

1 YEAR
WARRANTY



User's Guide



Shop online at

omega.com[®]

Ω OMEGA[®]

omega.com

e-mail: info@omega.com

For latest product manuals:

omegamanual.info



MADE IN TAIWAN

HHP9303 Pressure Meter with Datalogging SD Card



OMEGAnet® Online Service omega.com	Internet e-mail info@omega.com
---	---

Servicing North America:

U.S.A.: Omega Engineering, Inc., One Omega Drive, P.O. Box 4047
ISO 9001 Certified Stamford, CT 06907-0047
Toll-Free: 1-800-826-6342 Tel: (203) 359-1660
FAX: (203) 359-7700 e-mail: info@omega.com

Canada: 976 Bergar
Laval (Quebec), H7L 5A1 Canada
Toll-Free: 1-800-826-6342 TEL: (514) 856-6928
FAX: (514) 856-6886 e-mail: info@omega.com

For immediate technical or application assistance:

U.S.A. and Canada: Sales Service: 1-800-826-6342/1-800-TC-OMEGA®
Customer Service: 1-800-622-2378/1-800-622-BEST®
Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

Mexico Latin America En Español: 001 (203) 359-7803 FAX: 001 (203) 359-7807
info@omega.com.mx e-mail: espanol@omega.com

Servicing Europe:

Benelux: Managed by the United Kingdom Office
Toll-Free: 0800 099 3344 TEL: +31 20 347 21 21
FAX: +31 20 643 46 43 e-mail: sales@omegaeng.nl

Czech Republic: Frystatska 184
733 01 Karviná, Czech Republic
Toll-Free: 0800-1-66342 TEL: +420-59-6311899
FAX: +420-59-6311114 e-mail: info@omegashop.cz

France: Managed by the United Kingdom Office
Toll-Free: 0800 466 342 TEL: +33 (0) 161 37 29 00
FAX: +33 (0) 130 57 54 27 e-mail: sales@omega.fr

Germany/Austria: Daimlerstrasse 26
D-75392 Deckenpfronn, Germany
Toll-Free: 0800 6397678 TEL: +49 (0) 7056 9398-0
FAX: +49 (0) 7056 9398-29 e-mail: info@omega.de

United Kingdom: OMEGA Engineering Ltd.
ISO 9001 Certified One Omega Drive, River Bend Technology Centre, Northbank
Irlam, Manchester M44 5BD United Kingdom
Toll-Free: 0800-488-488 TEL: +44 (0) 161 777-6611
FAX: +44 (0) 161 777-6622 e-mail: sales@omega.co.uk

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification. The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.
WARNING: These products are not designed for use in, and should not be used for, human applications.

Table of Contents

Section	Page
Introduction	1
Key Features	2
Operating Instructions	2
What's in the case	2
Setup	4
Normal operation	7
Holding and storing measurements	8
Automatic vs. manual datalogging	9
Transferring data from an SD card to a computer	10
Specifications	12
Maintenance and Troubleshooting Tips	13

INTRODUCTION

Thank you for purchasing the OMEGA® HHP9303 Pressure Meter with Datalogging SD Card. Please read this user's manual carefully and thoroughly before using the instrument.

The HHP9303 is a general-purpose handheld instrument suitable for measuring pneumatic and hydraulic pressures in automotive, mechanical engineering, HVAC/R (heating, ventilation, air-conditioning, and refrigeration) and food-processing environments.

The HHP9303 has the performance and features needed to satisfy the most demanding aspects of the above applications. It works with any of eight optional pressure sensors, each with a different full-scale range (2, 5, 10, 20, 50, 100, 200 and 400 bar). A front-panel pushbutton enables rapid switching among sensors with no need for precalibration. Another front-panel pushbutton facilitates fast switching among the following 10 commonly used pressure units: Bar, psi, kg/cm², mm Hg, inches Hg, meters H₂O, inches H₂O, atmospheres, hectopascals (hPA) and kilopascals (kPA).

