# Vacuum Degasser User Manual

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# Vacuum Degasser User manual

## Introduction



#### Note

This manual **must** be read in conjunction with the main Zetasizer Nano manual and MPT-2 Autotitrator manual.

This manual covers the operation and maintenance of the MPT-2 multi purpose titrator.

Instrument	Part Number
Malvern Vacuum Degasser	DEG0003

This manual can used as a stand-alone manual that covers the operation and maintenance of the Malvern Vacuum Degasser. The aim of this manual is to:

- Identify what the accessory is.
- Explain, in simple terms, how it works.
- Identify the physical features of the accessory.
- Explain how the accessory should be connected and used to make a measurement.
- Identify the user maintenance procedures.

It is **important** that the main Zetasizer Nano manual and MPT-2 Autotitrator manual are read before starting the first measurement. Topics covered in these manuals include:

Health and safety information. Information is given on laser safety, electrical, temperature and sample handling warnings. Also refer to the below Health and Safety section

- Site requirements. Details what services are necessary for connection of the Zetasizer Nano system. The information detailed here also applies to the MPT-2 Autotitrator.
- What are the Zetasizer Nano instruments, what are the components of the Zetasizer Nano and what do they do, instructions on using the instrument and the software, basic measurement and maintenance procedures.
- Sample preparation for each measurement type.
- Use of Standard Operating Procedures (SOPs), and organising the measurement files, and discussion on each of the analysis theories used.
- Customising reports and exporting results.

## Degasser specific Health and safety



#### Warning!

Use of the system in a manner not specified by Malvern Instruments Ltd may impair the protection provided by the system.



#### Warning!

Use of this product outside the scope of this manual may present a hazard.



#### Note

Removal of the covers by unauthorised personnel will invalidate the warranty of the accessory.

Use appropriate care when handling flammable solvents. Make sure that there are no leaks in the titrant lines - refer to **General Operation - Initial pump-down**. Ensure that hazardous exhaust gases are properly vented.

## Access to the Vacuum Degasser

Within this manual, reference may be made to the various people who will have access to the accessory. Below is a list of these people and their responsibilities:

## Malvern personnel

Malvern personnel (service engineers, representatives etc.) have full access to the accessory and are authorised to perform all service procedures that may require the removal of the covers.

## Supervisor

The supervisor is the person responsible for the management/safety of the system and of its operation. The supervisor is responsible for the training of the operators in the use and maintenance of the instrument.

The supervisor must under no circumstances remove the covers of the instrument or accessory.

## Operator

An operator is a person trained in the use of the system.

The operator must under no circumstances remove the covers of the instrument or accessory.



#### Note

Removal of the covers by unauthorised personnel will invalidate the warranty of the accessory.

## Where to get help

## Other manuals

Several manuals may be supplied with the system, with each one giving information on a different aspect of the system. Below is a list of the typical manuals supplied with the system, detailing the type of information that each manual will contain.

#### MPT-2 Autotitrator user manual

This manual can be thought of as a basic tutorial. It will act as a guide for all operations of the titrator.

#### Zetasizer Nano series user manual

Covers all aspects of the main optical unit. i.e. health & safety issues, unpacking instructions, system checkouts, identification of features & maintenance, and Zetasizer Nano application software. This manual also covers all aspects of making Size, Zeta and Molecular weight measurements, from sample preparation to interpreting the results.

The health and safety section in this manual also applies to the Autotitrator and Vacuum Degasser.

## Help desk

All queries regarding the system should initially be directed to the local Malvern representative. Please quote the following information:

- Model and serial number of the optical unit and accessories.
- Version of the Malvern software.

The serial number of the optical unit and the accessories can be found on the rear panel of each module, and on the cuvette holder for the Zetasizer.

The version number of the Malvern software can be found by starting the software and selecting **Help-About**.

Contact the United Kingdom help desk if the local Malvern representative is available. The direct line to the United Kingdom Helpdesk is +44 (0)1684 891800. It should be noted that this help line is primarily English speaking.

## Introduction to the Degasser

The Vacuum Degasser is a high-efficiency in-line module that removes dissolved gasses from solvents used in flowing systems, and more specifically from the titrants used in the **MPT-2 Autotitrator**. Its design assures reliable continuous operation and the highest level of continuous performance available without the need for helium degassing. Up to 3 titrant lines may be degassed simultaneously by one unit.

