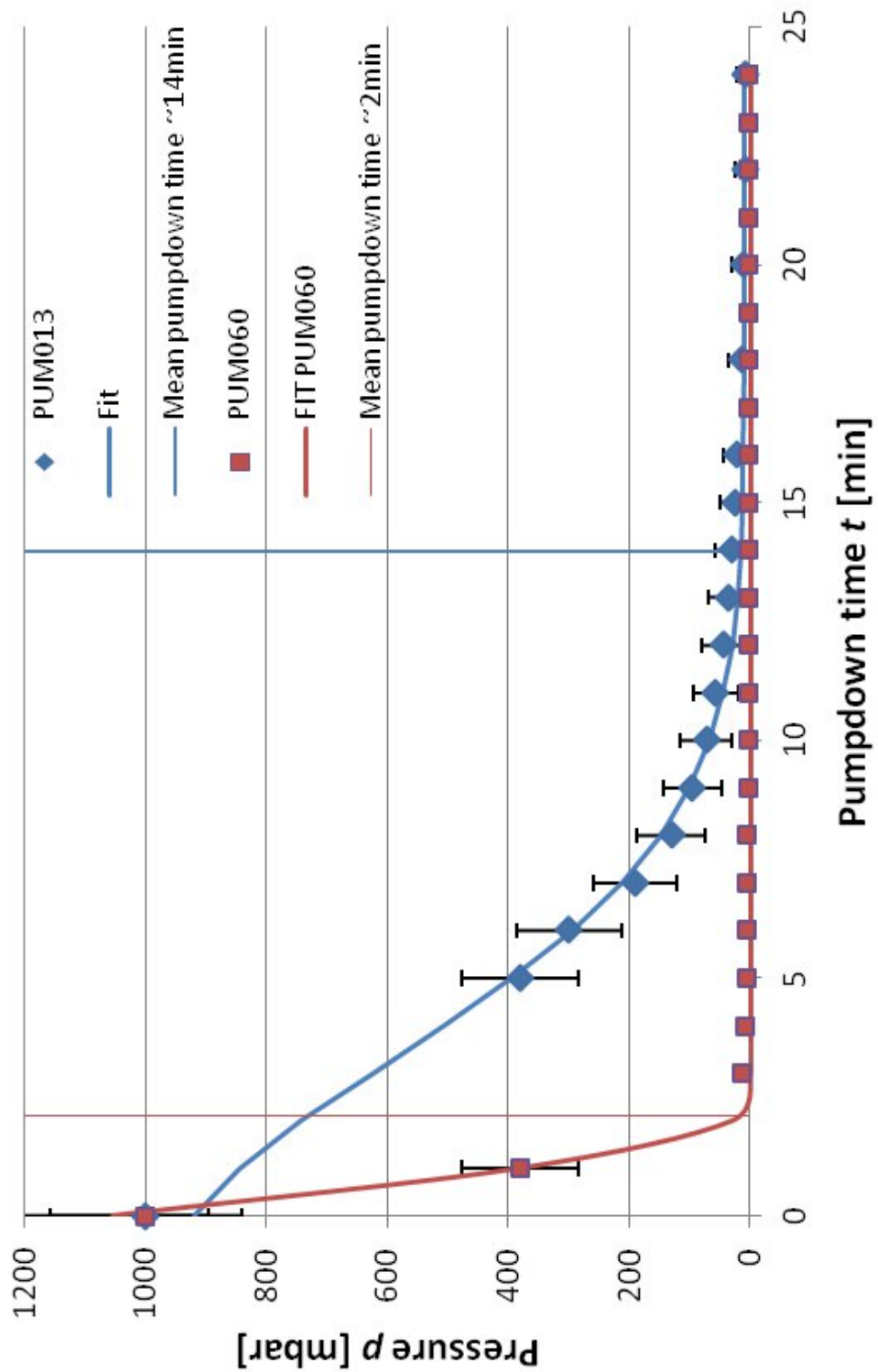


Fig 8 EXSICA3S

#### Specifications

- **outline dimensions, incl. valves, hinges etc:**  
498 x 294 x 300mm<sup>3</sup> (W x H x D)
- **outline dimensions, box only:**  
400 x 275 x 300mm<sup>3</sup> (W x H x D)
- **inside dimensions:**  
330 x 225 x 240mm<sup>3</sup> (W x H x D)
- **compartment dimensions:**
  - 1: 330 x 75 x 240mm<sup>3</sup> (W x H x D)
  - 2: 330 x 70 x 240mm<sup>3</sup> (W x H x D)
  - 3: 330 x 70 x 240mm<sup>3</sup> (W x H x D)
- **wall thickness:** 24mm
- **weight:** 19kg
- **material:** PMMA GS transparent
- **shelves:** 2 pieces, removable
- **pump and vent connections:**  
2 angle valves with metric 6mm Serto tube fittings
- **Roughing pumps recommended**  
PUM013 (13l/min) or PUM060 (60l/min)
- **security valve:** opens at 200mbar overpressure
- **pressure gauge:** -1 to +0.6 bar
- **door:** 2 clip catch
- **o-ring:** 380.37 x 6.99mm (D x d), NBR 70°Shore

## EXSICA3S pump curve



## ***EXSICA2W***

Large size vacuum Exsiccator (desiccator) cabinet with 2 slots to store larger items under vacuum or in a controlled atmosphere.