Because it is microprocessor-based, the HHP9303 can make full use of the portability, reliability and large storage capacities that SD memory cards offer. Pressure measurements can be made automatically at any sampling rate between one second and nine hours. After time-stamping and storing the measurements on an SD card plugged into the instrument (a process called datalogging), the user can remove the card and plug it into a laptop or desktop computer either directly or via a USB card reader. The data logs are stored on the card as files with the .xls extension, which can be opened by Microsoft's Excel application.

The HHP9303 has a backlit 2-1/2 inch diagonal display and is powered by six AA Alkaline batteries or an optional 9-VDCdd AC adapter.

KEY FEATURES

- Measures hydraulic or pneumatic pressure using optional sensors with full-scale ranges from 2 to 400 bar
- Sensors calibrated by single push of a button
- Ten different pressure units selectable via front panel
- Displays maximum and minimum readings
- Performs real-time automatic datalogging at sampling time settable from 1 second to 9 hours
- Also supports manual logging and changing of card storage location
- Outputs Excel-compatible data logs
- Accepts SD memory cards of up to 16 GB capacity
- Big (2.5-inch diagonal) front-panel green backlit LCD is easy to read
- Auto power off function
- Powered by six AA batteries or optional 9V AC/DC adapter

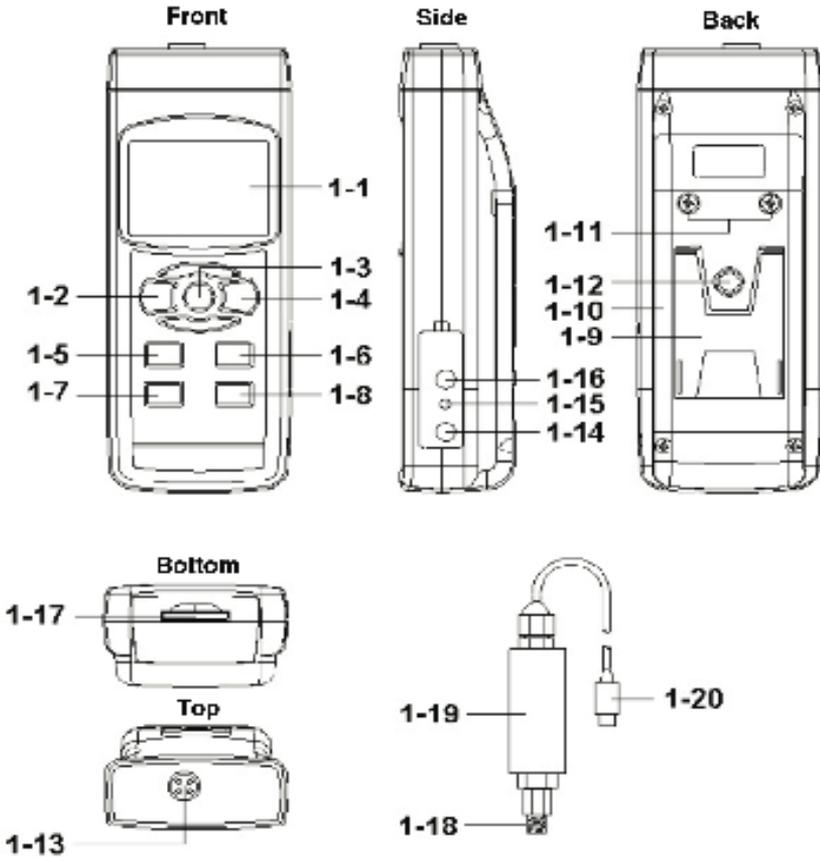
OPERATING INSTRUCTIONS

What's in the case

The HHP9303 comes fully assembled along with a 2 GB SD memory card with this user's manual.

Optional accessories available from OMEGA include eight optional pressure sensors, each with a different full-scale range (2, 5, 10, 20, 50, 100, 200 and 400 bar) and a 9VDC adapter for a 110V power supply. See the Optional Accessories section of this manual for more details.