**Internally**, the titrant flows through a short length of **Teflon AF®** tubing which is located in a vacuum chamber. Within this chamber a partial vacuum is maintained by a constantly running, low RPM (revolutions per minute) vacuum pump.

- Dissolved gasses migrate across the tubing wall under a concentration gradient produced by the vacuum as the titrant flows within the coil.
- Gasses removed are expelled, and the chamber is maintained at a constant, preset vacuum level by varying the vacuum pump speed as needed.

An additional port in the vacuum pump continually flushes the pump head with a small "bleed" of air to remove any titrant vapours which may enter the pump from the vacuum chamber. This air bleed eliminates the need for any solenoid valves within the system. This patented\* design results in zero vacuum "hysteresis".



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## Identifying the features of the Degasser

## **Front Panel Connections**



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There are 3 degassing channels labelled A to C on the front of the Degasser. Each channel consists of a pair of female connectors which provide the input and output ports for running the titrant lines through the Vacuum Degasser.



Flow direction is not critical.

Plugs are provided to seal the ports of any unused channels. This must be done to ensure the Degasser works correctly.

## **Front Panel Indicators**

Three LEDs are located on the front of the instrument above the titrant inlets and outlets; these indicate the following.

#### Power (Green)

Indicates when power is applied to the Vacuum Degasser - cable is plugged in and Power switch turned ON.

#### Status (Yellow)

Indicates when vacuum level is outside the acceptable operating range. This LED will light at initial power-up and remain on during pump-down. It will turn off after a few minutes when the vacuum level goes below 100 mm of Hg absolute.

If an error condition occurs, this LED will flash in one of two modes:

- Flashing on and off in even 1-second intervals: pump was not able to reach vacuum set point, indicating a possible leak in the system.
- Flashing on for 1 second and off for 2 seconds indicates a vacuum signal error.

#### Vacuum (Green)

Indicates when vacuum level is within the acceptable operating range. The LED will light up after the initial pump-down, and remain on as long as the Vacuum Degasser is powered up and the vacuum level is below 100 mm of Hg absolute.

## **Rear Panel Connections and Controls**



Power Connector



Only use the AC power adaptor as supplied from Malvern Instruments.

Connect the output plug from the AC power adaptor to this connector.

See Specifications chapter for further power requirement information.

#### **Power Switch**

The On/Off power switch turns the Vacuum Degasser On,

 $\mathbf{O} = Off$ 

**I** = On.

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#### **Exhaust Port**

Any gas pumped out of the vacuum chamber exits the unit through the exhaust port.

#### Validation Connector

Depending on the model, there may be a 2-pin receptacle labelled "Validation" located next to the power switch. This receptacle and its associated screw-lock plug allow a validation signal from the Vacuum Degasser's control circuit to be sent to a computer or data system. This validation output indicates vacuum level (see **Spec-ifications** section for details).

## Setup and Connection of the Degasser

## Installing the AC Adapter and Power lead

- Ensure Degasser is turned on.
- Plug the round connector at the end of the AC Adapter's cord into the Power socket on the Vacuum Degasser rear panel.
- Select the correct country specific adaptor plug and connect to the AC adapter
- With the wall power socket off, insert AC adaptor into the wall socket.



Note

The AC adapter should be positioned for easy disconnection.

## **Connecting the Tubing**

Titrant lines to be degassed are connected to the Vacuum Degasser's front panel ports, as detailed below. Any **unused ports** must be **plugged** to enable the degasser to operate correctly.

#### To make a tubing connection:

For tubing and connector sizes, refer to the **Specification** chapter.

- Run a line of tubing from the titrant supply to the Vacuum Degasser.
- Push the tubing through the connector and slide a ferrule over the tubing end ①; note the direction of the ferrule taper ②.



- Cut the **tubing** so the end is flat ③.
- Move the tubing so its end is **flush** with base of the ferrule ④.

 Screw the connector into one port on the front of the Vacuum Degasser (Channel A, for example). The direction of flow through the Vacuum Degasser is not critical.

#### Note

Plastic connectors should only be tightened by hand - over-tightening them will damage the threads.

- Repeat the steps above to connect additional titrant lines.
- Once all required titrant lines have been connected to the Vacuum Degasser, plug all unused ports with the spare plugs supplied. Press these in by hand.



