1 YEAR WARRANTY

OMEGA CARE℠ Extended Warranty Program

CE

OMEGA®

User's Guide

Shop online at omega.com®

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

ISO 9001 CERTIFIED CORPORATE QUALITY
STAMFORD, CT

ISO 9001 CERTIFIED CORPORATE QUALITY
MANCHESTER, UK

OMEGASCOPE™ OMSP-2000 SERIES PC Oscilloscopes

OMEGA®

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

Servicing North America:

U.S.A.:
ISO 9001 Certified

Omega Engineering, Inc., One Omega Drive, P.O. Box 4047
Stamford, CT 06907-0047 USA
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.ca

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:
ISO 9001 Certified

OMEGA Engineering Ltd.
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.

WARNING: These products are not designed for use in, and should not be used for, human applications.

Contents

1 Welcome

The OMSP-2000 Series PC Oscilloscopes are compact units designed to replace traditional bench-top oscilloscopes costing many times the price.

Here are some of the benefits provided by your new PC Oscilloscope:

- Portability: Take the unit with you and plug it in to any Windows PC.
- Performance: Fast sampling from 100 MS/s to 200 MS/s, probe-tip bandwidth from 10 MHz to 25 MHz and fast USB 2.0 interface. See Specifications 9 for the details of each scope model.
- Flexibility: Use it as an oscilloscope, spectrum analyser, data logger or high-speed data acquisition interface.
- Long-term support: Software upgrades are available to download from our website. You can also call our specialists for technical support. You can continue to use both of these services free of charge for the lifetime of the product.
- Value for money: Buying an OMSP-2000 Series PC Oscilloscope means that you don't have to pay twice for all the features that you already have in your PC. The OMSP-2000 Series oscilloscope contains the special hardware you need and nothing more.
- Convenience: The software makes full use of the display, storage, user interface and networking built in to your PC.

2 Introduction

2.1 Using this guide

In this guide you will see symbols like this: 2 This is the cross-reference symbol, and it indicates the number of a page on which you can find more information about a topic.

The abbreviation MS/s is used in this guide to mean megasamples per second.

2.2 Safety symbols

The following symbols appear on the top of the OMSP-2000 Series PC Oscilloscopes.

Symbol 1: Warning triangle

This symbol indicates that a safety hazard exists on the indicated connections if correct precautions are not taken. Read all safety documentation associated with the product before using it.

Symbol 2: Equipotential

This symbol indicates that the outer shells of the indicated BNC connectors are all at the same potential (shorted together). You must therefore take necessary precautions to avoid applying a potential across the return connections of the indicated BNC terminals. Such a potential could cause a large current to flow, resulting in damage to the product or the connected equipment, or both.

2.3 Safety warning

We strongly recommend that you read the general safety information below before using your oscilloscope for the first time. Safety protection built in to equipment may cease to function if the equipment is used incorrectly. This could cause damage to your computer, or lead to injury to yourself and others.

Maximum input range

The OMSP-2000 Series PC Oscilloscopes are designed to measure voltages in the range -20 V to +20 V. The Ch A and Ch B inputs are protected to ±100 V. Contact with voltages outside the protection range may cause permanent damage to the unit.

Mains voltages

These products are not designed for use with mains (line power) voltages. To measure mains, use a differential isolating probe specifically designed for high voltages.

Safety grounding

The OMSP-2000 Series PC Oscilloscopes connect directly to the ground of a computer through the USB cable provided to minimise interference.

As with most oscilloscopes, avoid connecting the ground input to any potential other than ground. If in doubt, use a meter to check that there is no significant AC or DC voltage between the ground input of the oscilloscope and the point to which you intend to connect it. Failure to check may cause damage to your computer or injury to yourself and others.

The product does not have a protective safety ground.

Repairs

The oscilloscope contains no user-serviceable parts. Repair or calibration of the oscilloscope requires specialised test equipment and must be performed by the factory.

2.4 FCC notice

This equipment has been tested to meet CFR47 (2006) Part 15 of the FCC limits for Class A equipment. 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 or her own expense.

The OMSP-2000 Series PC Oscilloscopes were successfully tested to the standard.

For safety and maintenance information see the safety warning 3.

2.5 CE notice

The OMSP-2000 Series PC Oscilloscopes meet the intent of the EMC directive 89/336/EEC and have been designed to EN61326-1 (2006) Class A Emissions and Immunity standard.