Figure 1 shows all of the controls and indicators on the front, back, top, bottom and right side of the HHP9303. It also shows the main components of an optional pressure sensor. Familiarize yourself with the positions and functions of these controls, indicators and ports before moving on to the setup procedure.



1. The HHP9303's controls and indicators and other physical features

- 1-1 Liquid-crystal display
- 1-2 POWER button
- 1-3 HOLD/ESC button
- 1-4 REC/ENTER button
- 1-5 ▲ button
- 1-6 ▼ button
- 1-7 TIME button
- 1-8 LOGGER SET button
- 1-9 Kickstand
- 1-10 Battery compartment cover
- 1-11 Battery compartment cover screws
- 1-12 Tripod attachment nut
- 1-13 Pressure sensor socket

- 1-14 Socket for 9VDC AC adapter
- 1-15 Reset button
- 1-16 RS232 output jack
- 1-17 SD card socket
- 1-18 Pressure sensor port
- 1-19 Pressure sensor
- 1-20 Pressure sensor connector

Setup

1. **Choose the power source.** Before using the HHP9303, be sure it is powered by fresh batteries or an optional 9VDC AC adapter plugged into the bottom jack on its right side (callout 1-14).

To remove the battery compartment cover, remove the two screws holding it in place (callout 1-11). Then install six AA batteries in the correct orientation, using the polarity marks on the inside of the compartment as a guide. Replace the cover by replacing the two screws.

2. **Install an SD card.** To prepare for setup, also install the supplied 2 GB SD memory card or another card with a capacity from 1 GB to 16 GB in the socket on the bottom of the HHP9303 (callout 1-17). When installing the card, make sure its gold contacts are facing front and push the card into the socket until you hear a click. To remove the card, push it in until you hear a click and the card pops out.

Now power on the instrument by pressing the POWER button (callout 1-2) to generate a short beep. (To power off the HHP9303, press the POWER button and hold it until the instrument responds with a long beep.)

When the pressure meter powers on, a series of transient startup screens will briefly appear. Once the display has stabilized, perform the following seven setup steps in the order presented.

1. **Format the SD card.** Press the LOGGER SET button (callout 1-8) and hold it for at least five seconds, until “Sd-F” appears in the lower half of the display. Quickly (within three seconds) press the REC/ENTER button.

(If you press buttons too slowly in setup mode, the screen will revert to the normal display. To return to the setup sequence, press and hold the **LOGGER SET** button again. To move ahead to the next field in the sequence or to the next parameter, press the **HOLD/ESC** button.)

Pressing the **REC/ENTER** button causes the word “no” or “yES” to appear over the term “Sd-F”. Press the **SET ▼** button to make a selection. Choose “yES” whenever a new SD card is being used, or when a used card is being repurposed (from use with another SD card instrument or a camera, for example) and all data on it is to be erased. Choose “no” to preserve any data on a card previously used with this instrument.

If you choose “yES”, after you press the **REC/ENTER** button the instrument will prompt you to confirm that decision by displaying the term “Ent” below “yES” and sounding three beeps. To confirm that you want to begin the erasure/formatting procedure, press the **REC/ENTER**. “Ent” will then flash several times and the instrument will sound another three beeps to confirm that the SD card has been erased and formatted.

2. **Set the date and time.** Once the SD card has been set up, the word “dAtE” will appear in the center of the display, along with the flashing value “00.00.00” at the lower left, above “yy.mm.dd”. Set the current year by pressing the ▼ or ▲ button repeatedly until the correct value appears above “yy”. Press the **REC/ENTER** button to store the setting. The next screen that appears will have the value above “mm” flashing. Use the ▼ or ▲ button to navigate to the current month and press the **REC/ENTER** button to store the setting. When the next screen flashes the value above “dd”, again use the ▼ or ▲ button to navigate to the current day and press the **REC/ENTER** button to store the setting.

Once you have set the date, the display will prompt you to set the hour, minute and second of the current time. Again use the ▼ or ▲ buttons to navigate to the correct values, and the **REC/ENTER** button to store the settings.

3. **Set the datalogging sampling time.** Once the date and time have been set and stored, the display will show a value below

the letters “SP-t”. Press the ▼ or ▲ button to decrease or increase the flashing hour value until the desired number appears below “SP-t”. Press the REC/ENTER button to store that setting. The minutes value will then flash. Press the ▼ or ▲ button to decrease or increase the value and then press the REC/ENTER button to store that setting. Finally, press the ▼ or ▲ button to decrease or increase the flashing seconds value and then press the REC/ENTER button to store that setting. This completes the setting of the pressure meter’s datalogging sampling time.

4. **Enable or disable auto power off.** Once the sampling time has been set and stored, the display will show the word “yES’ over the term “PoFF”. Press the ▼ button until the desired automatic power off management scheme (“yES” for enable; “no” for disable) is displayed. Press the REC/ENTER button to store the selection. If enabled, the power off function shuts off the HHP9303 after a period of inactivity of ten minutes.
5. **Enable or disable the beeper.** Once the auto power off function has been enabled or disabled, the display will show the word “yES” over the word “bBEEP”. Press the ▼ button until the desired setting (“yES” or “no”) is displayed, and then press the REC/ENTER button to store the selection.
6. **Choose a decimal point or comma** to represent the decimal division between integers and fractions (for example, American-style 20.88 vs. European-style 20,88). Once the beeper has been enabled or disabled, the display will show the word “bASIC” above the phrase “dEC”. Press the ▼ button to make “bASIC” (American style) or “Euro” appear in the upper display, as desired. Press the REC/ENTER button to store the selection.
7. **Choose the full-scale range of the optional pressure sensor.** Once the format of decimal divisions has been set and stored, the term “tyPE” will appear in the lower part of the display. Above it will appear the default value “2”, for a 2-bar sensor. Press the ▼ or ▲ button until the value displayed matches the full-scale range, in bar, of your optional sensor. OMEGA offers pressure sensors with full-scale ranges from 2 bar to 400 bar. Press the REC/ENTER button to store the setting.

Once the pressure sensor's range has been set and stored, the display will then either return to the first of the seven steps in the setup sequence--choosing whether or not to format the SD memory card—or show the term “ESC”. If “ESC” appears, press either the HOLD/ESC button or the LOGGER SET button to exit the setup procedure and enter normal operating mode.

Normal operation

1. To prepare to measure pressure:

- Plug the connector (callout 1-20 of Fig. 1) of an optional pressure sensor (callout 1-19) into the socket on the top of the meter (callout 1-13).
- Power on the meter by pressing the POWER button. Press the ▼ button (which has the word “Sensor” stenciled above it) once to confirm that the sensor's full-scale range is the same as the one you stored as Step 7 of the setup procedure.
- Press the ▲ button (which has the word “Unit” stenciled above it) repeatedly until the desired pressure unit appears on the display. The table below correlates available pressure units with their display readings.

Pressure unit	Display reading
psi	PSI
inches Hg	In Hg
inches H ₂ O	In H ₂ O
hPA	hPA
kPA	_PA
bar	bAr
kg/cm ²	_g C2
mm Hg	--Hg
meters H ₂ O	-t H ₂ O
Atmospheres	AtP

After confirming the display unit, power off the meter and then power it on again. This will make the chosen unit the default display unit.

If the display does not show a zero value after the pressure sensor has been plugged into the instrument, press the TIME button (which has the word “Zero” stenciled above it) on the

front panel and hold it for at least 10 seconds, until the display shows a zero reading.

2. **To measure pneumatic or hydraulic pressure**, connect the sensor's port (callout 1-18) to the equipment you wish to measure. The HHP9303 will measure the pressure at the interface point and display it in the unit you selected.

Whenever the HHP9303 is in measurement mode, you can turn off the backlight (which is on by default) by briefly pressing (but not holding) the POWER/ESC button. To reactivate the backlight, briefly press the button again.

Whenever the instrument is in measurement mode, you also can check the current date and time by briefly pressing the TIME button. Doing so causes both values to appear briefly at the lower left of the display.

Holding and storing measurements

3. **To hold a measured value** of pressure, press the HOLD/ESC button during the measurement. Doing so will cause the word "HOLD" to appear at the top of the display. Pressing the HOLD/ESC button again releases the hold.
4. **To record and recall readings**, press the REC/ENTER button while making measurements. This will make the term "REC" appear at the top of the display. Pressing the REC/ENTER button again, briefly, will make the term "MAX" appear to the right of "REC" and switch the display to the maximum value stored in memory during the last recording session. Pressing the REC/ENTER button again, briefly, will make the term "MIN" appear to the right of "REC" and switch the display to the minimum value stored during the last session.
5. **To exit recording mode**, press and hold the REC/ENTER button for at least three seconds, until the term "REC" disappears from the top line of the display. The display will then revert to showing the current reading.

Automatic vs. manual datalogging

The HHP9303 can automatically log data at a user-selected sampling period from 1 second to 9 hours. To view the sampling time for which the instrument was set up, press the LOGGER SET button (which has the words “Sampling check” stenciled below it) once. To change the sampling time, perform Step 3 of the setup procedure.

6. **To start automatic datalogging**, press the REC/ENTER button once. The top line of the display will then show the term “REC”. Pressing the LOGGER SET button at this point will make REC flash and add the flashing term “LOGGER” at the top right of the display. This indicates that the instrument is currently storing measured values and their time stamps in memory.
7. **To pause automatic datalogging**, press the LOGGER SET button once; this action makes the flashing term LOGGER disappear from the top right of the display and changes the term “REC” from flashing to constant. Pressing the LOGGER SET button again resumes automatic datalogging.
8. **To end automatic datalogging**, press the REC/ENTER button and hold it for at least two seconds. This action causes the “REC” message to disappear.
9. **To log data manually**, set the sampling time to zero using the procedure detailed earlier. Then press the REC/ENTER button once. The display will show the term “REC” on the top line, a value in the middle, and below it the letter “P” on the left and a number from 1 to 99 on the same line to the right. The number indicates the position on the SD card that will be used to store manually logged data.

Now press the LOGGER SET button. This will cause the beeper to sound and the term “LOGGER” to briefly appear at the upper right of the display. As in automatic datalogging mode, in this mode the instrument is storing measurements and their time stamps on the SD card.

In manual datalogging mode, however, measurements are being stored continuously (with a sampling time of zero), and their locations on the card can be changed.

10. **To change the storage location of manually logged data**, press the ▼ button once; this causes the “P” to disappear from the left side of the display and the value on its line to begin flashing. Once the flashing begins, you can use the ▼ and ▲ buttons to change the flashing value to any number between 1 and 99. Once you have chosen the storage location, press the REC/ENTER button to save the setting. This causes the value to stop flashing and the “P” to return.

11. **To end manual datalogging**, press the REC/ENTER button and hold it for at least three seconds. This action causes the “REC” message to disappear from the top line of the display.

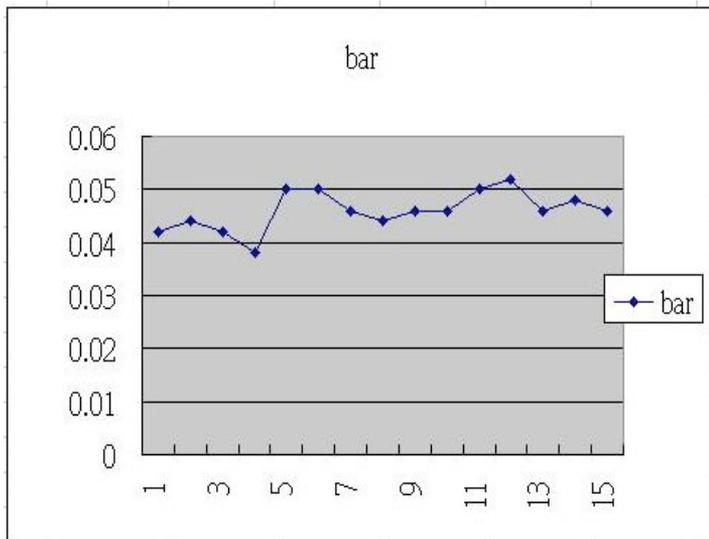
Transferring data from the SD card to a computer

After automatic or manual datalogging of measurements, remove the SD card from the HHP9303 and plug it into your computer either directly (if it has an SD card slot) or through an SD card reader.