#### Caution!

**DO NOT** prime the membranes by pushing titrant through the degassing systems. This technique can generate several hundred pounds of pressure which might rupture the Teflon AF® membrane. The maximum recommended pressure on the membrane is **0.7 MPa** (100 psig, 7 Bar).

Prime the system using the prime procedure used in the normal set-up and operation of the MPT-2.

# Connecting the Vacuum Degasser in a Typical System

The following illustration shows the tubing connections that are typically made between the Vacuum Degasser and the **MPT-2 Autotitrator**. The direction of flow through the Vacuum Degasser is not critical.



The below diagram indicates how the MPT-2 Autotitrator will be connected to the Vacuum degasser.

- The titrant tubes are fed from the titrant containers through the space ① at the top of the dispensing area cover ② towards the degasser input ports.
- Titrant tubing then comes from the degasser output ports, back through the space ① at the top of the dispensing area cover ②, and towards the Autotitrator manifold assembly.



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## **Operating the Degasser**

## **Operating Summary**

The notes below give a brief overview of the operating process. More information is given in the following sections.

- Select and fill each titrant container with the titrant(s) used for the analysis.
- Verify that the Vacuum Degasser is properly installed as described in the previous Setup and connection of the Degasser chapter.



#### Caution!

Never connect the Vacuum Degasser to the output side of the MPT-2 Autotitrator pump. The high pressure may cause permanent damage to the degassing membrane.

- Verify that plugs are installed in any unused ports.
- Switch on the degasser and prime the MPT-2 as described in the MPT-2 Autotitrator manual. Allow the system to equilibrate for 5-10 minutes.
- Shutdown the instrument when not performing any degassing.

## **General Operation**

#### Powering up the Vacuum Degasser

With the Vacuum Degasser plumbed into the system and the power lead installed, as described in the (see previous section), turn on the rear panel power switch. The green Power LED should illuminate.

Immediately upon turning on the instrument, the microprocessor examines the vacuum sensor signal to confirm that it is within an expected range. Following the start-up test, the microprocessor ramps the vacuum pump to high RPM, to quickly exhaust atmosphere from the vacuum chamber. As the vacuum level approaches the preset control value, the pump RPM will slowly ramp down to a low speed (typically 40 to 60 RPM) and will vary slightly as needed under the changing degassing load to maintain a virtually constant vacuum level.

#### Initial pump-down

During initial pump-down, the yellow Status LED will be lit. Once the vacuum has reached normal operating level, the yellow LED will extinguish and the green Vacuum LED will illuminate. As well as checking the front panel LEDs, the running of

the vacuum pump can be checked by placing a hand onto the instrument and checking for vibration

Start the titrant flow through the system and check for leaks around the connectors.

#### **Note** If a le

If a leak occurs at the connection, tighten the fitting an additional 1/8 turn. If the leak persists, disconnect the leaking fitting and inspect it. If the nut and ferrule appear to be in good condition, reconnect the fitting. If the leak persists, replace the nut and ferrule and repeat the procedure until you achieve leak-free operation.

The Vacuum Degasser maintains a constant vacuum pressure of 50 mm Hg absolute (nominal) by varying the speed of the vacuum pump as needed depending on the degassing load in the system. The pump is designed for at least 5 years of constant running and has integral in-pump venting, which eliminates the need for stop-start running (U.S. Patent 6,248,157). The vacuum level and pump speed are constantly monitored by the microprocessor for changes in operating conditions which might be attributed to chamber internal leaks. If a potential leak is detected (if the pump RPM > 300 for 30 minutes), the pump will be shut down and the yellow Status LED will flash. The vacuum is maintained as long as the Vacuum Degasser is powered on. Titrants flowing through the Vacuum Degasser will continue to be degassed so long as the instrument is on and running.

Also refer to Small leak detection, later in this chapter.

#### Turning off / powering down

Turn off the Vacuum Degasser when the MPT-2 Autotitrator to which it is connected is not in use. The vacuum chamber(s) will slowly return to atmospheric pressure when the unit is powered off. This is accomplished by a small, in-line vacuum bleed and reduces the possibility of titrant vapours condensing in the vacuum tubing or pump head.

