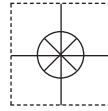


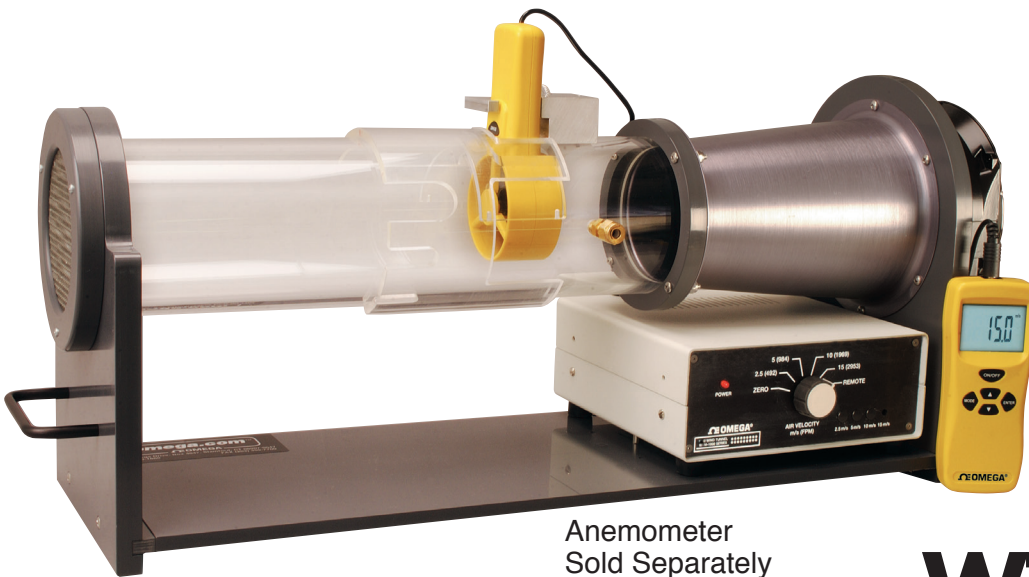
1 YEAR
WARRANTY



Ω OMEGA® **User's Guide**

***Shop online at
omega.com®***

***e-mail: info@omega.com
For latest product manuals:
www.omegamanual.info***



Anemometer
Sold Separately

WTM-1000 **Laboratory Grade, Bench Top** **Mini Wind Tunnel**



omega.com info@omega.com

Servicing North America:

U.S.A.:

Omega Engineering, Inc., One Omega Drive, P.O. Box 4047
Stamford, CT 06907-0047 USA
Toll-Free: 1-800-826-6342 (USA & Canada only)
Customer Service: 1-800-622-2378 (USA & Canada only)
Engineering Service: 1-800-872-9436 (USA & Canada only)
Tel: (203) 359-1660 Fax: (203) 359-7700
e-mail: info@omega.com

For Other Locations Visit omega.com/worldwide



	Page
Chapter 1 Introduction	1
1.1 Description	1
1.2 Unpacking	1
1.3 Safety Information	2
Chapter 2 Operation	5
2.1 Setting Up the Mini Wind Tunnel - Precautions	5
2.2 Operating the Wind Tunnel	5
2.3 Correction Factors	6
Chapter 3 Specifications	8
Chapter 4 In Case Of Problems	9
Chapter 5 Maintenance	10
Chapter 6 Spare Parts and Replacement Parts	10



Notes

Introduction

1.1 Description

The new Mini Wind Tunnel Model WTM-1000 is designed to give a highly uniform flow rate over a 10 cm (4") diameter test chamber. The Wind Tunnel has an electronic control unit where it controls the DC Fan speed and provides four selectable fixed air speeds. The fixed air speeds are:

2.5 m/s (492 FPM)
5 m/s (984 FPM)
10 m/s (1969 FPM)
15 m/s (2953 FPM)

In addition, there is a REMOTE selection on the electronic control unit selector switch. This will allow connecting an external potentiometer to control the DC fan speed and be able to vary the speed from 0 to 15 m/s. A cable to connect an external potentiometer to the control unit is included in the shipping box.

The purchase of the WTM-1000 also includes a NIST traceable calibration certificate.