Because the files containing time-stamped data logs have the extension .xls, they open in Microsoft’s Excel application. Figures 2 and 3 show two kinds of Excel presentations: a data-only screen and a graphics-only screen.

	A	B	C	D	E
1	Position	Date	Time	Ch1_Value	Ch1_Unit
2	1	2009/10/19	10:18:58	0.042	Bar
3	2	2009/10/19	10:19:00	0.044	Bar
4	3	2009/10/19	10:19:02	0.042	Bar
5	4	2009/10/19	10:19:04	0.038	Bar
6	5	2009/10/19	10:19:06	0.05	Bar
7	6	2009/10/19	10:19:08	0.05	Bar
8	7	2009/10/19	10:19:10	0.046	Bar
9	8	2009/10/19	10:19:12	0.044	Bar
10	9	2009/10/19	10:19:14	0.046	Bar
11	10	2009/10/19	10:19:16	0.046	Bar
12	11	2009/10/19	10:19:18	0.05	Bar
13	12	2009/10/19	10:19:20	0.052	Bar
14	13	2009/10/19	10:19:22	0.046	Bar
15	14	2009/10/19	10:19:24	0.048	Bar
16	15	2009/10/19	10:19:26	0.046	Bar

2. Typical Excel data-only screen



3. Typical Excel graphics-only screen

SPECIFICATIONS

Embedded microcontroller	Custom one-chip LSI device
Display type	Liquid-crystal with green backlight
Display size	2.05 x 1.5 inches (52 x 38 mm)
Displayed pressure unit	bar, psi, inches Hg, inches H ₂ O, hPA, kPA, kg/cm ² , mm Hg, meters H ₂ O, atmospheres
Measurement accuracy	± 0.5% of full-scale reading + 1 digit
Stored readings	Maximum, minimum
Datalogging sampling time	Settable between 1 second and 8 hours, 59 minutes, 59 seconds (in automatic datalogging mode)
SD card capacity	1 GB to 16 GB
Settable parameters	Date, time, auto power off, beep sound, sampling time, decimal point or comma decimal division, optional pressure sensor's full-scale range (2, 5, 10, 20, 50, 100, 200 or 400 bar)
Operating temperature	32 to 122°F (0 to 50°C)
Operating relative humidity	0 to 85%
Power supply	Six Alkaline AA batteries or optional 9-VDC AC adapter
Power consumption	5 mADC (normal operation, with backlight off and SD card not saving data); 25 mADC with backlight on and card saving data; 37 mADC with backlight on and card saving data
Dimensions of meter	6.97 x 2.68 x 1.77 inches (177 x 68 x 45 mm)
Weight of meter	0.77 lb (350 g)

MAINTENANCE & TROUBLESHOOTING TIPS

Keep the pressure sensor(s) clean and protected from the elements when not in use.

When the icon  appears in the left corner of the display, it's time to replace the six AA batteries that power the instrument (although measurements will remain valid for several hours after the low-battery indicator first appears). Replacing the batteries requires removing the two screws that hold the battery compartment cover in place, as explained earlier. After inserting fresh batteries in the correct orientation, tighten the screws to secure the cover.

If the meter “freezes” (like a computer) and buttons become unresponsive, try resetting the instrument by pushing the RESET button on its right side (callout 1-15 of Fig. 1) with the end of a paper clip.

Remove the batteries when storing this product for an extended period of time.

Do not drop or disassemble the meter or immerse it in water.

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 2011 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