#### Flushing - cleaning the degasser

When flushing a line of titrant, the single inside the chamber contains a very small amount of titrant (approximately 480 microlitres). When changing from one titrant to another; if the final titrant is immiscible with the first, use an intermediate titrant that is miscible with both the initial and final titrant. Once air bubbles have been cleared from the titrant line, any further bubbles observed will be coming from the titrant container or from a leaking fitting.



Note

The MPT-2 should be primed after the degasser has reached equilibration. This will ensure that the titrant in the tubes from the degasser to the sample tube is fully degassed. The Vacuum Degasser uses Teflon AF® membranes; which fully degas titrants in the time it takes for the volume to pass through the chamber.

## **Principles of Operation**

The Vacuum Degasser consists of a vacuum chamber, degassing tube, variable speed vacuum pump, microprocessor controller, sensor, and check valves. The titrant flows into a degassing tube, which is inside a vacuum chamber. Decreased pressure in the chamber causes the outward movement of gas, dissolved in the titrant, across the tube wall, thus degassing the titrant; this is in accordance to Henry's Law. The pressure in the vacuum chamber is established by the vacuum pump and monitored by the microprocessor through an integrated absolute pressure sensor. Degassed titrant exits the vacuum degasser and enters the pump.



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## **Smart Leak Detection**

An additional benefit of maintaining a constant vacuum level is that a potential leak in the vacuum degassing system can be observed by monitoring the RPM of the pump. If a leak occurs within the chamber, the microprocessor will increase the pump RPM in an attempt to maintain the vacuum level. If the pump cannot maintain the vacuum level (if it runs at an elevated RPM for more than 30 minutes), the yellow LED will flash, indicating a possible leak condition, and the system will shut down and go into a "safe" mode.

## Principles of degassing using Teflon AF® membranes

This relatively recent addition Teflon AF® membranes to the field of degassing is due to their having properties not found in other fluoropolymers. The fully amorphous nature of this fluoropolymer and its molecular structure creates a molecular level porosity unlike the mechanically induced porosity in PTFE extruded tubing. In addition, unlike the process used in extruding PTFE, no extrusion agents are needed (like kerosene, etc.) which contaminate titrants until they are extracted by the titrant over time. Likewise, this molecular structure, combined with the very small surface areas required to degas the titrant, reduces the possibility of carryover from one titrant to another to virtually zero.

Teflon AF® is so non-polar that it is both solvophobic and hydrophobic. This feature of Teflon AF® reduces the possibility of cross-channel contamination from one channel to another, and when combined with the ultra-low internal volumes of Teflon AF® channels needed for low flow rates, all but eliminates any cross contamination concern. Teflon AF® has been used in certain optical systems associated with HPLC for a few years without concern for normal HPLC solvents. However, Teflon AF® is soluble in certain solvents (Refer to the **Chemical Compatibility** chapter) and **must** not be used to degas these solvents when used for titration.

Teflon AF® is permeable to some degree to water vapour whereas PTFE is not. While the vacuum pump in the Vacuum Degasser contains internal provisions for sweeping water or titrant vapour from the pump continuously, it is possible that over time, high concentration buffers may form crystals within the channel due to the loss of water within the channel. The same precautions should be taken to prevent crystallization within these channels as are taken for the MPT-2 Autotitrator. Refer to the **Short-term Shutdown** procedures.

## Extending the degassing flow rate range

Certain organic titrants outgas upon mixing with water, if not properly degassed. These titrants are generally alcohols (e.g. methanol), acetonitrile and tetrahydrofuran. Passing water and methanol through a single channel is generally sufficient to degas these titrants so outgassing does not occur upon mixing when a 75% methanol: 25% water mixture is generated by the Vacuum Degasser or pump at a flow rate of 2 mL/min. If outgassing does occur, or if a flow rate higher than 2 mL/min. is required, it is a general rule that only the organic portion of the titrant needs to be passed through a second degassing channel to ensure outgassing does not occur. This is due to the ability of all organic titrants (e.g. methanol) to hold at least 10 times more dissolved atmosphere than water can. To more thoroughly degas a titrant, connect the outlet of the organic channel to the inlet a second channel and the outlet of the second channel to the pump. This places the two channels in series and doubles the degassing capacity for the organic portion of the titrant.

## Shutdown

There are two types of shutdown procedures: long-term and short-term.