Figure 1- Illustrates the important components of the wind tunnel as well as it's overall dimensions (page 3). Figure 2 - Shows the front panel of the Electronic Control Box (page 4). Figure 3 - Shows the rear panel of the Electronic Control Box (page 4).

1.2 Unpacking

1.2.1

Remove the packing list and verify that you have received all your equipment. If you have any questions about the shipment, please call our Customer Service Department at **1-800-622-2378** or **203-359-1660**. We can also be reached on the Internet at **omega.com**, e-mail: **cservice@omega.com**. When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

With your order of the WTM-1000 Mini Wind Tunnel you get:

1. Wind Tunnel
2. Power Cord
3. Remote Connection Cable
5. Spare Fuse
6. Vane/Probe Clamp Sleeve
7. Chamber Door
8. Vane Window Door
9. Package of ten 1/4" Teflon Compression Ferrules
10. NIST Traceable Calibration Certificates
11. Operators manual

ACCESSORIES	DESCRIPTION
POWER CORD-DM	Power cord with connector for Denmark
POWER CORD-E-10A	Power cord with connector for Continental Europe
POWER CORD-IT	Power cord with connector for Italy or Ireland
POWER CORD-SE	Power cord with stripped ends (no connector) All countries 250 Vac max
POWER CORD-UK	Power cord with connector for United Kingdom
POWER CORD MOLDED	Power cord with connector for North America (USA, Mexico, Canada) standard 120 Vac

Call Omega Engineering for pricing and availability.

1.3 Symbols and Safety Information

Symbols Used

The following table lists the International Electrical Symbols. Some or all these symbols may be used on the instrument or in this manual.

 Alternating Current (AC)



Caution/Warning: Read User's Manual (Important Instructions)



Caution. Possibility of electric shock



Off



On

The following definitions apply for "WARNING" and "CAUTION".

- "WARNING" Identifies conditions and actions that may pose hazards to the user.
- "CAUTION" Identifies conditions and actions that may damage the instrument being used.



WARNING

- No replacement cord shall be used other than the one shipped with the product.
- Use equipment only as instructed in the manual, otherwise protection may be impaired and user is risking an injury.
- Disconnect power from the source before changing the fuse.