Fig 9 EXSICA2W

### Specifications

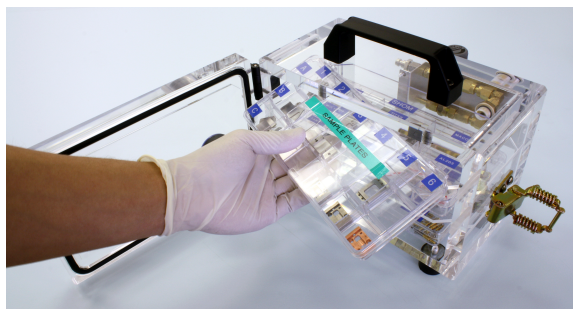
- **outline dimensions, incl. valves, hinges etc:**  
683 x 322 x 335mm<sup>3</sup> (W x H x D)
- **outline dimensions, box only:**  
585 x 295 x 335mm<sup>3</sup> (W x H x D)
- **inside dimensions:**  
495 x 225 x 260mm<sup>3</sup> (W x H x D)
- **compartment dimensions:**
  - 1: 495 x 105 x 260mm<sup>3</sup> (W x H x D)
  - 2: 495 x 115 x 260mm<sup>3</sup> (W x H x D)
- **wall thickness:** 35mm
- **weight:** 28kg
- **material:** PMMA GS transparent
- **shelves:** 1 piece, removable
- **pump and vent connections:**  
2 angle valves with metric 6mm Serto tube fittings
- **Roughing pumps recommended**  
PUM060 (60l/min)
- **security valve:** opens at 200mbar overpressure
- **pressure gauge:** -1 to +0.6 bar
- **door:** 2 clip catch
- **o-ring:** 494.16 x 6.99mm (D x d), NBR 70°Shore

## ***EXSICA3P***

Portable, lightweight, fully transparent vacuum Exsiccator cabinet with 3 slots. Carry your samples under vacuum or in a controlled atmosphere.



**Fig 10 EXSICA3P**

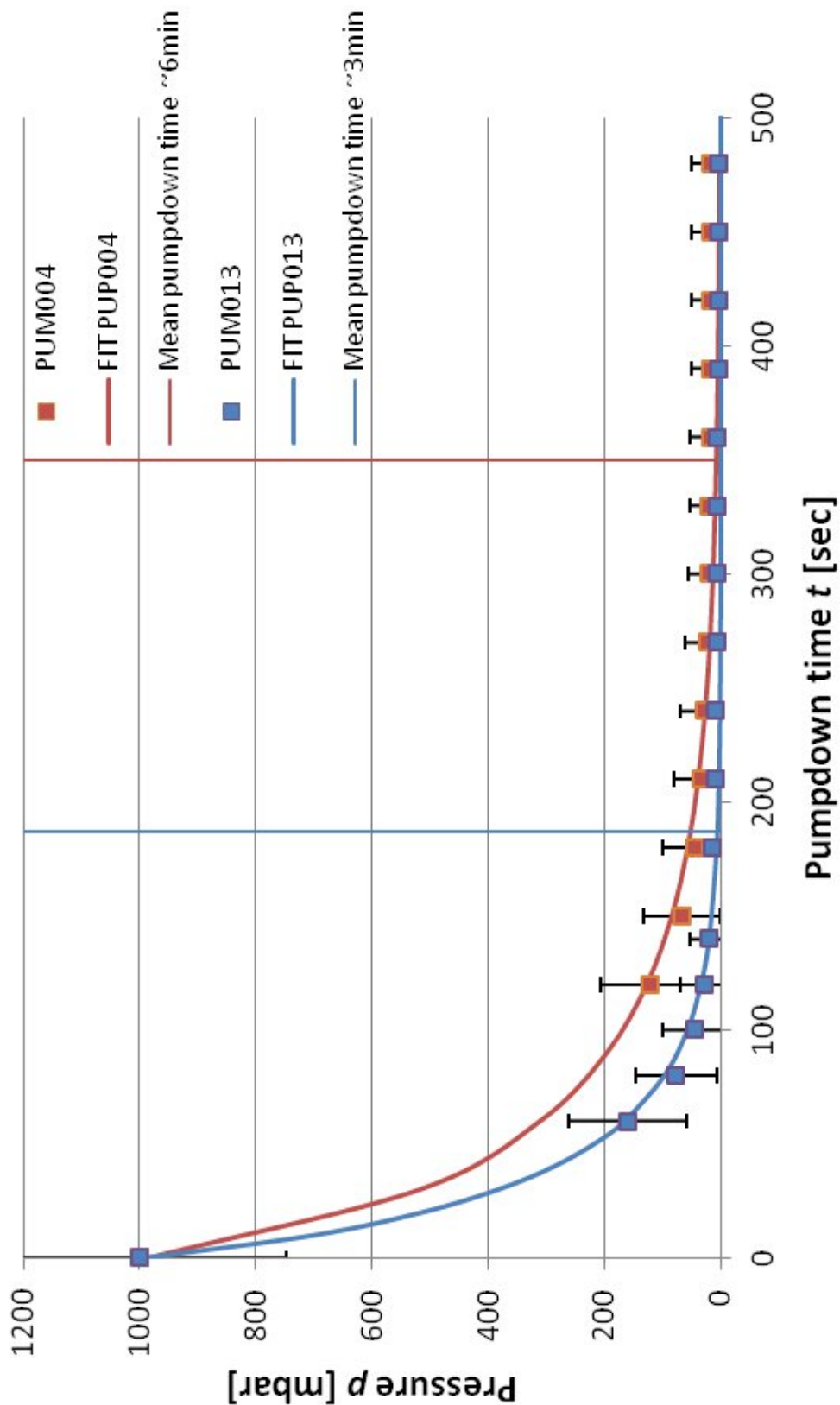


**Fig 11 Storing samples in the EXSICA3P**

### Specifications

- **outline dimensions, incl. valves, hinges etc:**  
265 x 206 x 212mm<sup>3</sup> (W x H x D)
- **outline dimensions, box only:**  
240 x 150 x 150mm<sup>3</sup> (W x H x D)
- **inside dimensions:**  
200 x 120 x 105mm<sup>3</sup> (W x H x D)
- **compartment dimensions:**
  - 1: 200 x 37 x 105mm<sup>3</sup> (W x H x D)
  - 2: 200 x 37 x 105mm<sup>3</sup> (W x H x D)
  - 3: 200 x 37 x 105mm<sup>3</sup> (W x H x D)
- **wall thickness:** 15mm
- **weight:** 3.9kg
- **material:** PMMA GS transparent
- **shelves:** 2 pieces, removable
- **pump and vent connection:**  
1 straight valve with quick connector for metric 6mm Serto tube fitting
- **Roughing pumps recommended**  
PUM004 (4l/min) or PUM013 (13l/min)
- **security valve:** opens at 200mbar overpressure
- **pressure gauge:** -1 to +0.6 bar
- **door:** 1 clip catch
- **o-ring:** 215.27 x 6.99mm (D x d), NBR 70°Shore
- including 3 storage containers with 18 compartments

## EXSICA3P pump curve



## 6. SERTO installation instructions

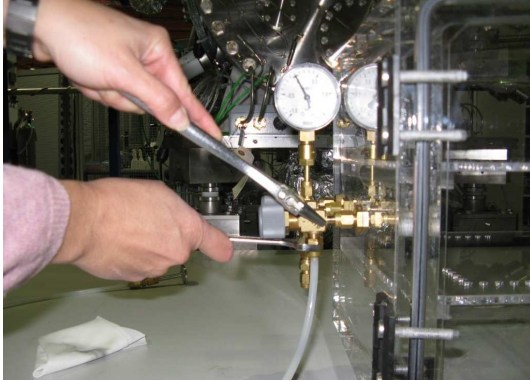


Fig 12 Installing SERTO parts

All brass components except the Pressure gauge are from the company SERTO AG. Read on their website [www.serto.ch](http://www.serto.ch).

Do not bend the angle valves when you connect the Exsiccator. Use a coach wrench to hold against it when you use the open-end wrench.



Anhang	Appendice	Appendix
<b>Montageanleitung SERTO</b>	<b>Instructions de montage SERTO</b>	<b>Installation instructions SERTO</b>
<p>1</p>		
<p>2</p>		
<p>3.1</p>	<p>3.2</p>	
<p>4</p> <p>Wiederholte Montage Montage répétée Repeated fitting of the union</p>		
		<p>5</p> <p>metal only</p>





Anhang      Appendice      Appendix

**Montageanleitung**      **Instructions de montage**      **Installation instructions**

**Messing/Edelstahl/Stahl/  
Messing chemisch vernickelt**      **Laiton/Acier inoxydable/Acier/  
Laiton nickelé chimiquement**      **Brass/Stainless Steel/Steel/  
Brass chem. nickel-plated**

**1. Vorbereiten**

Rohr rechtwinklig ablängen und entgraten.  
Das Rohrende muss auf einer Länge von ca. 1,5 d gerade sein und eine unbeschädigte Oberfläche aufweisen. Die Verschraubung ist initia geschmiert. Die Montage und Wiedermontage grösserer Verschraubungen lässt sich durch Schmiermittel wie Öl, MoS<sub>2</sub>, Teflon etc. weiter optimieren (Gewinde, Klemmring).

**2. Rohr verstärken und einführen**

Stützhülse\* vorsehen für dünnwandige und/oder weiche Rohre sowie Kunststoffrohre

**Kupfer** ab d 10 mm mit s < 1.0 mm  
ab d 12 mm mit s < 1.5 mm

**Edelstahl** ab d 6 mm mit s < 0.5 mm  
ab d 10 mm mit s < 1.5 mm

**Kunststoff** alle

Auf sauberes Fluchten von Rohr und Verschraubung achten. Bis zum Anschlag einführen.  
Details siehe Kapitel **Rohre** im Anhang.

**3. Montage**

3.1 Anschlussmutter bis zum fühlbaren Anschlag von Hand aufschrauben.  
Dazu Rohr gegen Grundteil drücken  
3.2 Anschlussmutter mit Gabelschlüssel **1 ¼ Umdrehungen** anziehen. (Ein Markierungsstrich kann die Kontrolle der vorgeschriebenen Umdrehungen erleichtern.) Nippel mit einem zweiten Schlüssel gegenhalten.

**4. Wiederholte Montage**

Bei wiederholter Montage der gleichen Verschraubung, Anschlussmutter von Hand erneut bis zum deutlich fühlbaren Anschlag montieren und mit dem Schlüssel für die endgültige Montage mit ¼ Umdrehung anziehen.  
**Bei wiederholter Montage Teile schmieren.**

**5. Kontrolle der Montage**

Kontrolle der Verformung. An der Rohrinnenseite muss ein deutlicher Wulst sichtbar sein.

**Rohre\***  
Es sind Rohre mit sauberer, glatter Oberfläche, deren Aussendurchmesser innerhalb von ± 0.1 mm liegen, zu verwenden.  
(Siehe auch Tabelle «Mindestwandungen» im Anhang.)

**Drehbarer Klemmring**  
Es ist ohne Einfluss für die Güte der Verbindung, wenn sich der Klemmring nach der Montage auf dem Rohr oder das Rohr in der Anschlussmutter drehen lässt.

Montagestützen zur Vormontage  
SO 56000, rostfreier Stahl teniferiert für Edelstahl und Messing M-Programm.  
SO 6000, CrNi Stahl gehärtet für Stahl.

**1. Préparation**

Couper le tube à longueur et ébarber. La zone du raccord jusqu'à 1,5 d de l'extrémité du tube doit être droite et sans endommagement. Le raccord est déjà lubrifié. Le montage et le remontage des gros raccords est facilité par l'utilisation de lubrifiants comme huile, MoS<sub>2</sub>, téflon etc. (filetage, bague de serrage).

**2. Renforcer et introduire le tube**

Prévoir des douilles d'appui\* pour les tubes avec une paroi mince ou pour des tubes en matière plastique

**Cuivre à partir** de d 10 mm avec s < 1.0 mm  
de d 12 mm avec s < 1.5 mm

**Acier à partir inoxydable** de d 6 mm avec s < 0.5 mm  
de d 10 mm avec s < 1.5 mm

**Plastique** tous

Aligner tube et raccord.  
Introduire jusqu'en butée à l'intérieur du raccord.  
Détails voir chapitre **tubes** dans l'appendice.

**3. Déformer, desserrer**

3.1 Visser l'écrou à la main jusqu'en butée dans le raccord, en poussant le tube.  
3.2 Serrer l'écrou de **1 ¼ tours** avec une clef à fourche. (Un trait de repère peut faciliter la vérification de la rotation prescrite.) Maintenir le raccord au moyen d'une seconde clef.

**4. Montage répété**

Pour un montage répété du même assemblage, visser de nouveau l'écrou à la main jusqu'à ce qu'il soit bien en butée, puis le serrer définitivement de ¼ de tour à l'aide d'une clef à fourche pour obtenir un montage définitif.  
**Il est essentiel que les pièces soient lubrifiées lors d'assemblage répétés.**

**5. Contrôle du montage**

A l'intérieur du tube, un bourrelet doit être clairement visible.

**Tubes\***  
Utiliser des tubes de surface propre et lisse, avec des tolérances de ± 0.1 mm sur le diamètre extérieur. (Voir aussi le tableau «Epaisseur de paroi minimal» en appendice.)

**Bague de serrage tournante**  
Le fait qu'il soit possible, après le montage, de tourner la bague sur le tube ou le tube au sein de l'écrou n'a aucune influence sur la qualité de l'assemblage.

Pièce de prémontage  
SO 56000, acier inoxydable teniferé, pour acier inoxydable et laiton Programme M.  
SO 6000, acier CrNi trempé, pour acier.

**1. Preparation**

Cut the tube to length and deburr it. The tube must be straight and free from blemishes for approximately 1,5 d from the end. The union is lubricated. Thus lubrication with lubricating oil, MoS<sub>2</sub>, Teflon etc. is recommended for the assembly and reassembly of bigger size d unions (thread, compression ferrule).

**2. Reinforcing the tube and pushing it in**

Stiffener sleeves\* are required to reinforce plastic tubes and thin walled tubes

**Copper** from d 10 mm with s < 1.0 mm  
from d 12 mm with s < 1.5 mm

**Stainless steel** from d 6 mm with s < 0.5 mm  
from d 10 mm with s < 1.5 mm

**Plastic** all

Align tube and union.  
Insert the tube as far as the stop.  
Details see chapter **tubes** in the appendix.

**3. Compression, stress relieving**

3.1 Screw on the union nut by hand until finger tight.  
At the same time, push the tube against the fitting.  
3.2 Tighten down the union nut **1 ¼ rotation** using an open ended spanner. (Making a mark will assist in correct rotation.) Hold adaptor from turning with a second wrench.

**4. Repeated fitting of the union**

When refitting the same tube union, screw the union nut back on by hand until finger tight and tighten down the union nut with an open ended spanner ¼ rotation for the final fit.  
**In case of repeated assembly, parts must be lubricated.**

**5. Checking of fit**

A distinct bead or deformation must be visible on the inside of the tube.

**Tubes\***  
Tubes with a clean smooth external surface and with an outside diameter within the tolerance ± 0.1 mm should be used.  
(See also table «Minimum wall» in the appendix.)

**Turnable compression ferrule**  
It is of no detriment to the efficiency of the connection if, after assembly, the ferrule can be turned on the tube, or the tube in the union nut.

Pre-assembly stud  
SO 56000, stainless steel, tuffride treatment, for stainless steel and brass M-Programme.  
SO 6000, CrNi steel hardened, for steel.