#### Short-term Shutdown (Overnight and Weekends)

Observe all precautions pertaining to hazardous titrants and/or those titrants that form harmful deposits or by-products.

 Remove harmful titrants from the Vacuum Degasser and other instruments in the system.



#### Caution!

Damage caused by precipitating buffer salts in capillary tubing, or damage resulting from this condition, is specifically excluded from warranty.

- Flush buffer salts from the system with water by priming the MPT-2 with demineralised water in the titrant container. Evaporation leaves salt crystals that may form harmful deposits. Remove chloroform or titrants that can decompose to form hydrochloric acid from the system.
- For weekend storage flush 60/40% MeOH/Water through the Vacuum Degasser, then turn off the Vacuum Degasser.

#### Long-term Shutdown and Storage

- Follow the first two Short-term Shutdown procedural steps above.
- Remove the column and direct the pump output tubing to a beaker. Flush the Vacuum Degasser, first with water and then with Isopropanol.
- Turn off the Vacuum Degasser. Then disconnect the tubing between the Vacuum Degasser and titrant containers, and the Vacuum Degasser and the MPT-2. Plug all of the ports on the Vacuum Degasser.
- Store the Vacuum Degasser in a clean, dry location.
- Before using the Vacuum Degasser, completely purge it with the correct titrant before reconnecting the MPT-2 and restarting the system.

## Maintenance

To experience long and trouble-free performance with the Vacuum Degasser, it is recommended that both routine and preventive maintenance procedures be regularly performed.

## **Preventative Maintenance**

Perform preventive maintenance to ensure that your Vacuum Degasser will perform consistently at an optimal level. To maintain the Vacuum Degasser in the best condition, the following measures are recommended:

- Adhere to standard laboratory cleanliness practices. Use only high-purity titrants - preferably High Performance Liquid Chromatography (HPLC) Grade. Water should be bottled HPLC Grade, or filtered and deionised tap water. Filter all titrants to prevent particulate contamination and tubing blockages.
- Use only high-purity gases when drying contact areas.
  Follow the short- and long-term shutdown procedures that are described above.
- Routine cleaning of the external surfaces of the instrument can be done using a clean, damp cloth. Immediately clean any spills which occur on or near the instrument using methods appropriate for the type of spill. Some titrants can damage the appearance and function of the instrument.

## **Routine Maintenance**

Routine maintenance is defined as replacing the normal wear items when degradation in performance is noticed.

Consult the Troubleshooting Guide, below, if a problem has arisen.



#### Warning!

**Never** remove the Degasser's cover. There is nothing inside that requires customer service or maintenance.

## **Troubleshooting Guide:**

Problem	Probable Cause	Solution
Power switch is on, but all 3 LEDs are off, indi- cating no power to the	The AC Adapter is not plugged into the AC wall socket.	Plug the AC Adapter into the AC outlet.
degasser.	Blown fuse.	Contact your Service Representative.
Yellow Status LED is on steadily, pump is running and RPM seems high.	Pump is in initial pull- down phase or system's degassing demand has increased.	Typically normal opera- tion, although if pump speed continues to rise for an extended period of time (as heard by the pitch of the stepper motor) it could indicate a potential fault condition.
Yellow Status LED is flashing approximately 1 second off, 1 second on. Vacuum pump is not run- ning.	Possible system leak.	Contact your Service Representative.
Yellow Status LED is flashing approximately 2 seconds off, 1 second on. Vacuum pump is not running.	Possible sensor or Con- trol Board fault.	Contact your Service Representative.
Is there a way to check whether the system is operating correctly when Power and Vacuum green LEDs are illumi- nated, but pump can't be heard running?	Due to the design of the pump and degasser, the pump is virtually silent at low RPM, even though vacuum is good and degassing is normal.	Place a hand on the top of the unit. A slight vibration can be felt indi- cating the pump is oper- ating at low RPM.
Bubbles appear through the output tubing.	Loose fitting(s).	Tighten the input and output fittings.

Problem	Probable Cause	Solution
No titrant flow.	If a buffer titrant was left in the degasser for some time after use, it may plug the degasser ele- ments.	Use a different channel, or connect the channel to a beaker of the titrant without the buffer. Draw the titrant through the channel to dissolve the buffer. Do not push the titrant through the chan- nel. If this flushing action does not work, contact your Service Represent- ative.