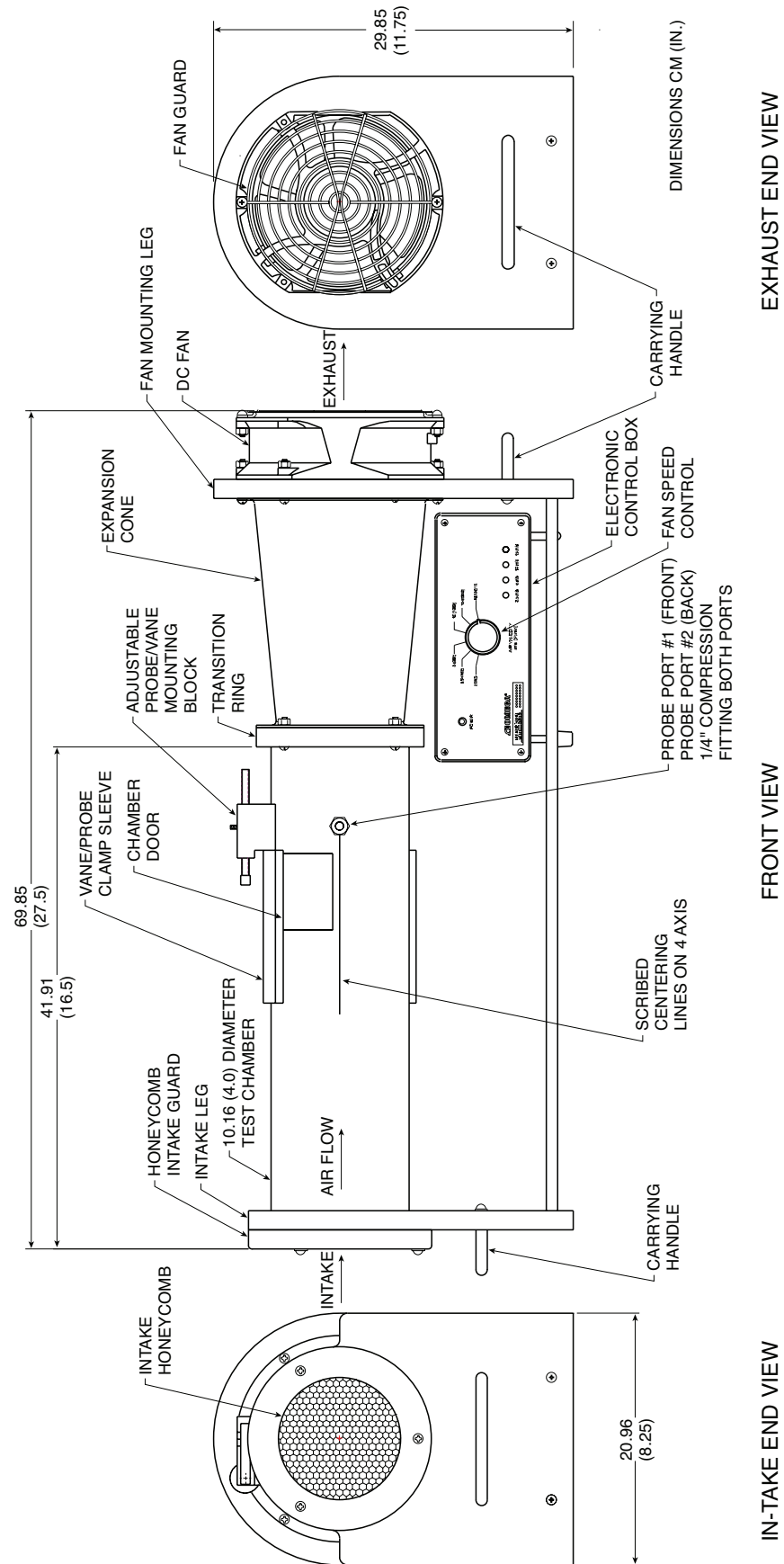


Figure 1 - Important Components of Mini Wind Tunnel and Overall Dimensions

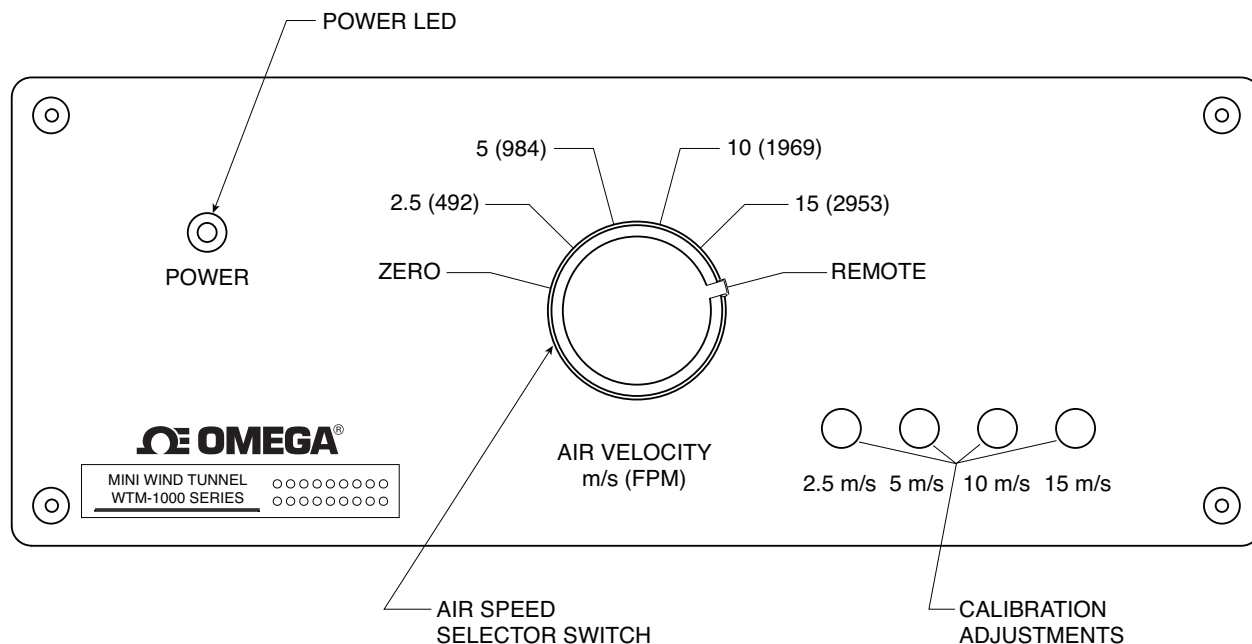


Figure 2. Front Panel, Control Unit Box

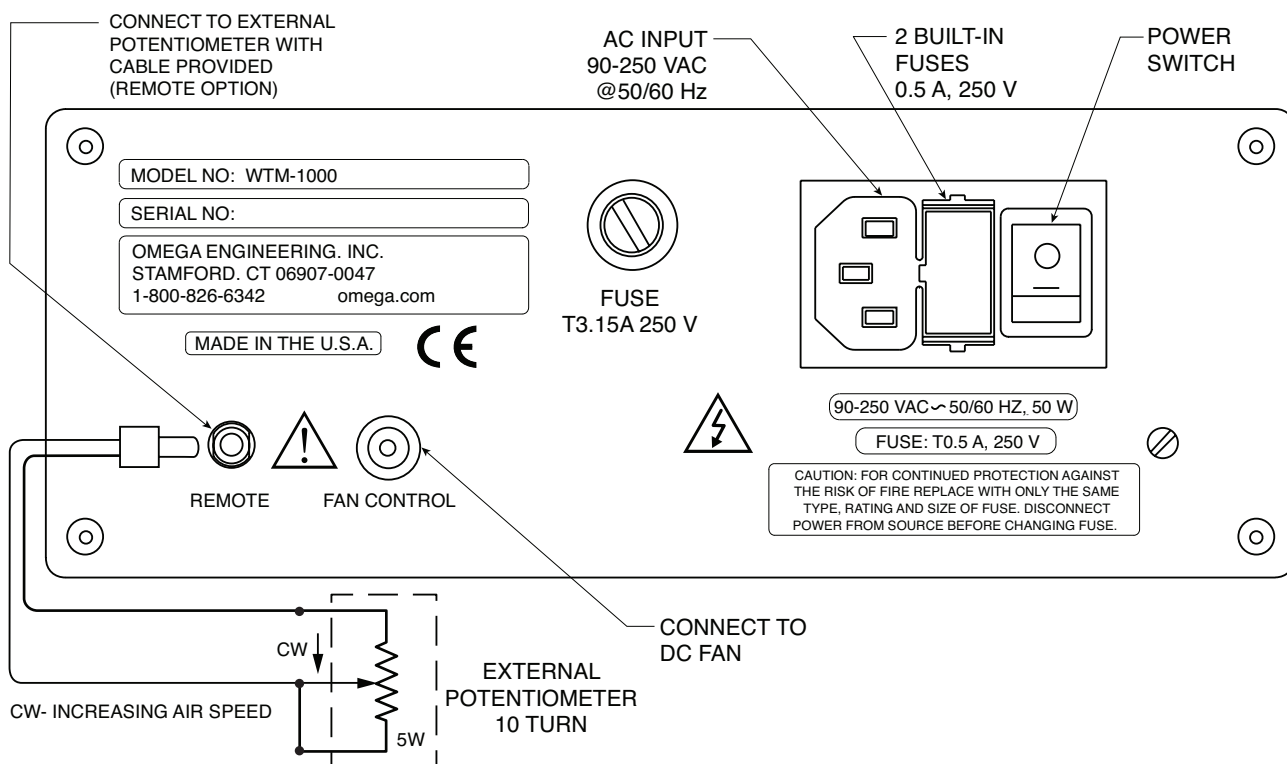


Figure 3. Back Panel, Control Unit Box

Operation

2.1 Setting Up the Mini Wind Tunnel - Precautions

A wind tunnel's performance can be severely diminished if not used properly. Please follow the following tips:

- Do not use the wind tunnel in small rooms. The air flow creates currents that undermine the wind tunnel's accuracy.
- Avoid locating the intake and exhaust toward open windows, door ways or corridors where people are walking. The effect of air current changes across the intake has a severe affect on the flow rate changing in the wind tunnel.
- There should be at least 1.5 m (5 feet) clear space in front of and behind the wind tunnel. No obstacles, moving objects, or open doors or windows.
- Locate the exhaust towards the largest open area of the room to minimize room air currents. The higher the flow rate, the more chance of creating currents.
- Air Probe geometry affects the readings. There is a correction factor table for different types of air probes (Hot wire & Vane type).
- The air flow rate of the wind tunnel depends on the air temperature and barometric pressure. Adjust it accordingly.
- This instrument should only be used for its intended purpose in accordance to the instruction manual.