The OMSP-2000 Series PC Oscilloscopes also meet the intent of the Low Voltage Directive and have been designed to meet the BS EN 61010-1:2001 IEC 61010-1:2001 (Safety requirements for electrical equipment for measurement, control and laboratory use) standard.

2.6 Trademarks

Windows, Excel and Visual Basic are registered trademarks or trademarks of Microsoft Corporation in the USA and other countries. Delphi is a registered trademark of Borland Software Corporation. Agilent VEE is a registered trademark of Agilent Technologies, Inc. LabView is a registered trademark of National Instruments Corporation.

OMEGASCOPE™ is a trademark of Omega Engineering, Inc.

2.7 Company details

Address:	Omega Engineering, Inc. One Omega Drive P.O. Box 4047 Stamford, CT 06907 USA
Phone:	203-359-1660
Fax:	203-359-7700
Email:	
Technical Support:	das@omega.com
Sales:	sales@omega.com
Web site:	www.omega.com

3 Product information

3.1 What do I get?

Your OMSP-2000 Series PC Oscilloscope kit contains the following items:

Quantity	Description
1	PC Oscilloscope
1	USB cable, for connection to the USB 1.1 or USB 2.0 port on your PC
1	Software and Reference CD, with OMEGASCOPE™ software, drivers 10, and example programs
1	USB Oscilloscope Installation Guide

3.2 System requirements

To ensure that your OMSP-2000 Series PC Oscilloscope operates correctly, you must have a computer with at least the minimum system requirements to run one of the supported operating systems, as shown in the following table. The performance of the software will increase with more powerful PCs, including those with multi-core processors.

Item	Absolute minimum	Recommended minimum	Recommended full specification
Operating system	Windows XP SP2, Windows Vista or Windows 7		
Processor	As required by Windows	300 MHz	1 GHz
Memory		256 MB	512 MB
Free disk space (Note 1)		1 GB	2 GB
Ports	USB 1.1 compliant port	USB 2.0 compliant port	

Note 1: The OMEGASCOPE™ software does not use all the disk space specified in the table. The free space is required to make Windows run efficiently.

3.3 Installation instructions

IMPORTANT
Do not connect your OMSP-2000 Series PC Oscilloscope to the PC before you have installed the OMEGASCOPE™ software.
If you do, Windows might not recognise the scope device correctly.

Procedure

- Follow the instructions in the Installation Guide included with your product package.
- Connect your PC Oscilloscope to the PC using the USB cable supplied.

Checking the installation

Once you have installed the software and connected the PC Oscilloscope to the PC, start the OMEGASCOPE™ software. The software should now display any signal connected to the scope inputs. If a probe is connected to your oscilloscope, you should see a small 50 or 60 hertz noise signal in the oscilloscope window when you touch the probe tip with your finger.

Moving your OMEGASCOPE™ PC Oscilloscope to another USB port

- Windows XP SP2

When you first installed the OMSP-2000 Series PC Oscilloscope by plugging it into a USB 11 port, Windows associated the driver with that port. If you later move the oscilloscope to a different USB port, Windows will display the "New Hardware Found Wizard" again. When this occurs, just click "Next" in the wizard to repeat the installation. If Windows gives a warning about Windows Logo Testing, click "Continue Anyway". As all the software you need is already installed on your computer, there is no need to insert the OMEGASCOPE™ CD again.

- Windows Vista and Windows 7

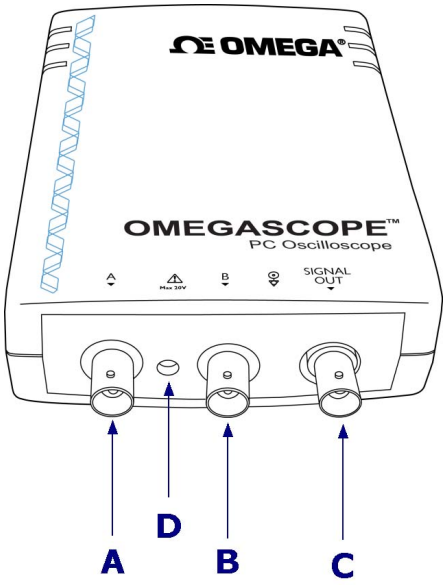
The process is automatic. When you move the device from one port to another, Windows displays an "Installing device driver software" message and then a "OMSP-2000 Series PC Oscilloscope" message. The PC Oscilloscope is then ready for use.

3.4 Connections

3.4.1 Connector diagrams

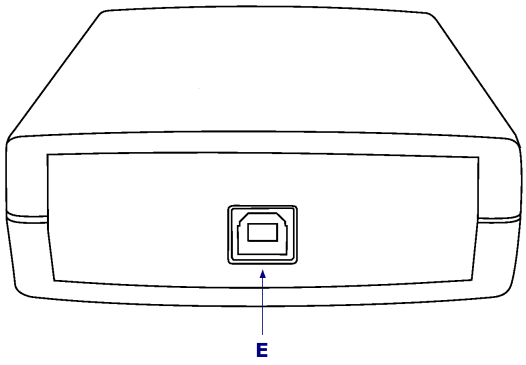
Connector diagrams

Front panel
OMSP-2204
OMSP-2205



A. Input channel A 8
B. Input channel B 8
C. Signal generator output 8
D. LED: shows when the oscilloscope is sampling data

Rear panel
OMSP-2204
OMSP-2205



E. USB port 8

3.4.2 Signal inputs

The OMSP-2000 Series PC Oscilloscopes have BNC oscilloscope connectors. The inputs have an impedance of 1 MΩ, so they are compatible with all standard scope probes including x10 attenuated types.

3.4.3 Signal Out connector

The SIGNAL OUT connector on the front panel carries the output of the oscilloscope's built-in signal generator, which can generate a number of built-in waveforms as well as arbitrary waveforms from a user-defined table of data.

Instructions for use

Refer to the *OMEGASCOPE™ Software User's Guide* for information on how to configure the signal generator.

Signal generator output specifications

Refer to the Specifications table 9.

3.4.4 USB port

Connect the oscilloscope's USB port to your PC's USB 2.0 port using the USB cable supplied. You can also connect it to a USB 1.1 port, but in this configuration the oscilloscope will not operate at full performance.

3.5 Specifications

Variant	OMS-2204	OMSP-2205
Number of channels	2	
Vertical resolution 11	8 bits	
Analog bandwidth 10	10 MHz	25 MHz
Maximum sampling rate 10 (real time)		
One channel in use	100 MS/s	200 MS/s
Two channels in use	50 MS/s	100 MS/s
Maximum sampling rate (repetitive signals)	2 GS/s	4 GS/s
Buffer size 10	8,000 samples	16,000 samples
	If two channels in use, buffer shared between channels.	
Timebase		
Ranges	2 ns/div (ETS) or 50 ns/div (real-time) to 200 s/div	
Accuracy	±100 ppm	
Inputs		
Connectors	BNC female	
Input impedance	1 MΩ	
Input capacitance	20 pF or less	
Coupling	AC or DC, software-controlled	
Voltage ranges 11	±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V	
Accuracy	3%	
Noise	1 LSB on ±1 V range	
Dynamic range	48 dB	
Overload protection	±100 V on single input	
Trigger		
Source	Ch A or Ch B	
Modes	Rising edge, falling edge	Rising edge, falling edge, hysteresis, pulse width, interval, dropout, windowed, logic
Signal generator output 8		
Standard waveforms	Sine, square, triangle, ramp (up/down)	
Arbitrary waveform buffer	4,096 samples	
DAC clock frequency	2 MHz	
Maximum signal frequency using standard waveforms	100 kHz	
Output impedance	600 Ω	
Resolution	8 bits	
Amplitude	±250 mV to ±2 V with ±1 V offset	
Operating environment		
Temperature range	0 °C to 45 °C (20 °C to 30 °C for quoted accuracy)	
Humidity	5% to 80% non-condensing	
Storage environment		
Temperature range	-20 °C to +60 °C	
Humidity	5% to 95% non-condensing	
PC connection	Designed for USB 2.0 Will work with USB 1.1 at reduced performance	
Power supply	4.60 V to 5.25 V @ 500 mA max. Obtained from USB port	
Dimensions	100 x 150 x 37 mm (3.9 x 5.9 x 1.5 in)	
Weight	210 g (7.4 oz)	
Compliance	European EMC and LVD standards 3 FCC Rules Part 15 Class A 3	

4 Glossary

Analog bandwidth—The frequency at which the measured signal amplitude is 3 decibels below the true signal amplitude.

Block mode—A fast data collection mode. The OMEGASCOPE™ software puts the oscilloscope into this mode to achieve the fastest possible sampling rates. The oscilloscope collects data as fast as possible and then stops to transfer the data to the PC. During data transfer to the PC in block mode, the oscilloscope cannot sample data from its inputs.

Buffer size—The size of the oscilloscope's buffer memory, measured in samples. The buffer allows the oscilloscope to sample data faster than it can transfer it to the computer.

Coupling mode—To switch from AC coupling to DC coupling, or vice versa, select AC or DC from the control on the OMEGASCOPE™ toolbar. The AC setting filters out very low-frequency components of the input signal, including DC, and is suitable for viewing small AC signals superimposed on a DC or slowly changing offset. In this mode you can measure the peak-to-peak amplitude of an AC signal but not its absolute value. Use the DC setting for measuring the absolute value of a signal.

Device Manager—Device Manager is a Windows program that displays the current hardware configuration of your computer. On Windows XP or Vista, right-click on 'My Computer,' choose 'Properties', then click the 'Hardware' tab and the 'Device Manager' button.

Driver—A program that controls a piece of hardware. The driver for the OMSP-2000 Series PC Oscilloscopes is supplied in the form of a 32-bit Windows DLL, `ps2000.dll`. This is used by the OMEGASCOPE™ software to control the oscilloscope.

ETS—Equivalent Time Sampling. Constructs a picture of a repetitive signal by accumulating information over many similar wave cycles. This allows the oscilloscope to create a composite cycle that has more samples, and therefore better time resolution, than a single cycle. ETS cannot be used for one-shot signals.

Maximum sampling rate—A figure indicating the maximum number of samples the oscilloscope can acquire per second. The higher the sampling rate of the oscilloscope, the more accurate the representation of the high-frequency details in a fast signal. "MS/s" is used in this manual an abbreviation for "millions of samples per second".

OMEGASCOPE™ software—A software program that accompanies all OMSP-2000 Series PC Oscilloscopes. It turns your PC into an oscilloscope, spectrum analyser, and meter display.

Oversampling—A technique for reducing noise in sampled signals. Measurements are taken more frequently than the requested sample rate, and then merged to produce the required number of samples. If, as is usually the case, the signal contains a small amount of noise, this technique can increase the effective vertical resolution 11 of the oscilloscope.

PC Oscilloscope—A virtual instrument formed by connecting an OMSP-2000 Series oscilloscope to a computer running the OMEGASCOPE™ software.

Signal generator—Generates a waveform and outputs it on the BNC socket marked Signal Out. This output can be used to drive a test signal through a BNC cable into an external circuit or into one of the oscilloscope's input channels. The OMEGASCOPE™ software allows the generator to output standard waveforms, such as sine and square waves, or arbitrary waveforms defined by the user.

Streaming mode—A data collection mode in which the oscilloscope samples data and returns it to the computer in a continuous stream. This mode allows the capture of more data than will fit in the oscilloscope's memory buffer, at sampling rates up to 13.3 million samples per second. The OMEGASCOPE™ program selects this mode for long timebases to enable the capture of very long sets of data.

Timebase—A timer that controls the speed at which the scope device captures data. At slow timebases this process is visible as OMEGASCOPE™ draws the trace across the scope view from left to right, but at fast timebases OMEGASCOPE™ draws the whole trace in a single operation. The timebase is measured in units of time (such as seconds) per division. There are ten divisions across the scope view, so the total time across the width of the view is ten times the "per division" setting.

USB 1.1—Universal Serial Bus (Full Speed). This is a standard port used to connect external devices to PCs. A typical USB 1.1 port supports a data transfer rate of 12 megabits per second, so is much faster than an RS-232 or 'COM' port.

USB 2.0—Universal Serial Bus (High Speed). This is a standard port used to connect external devices to PCs. A typical USB 2.0 port supports a data transfer rate 40 times faster than USB 1.1 when used with a USB 2.0 device, but can also be used with USB 1.1 devices.

Vertical resolution—A value, in bits, indicating the precision with which the oscilloscope converts input voltages to digital values. Oversampling (see above) can improve the effective vertical resolution.

Voltage range—The range of input voltages that the oscilloscope can measure. For example, a voltage range of ±100 mV means that the oscilloscope can measure voltages between -100 mV and +100 mV. Input voltages outside this range will not be measured correctly, but will not damage the instrument as long as they remain within the protection limits of ±100 V.

Index

U

V

W

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 it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS 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.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

Shop online at omega.com[sm]

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

M5060/1111