## User consumables and spares

This section lists all available user consumables and spares. Contact the Malvern Instruments representative, quoting the part number listed below.

Part	Part Number
MPT-2 and Degasser Connectors pack -	ZEN4037
for all internal and external connections on the	
Autotitrator, except pump, and for connecting to	
the Vacuum degasser.	
Inc: 4 x manifold (red) 2 x push on barb connections	
4 x manifold (green) 4 x black tubing grips	
4 x manifold (cream) 1 x Luer filter fittings	
4 x plastic nuts 1 x Luer caps	
MPT-2 Internal tubing and Degasser connecting tubing pack -	ZEN4038
for all internal connections on the Autotitrator and	
for connection to the Degasser.	
Inc: 20 x tubing cones (ferrules) and 8m tubing	

Vacuum Degasser

## **Specifications**

#### General:

Dimensions:	Height: 5.0 in. Width: 2.87 in. Depth: 9.81 in.
Weight	6 lb
Channels	3 independent
Degassing Process	Gas permeation through a fluoropolymer membrane
Maximum Flow Rate	10 mL/min.
Degassing Capacity	~2 ppm at 1 mL/min.
Dead Volume	~480 microliters per channel for standard channel
Materials contacting titrant/solvents	PEEK, Glass-filled PTFE, Teflon AF®, PTFE
Power:	
Power requirement using supplied AC Adapter	100 to 240 VAC, 1A, 50 to 60 Hz
Interchangeable adaptor plugs	4 supplied with AC Adapter Interchangeable to AC Adaptor: North America/ Japan, U.K., Continental Europe, Australia
Installation Over-Voltage Category	II (IEC 60664)

#### Validation Output:

Signal	5 mVDC / 1 mm Hg absolute from 20 to 800 mm Hg (0.100 VDC at 20 mm Hg; 4.000 VDC at 800 mm Hg)
Accuracy	$\pm 1.0\%$ of reading $\pm 0.010$ VDC from 20 to 800 mm Hg

# Operating<br/>Conditions:Ambient Temperature10 to 35 °CAmbient Relative<br/>Humidity (RH)20 to 80 % RH (without condensation)Altitude0 to 2000 MetersIndoor vs. Outdoor UseIndoorPollution Degree2 (IEC 60664

otorage opriations.	
Ambient temperature	–20 to +60 °C
Ambient Relative Humidity	20 to 80% RH (without condensation)
Altitude	0 to 12000 M
Connector and Tubing sizes:	
Connectors Material Size / description	PEEK 1/4-28 flangeless fittings for 1/16" 'Outside Diameter' tubing
Connecting Tubing from MPT-2 Material Size	PTFE 1.6mm x 0.8mm (Outside Diameter x Inside Diameter)

#### **Storage Conditions:**

## System Requirements and Unpacking

## **Space Requirements:**

The Vacuum Degasser is designed to sit on a standard laboratory bench top, and is plumbed into the MPT-2 Autotitrator system between the titrant supply and MPT-2 Autotitrator pump.

Enough space should be given to allow easy access to all components of the system.

Dimensions	Height: 5.0 in.
	Width: 2.87 in.
	Depth: 9.81 in (distance front to back)

Allow additional space both in front, to accommodate the tubing connected to the unit, and behind to accommodate the power lead.

## **Electrical Power Requirements**

The mains power supply must be clean and filtered. If necessary, fit an un-interruptible power supply (UPS) to remove any spikes or noise. The power requirement for the Vacuum degasser is indicated below.

Power requirement 100 to 240VAC / 47 to 63Hz



Caution!

Use the correct power lead for the territory.

A set of four interchangeable adaptor plugs are is included to allow the AC adapter to be plugged into the standard electrical wall sockets in North America, Japan, the U.K., most countries in continental Europe, and Australia.

If it is necessary to replace the AC Adapter - Contact Malvern instruments about replacement.



#### Note

Refer to the **Health and Safety** section on the main **Zetasizer Nano user manual** for more information.

## Unpacking the Vacuum Degasser

Carefully unpack the Vacuum Degasser and check for obvious signs of damage that may have occurred during shipment. Immediately report any damage or missing items to your Service Representative.

#### Items supplied with the Vacuum Degasser:

Item	Quantity
Malvern Vacuum Degasser	DEG0003
AC Adapter (including lead)	1
Interchangeable adaptor plugs	4 (North America/Japan, U.K., Continental Europe, Australia)
User Manual	1

## **Chemical Compatibility**



Note

Consult the MPT-2 Autotitrator manual for details of the MPT-2 chemical compatibility.

## **Titrants and Solvents**

Use only HPLC grade solvents in all analyses.



#### Caution!

The degassing membrane in the Vacuum Degasser is manufactured from Teflon AF®.

#### Teflon AF® Solvent Compatibility is:

- Teflon AF® is inert to all solvents normally used in HPLC.
- Teflon AF® is soluble in perfluorinated solvents such as Fluorinert® FC-75 and FC-40 and Fomblin perfluoro polyether solvents from Ausimont.
- Freon® solvents will adversely affect Teflon AF®.

Use of inappropriate solvents in the Vacuum Degasser will result in the dissolution and hence destruction of the membrane.



#### Caution!

Use appropriate care when handling flammable solvents. Make sure that there are no leaks in the titrant lines - refer to **General Operation - Ini-tial pump-down**. Ensure that hazardous exhaust gases are properly vented.

## Corrosion

All parts that contact the titrant (solvents) are made of PEEK, Kel-F®, Tefzel® or Teflon AF®, PTFE or Glass-filled PTFE

PEEK is sensitive to Sulphuric acid and certain solvents.

## **Regulatory Information**

## **CE** Declaration of Conformity

The CE badge on this product signifies conformance to European Commision Directives.

JE Declaration of Co	onformity MANER
Supplier details	
Name (NAME OF MANUFACTURER) Malvern Instruments Limited	English company number (REGISTERED) 1020602
Address (ADDRESS OF MANUFACTURER)	
Enigma Business Park, Grovewood Road, Malvern, Worcestershire, WR14 1XZ, UK	
Product details	
Description: Vacuum Degasser	
Directive(s) and Standard(s) to which conformity is declare	d
Directive(s) and Standard(s) to which conformity is declare EMC directive 89/336/EEC as am Low Voltage Directive 73/23/I	d ended by 92/31/EEC and 93/68/EEC EEC as amended by 93/68/EEC
Directive(s) and Standard(s) to which conformity is declare EMC directive 89/336/EEC as am Low Voltage Directive 73/23/ EN 61326-1: 1997 Incorpo EN 61010-1:2	d ended by 92/31/EEC and 93/68/EEC EEC as amended by 93/68/EEC vrating Amendments A1:1998 001 (2 <sup>nd</sup> Edition)
Directive(s) and Standard(s) to which conformity is declare EMC directive 89/336/EEC as am Low Voltage Directive 73/23/I EN 61326-1: 1997 Incorpo EN 61010-1:2	d ended by 92/31/EEC and 93/68/EEC EEC as amended by 93/68/EEC vrating Amendments A1:1998 001 (2 <sup>nd</sup> Edition)
Directive(s) and Standard(s) to which conformity is declare EMC directive 89/336/EEC as am Low Voltage Directive 73/23/J EN 61326-1: 1997 Incorpo EN 61010-1:2 Declaration	d ended by 92/31/EEC and 93/68/EEC EEC as amended by 93/68/EEC vrating Amendments A1:1998 001 (2 <sup>rd</sup> Edition)

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## Federal Communications Commission (FCC) Notice (US only)

The FCC mark on this product signifies conformance to FCC regulations relating to Radio Frequency Devices. These have been satisfied by testing the product against, and being found to be compliant with:

FCC CFR 47 Part 15:March 2003.Class A digital device.

The device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1) This device may not cause harmful interference, and

2) this device must accept any interference received, including interference that may cause undesired operation.



#### Note

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



#### Note

Changes or modifications not expressly approved by Malvern Instruments Limited could void the user's authority to operate the equipment.

## **Disposal of Electrical & Electronic Equipment**

This regulation is applicable in the European Union and other European countries with separate collection systems.



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This symbol on the product or on its packaging indicates that when the last user wishes to discard this product it must not be treated as general waste. Instead it shall be handed over to the appropriate facility for the recovery and recycling of electrical and electronic equipment.

By not discarding this product along with other household-type waste, the volume of waste sent to incinerators or landfills will be reduced and natural resources will be conserved.

For more detailed information about recycling of this product, please contact your local city office, your waste disposal service, or your Malvern representative.