2.2 Operating the Wind Tunnel

Before operating the wind tunnel, please follow all the precautions stated in the previous section and then proceed as follows:

- 1-  Connect the cable from the DC Fan to the back of the Control unit box labeled 'Fan Control'. Make sure the power switch in the back of the control unit is off.
- 2- Connect the AC input of the Control unit to a line voltage (90 to 250 VAC @ 50/60 Hz) with the Power cord provided. Please refer to the accessory table for power cords for other countries.
- 3- Set the air speed selector switch on the front of the control unit to Zero position (Meaning Zero air velocity). Turn on the Power switch in the back. You will see the power LED indicator on the front of the control box turns on.

The air speed selector switch can be set to four fixed air speeds. The wind tunnel has been calibrated at these four air speeds. The standard conditions are at 70°F (21.1°C) ambient temperature and 29.92 inches of Hg of Barometric pressure. There are four plugs in front of the control unit box. Removing the plugs, you will have access to potentiometers that will allow you to adjust the air speed at the four settings.

For Hot wire anemometers:

- 1- Use the Chamber Door (Solid) to cover the test chamber.
- 2- Insert the air probe into Port #1 as shown in Fig 1. Port #2 is used to insert a reference air probe if desired.
- 3- Align the air probe sensor to the center of the chamber using the scribed line on the outside of the chamber.
- 4- Use the Teflon Ferrules and "hand-tighten" the probe in place. Do not use tools or wrenches.

For Vane Type Anemometers:

- 1- Remove the chamber door. Open the clamp in the adjustable mounting block by turning the wheel.
- 2- Place the vane propeller inside the chamber. Make sure it is in the center of the chamber.
- 3- Place the vane window door.
- 4- Secure the vane propeller in place by tightening the clamp using the wheel.
- 5- Slide the Vane Clamp sleeve over the vane window door and up against the vane probe to minimize any air leaks.

Once the air probe is in place (either Hot wire or Vane type), turn the air speed selector switch from 2.5 m/s (492 FPM) up to 15 m/s (2953 FPM). Check the air probe reading vs. the switch setting on the wind tunnel.

2.3 Correction Factors**For Hot Wire Anemometers:**

If the environmental conditions are other than the standard conditions (70 °F and 29.92 inches of Hg), you need to correct for them. Here is the correction factor equation:

$$K1 = (29.92 / P) \times (460 + T) / 530 \text{ where,}$$

P is the Barometric pressure in inches of Hg
T is the ambient temperature in Degree F

There is a second correction factor which is a function of the air probe geometry (K2).

Table 1 lists K2 for different air probes. So, the actual air velocity is as follows:

$$\text{Actual Value} = \text{Measured Value (Average value over one minute time)} \times K1 \times K2$$

For Vane type anemometers:

You only need to correct for the air probe geometry (K2). The actual air velocity is as follows:

$$\text{Actual Value} = \text{Measured Value (Average value over one minute time)} \times K2$$

Model No.	Description	Correction Factor - K2			
		@ 2.5 m/s	@5 m/s	@10 m/s	@15 m/s
FMA-904	Hot Wire 0-2000 FPM	1.04	1.00	1.01	N/A
FMA-905	Hot Wire 0-5000 FPM	1.00	1.00	1.01	1.04
HHF42	Hot Wire 40-3940 FPM	1.04	1.00	1.06	1.07
HHF801	Vane Type 160-2358 FPM	1.08	1.12	1.17	N/A
HHF802	Vane Type 80-4930 FPM	0.90	0.96	1.04	1.07
HHF803	Vane Type 160-4930 FPM	0.94	1.00	1.09	1.06
HHF91	Vane Type 125-4900 FPM	0.86	0.92	1.00	1.03
HHF92A	Vane Type 80-6900 FPM	0.92	0.97	1.05	1.04
HHF81	Vane Type 80-5910 FPM	1.03	1.06	1.13	1.12
HHF82	Vane Type 80-5910 FPM	1.14	1.18	1.24	1.22
HHF11	Vane Type 80-6900 FPM	0.88	0.90	0.99	1.01

Example 1:

An FMA-904 Hot wire anemometer is being checked in the Wind Tunnel at 2.5 m/s (492 FPM) air speed. The Environmental conditions are:

Barometric Pressure = 27.88 inches of Hg

Ambient Temperature = 80 °F

The FMA-904 measures 442 FPM. Calculate the actual air speed:

Actual Air speed = Measured Value (Average value over one minute time) x K1 x K2

$$K1 = (29.92/P) \times (460 + T)/530$$

$$K1 = (29.92/27.88) \times (460 + 80)/530$$

$$K1 = 1.093$$

From Table 1, K2 for FMA-904 @ 2.5 m/s is 1.04

$$\text{Actual Air speed} = 442 \times 1.093 \times 1.04$$

$$\text{Actual Air speed} = 502 \text{ FPM}$$

Example 2:

An HHF92A Vane type anemometer is being checked in the Wind Tunnel at 15 m/s (2953 FPM). The HHF92A measures 2848 FPM. Calculate the actual air speed:

Actual Air speed = Measured Value (Average value over one minute time) x K2

From Table 1, K2 for HHF92A @ 15 m/s is 1.04

$$\text{Actual Air speed} = 2848 \times 1.04$$

$$\text{Actual Air speed} = 2962 \text{ FPM}$$

Chapter 3 - Specifications

Accuracy:	$\pm 1\%$ of setting or ± 0.1 m/s, whichever is larger
Test Chamber:	10 cm (4") diameter
Flow Rates:	2.5 m/s (492 fpm), 5.0 m/s (984 fpm), 10 m/s (1969 fpm), 15 m/s (2953 fpm)
Remote Option:	Use an external 5K, 10-turn potentiometer to vary air speed
DC Motor:	24 Vdc @ 1.1 A (26 W)
Power:	90 to 250 Vac @ 50/60 Hz
Operating Temperature:	5 to 45°C (41 to 113°F)
Operating Relative Humidity:	80% RH max without condensation
Size:	68.5 L x 20.3 W x 29.2 cm H (27 x 8 x 11.5")
Weight:	8.2 kg (18 lb)
Storage Temperature:	-40°C (-40°F) to 71°C (160°F)

Equipment is for indoor use only.

PROBLEM	SOLUTION
? The wind tunnel is not on - no power to control box	 Make sure the motor control box is plugged in and connected to a live outlet. Turn on power switch   Check the fuse in the motor control box - if blown, replace with same type and rating. "CAUTION: For continued protection against the risk of fire, replace with only the same type, rating and size of fuse. Disconnect power from the source before changing the fuse."
? The wind tunnel is on - fan does not turn.	 Make sure the cable from the fan is connected to the motor control box.  Make sure the power switch on the motor control box is "ON".  Make sure there are no obstructions around the fan area of the wind tunnel.
? Can't get velocity desired.	 Check your AC power.  Check the position of the selector switch on the motor control box.
? Poor repeatability.	 Locate the wind tunnel in room that has AT LEAST 1800 cubic feet of space.

Chapter 5 - Maintenance

The following points should be adhered to for a maintenance-free operation of the wind tunnel.

- Make sure the wind tunnel is operating in a relatively dirt-free room. Follow the precaution tips.
- There are no special instructions for cleaning the unit.
- This unit has non serviceable parts. If needed, contact Omega for necessary repairs.

Chapter 6 - Spare and Replacement Parts

Part Number	Description
WTM-0014	Honeycomb flow straightener
WTM-0009	Chamber Window Cover (Solid)
IR-0032C	Remote Connection Cable



Notes



Notes

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2014 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!** *Shop online at omega.comSM*

TEMPERATURE

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

FLOW/LEVEL

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

pH/CONDUCTIVITY

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Data Logging Systems
- ☑ Recorders, Printers & Plotters

HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments