D5000 OMEGABUS® Series
Four Channel Sensor to Computer Interface Modules

NEW™

1 YEAR WARRANTY

MADE IN USA

YEAR 2000 COMPLIANT

CE

From
$250
Basic Unit
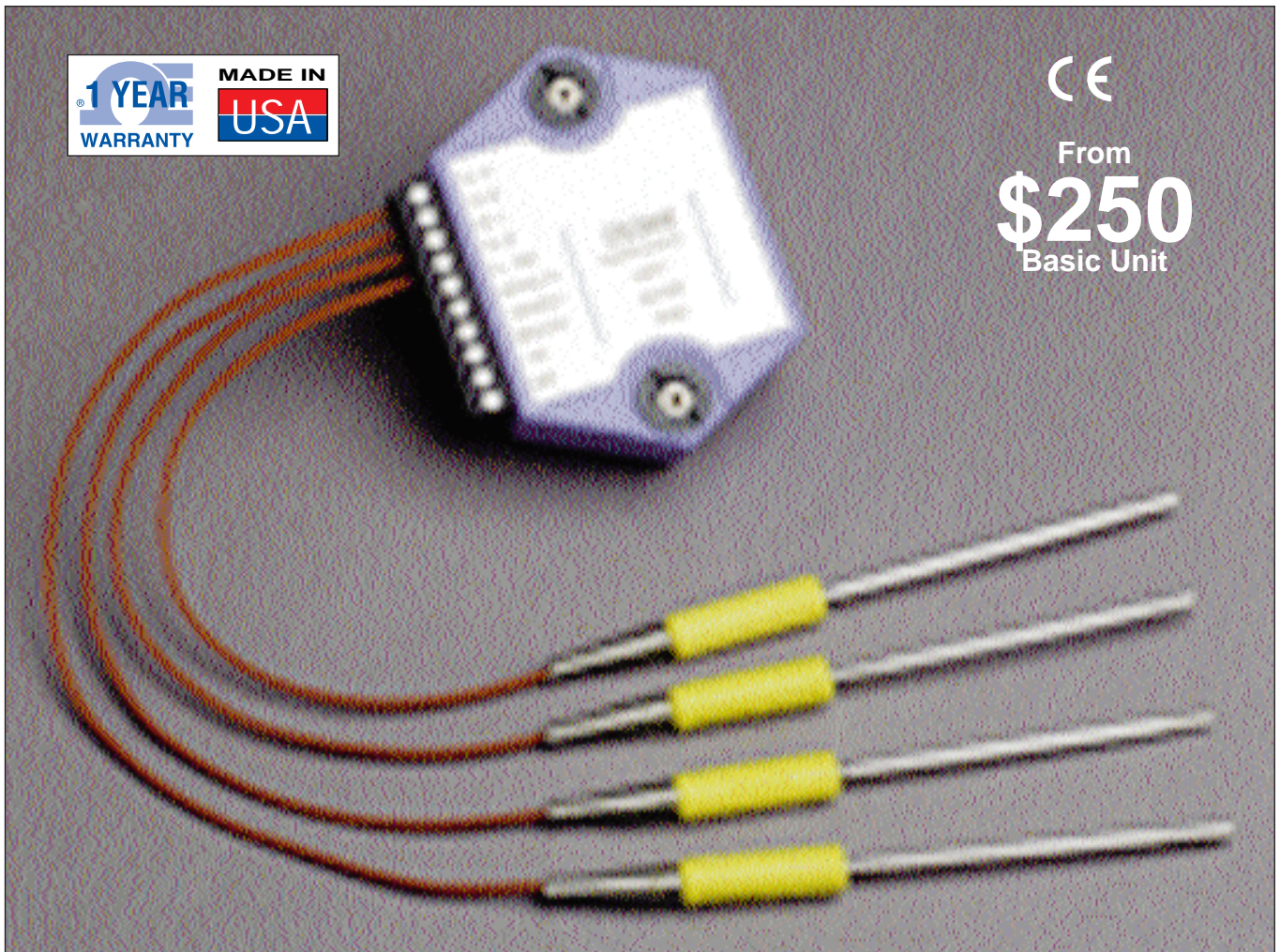
✔ **Four Channel Analog Input**

✔ **Complete Sensor to RS-485 or RS-232C Interface**

✔ **ASCII Format Command/ Response Protocol**

✔ **500 V RMS Analog Input Isolation**

✔ **15-Bit Measurement Resolution**

✔ **Continuous Self-Calibration; No Adjustments of any Kind**

✔ **Programmable Digital Filter**

✔ **Requires +10 V to 30 Vdc Unregulated Supply**

✔ **Transient Suppression on RS-485 Communications Lines**

✔ **Screw Terminal Plug Connectors Supplied**

The D5000 Four Channel Sensor to Computer Modules are a family of complete solutions designed for data acquisition systems based on personal computers and other processor-based equipment with standard serial I/O ports. The modules convert four analog input signals to engineering units and transmit in ASCII format to any host with standard RS-485 or RS-232C ports. These modules can measure temperature, voltage and current. The modules provide direct connection to a wide variety of sensors and perform all signal conditioning, scaling, linearization and conversion to engineering units.

The modules contain no pots or switches to be set. Features such as address, baud rate, parity, echo, etc. are selectable using simple commands over the communications port–without requiring access to the module. The selections are stored in nonvolatile EEPROM which maintains data even after power is removed.

The key to the D5000 series is that the modules are easy to use. You do not need engineering experience in complicated data acquisition hardware. With the D5000 series modules, anyone familiar with a personal computer can construct a data acquisition system.

This modular approach to data acquisition is very flexible, easy to use and cost effective. The modules can be mixed and matched to fit your application. They can be placed remote from the host and from each other. You can string up to 30 modules on one set of wires by using RS-485 with repeaters.

The D5000 Series is completely hardware and software compatible with the D1000, D2000, D3000 and D4000 series and may be mixed in any combination.

All modules are supplied with screw-terminal plug connectors and captive mounting hardware. The connectors allow system expansion, reconfiguration or repair without disturbing field wiring.

THEORY OF OPERATION
D5000 modules are complete four-channel data acquisition systems. Each unit contains analog signal conditioning circuits optimized for a specific input type. The amplified sensor signals are converted to digital data with a microprocessor-controlled integrating A/D converter. Offset and gain errors in the analog circuitry are continuously monitored and corrected using microprocessor techniques. The D5000 converts the digital signal data into engineering units using look-up tables. The resultant data is stored in ASCII format in a memory buffer. The modules continuously convert data at the rate of 8 conversions per second and store the latest result in the buffer. The host computer may request data by sending simple ASCII commands to the module. The D5000 will instantly respond by communicating the ASCII buffer data back to the host.

USER OPTIONS
The D5000 offers a variety of user-selectable options including choice of address, baud rate, parity, echo, etc. All options are selectable using simple commands over the communications port. All options are stored in a nonvolatile EEPROM which maintains data even after power is removed.

DIGITAL FILTER
The D5000 options include a unique programmable single pole digital filter. The filter is used to smooth analog data in noisy environments. Separate time constants may be specified for small and large signal changes. Typically, a large time constant is specified for small signal changes to filter out noise and provide stable output readings. A smaller time constant may be chosen for large signal changes to provide fast response to such changes.

COMMUNICATIONS
The D5000 are designed to be easy to interface to all popular computers and terminals. All communications to and from the module are performed with printable ASCII characters. This allows the information to be processed with string functions common to most high-level languages such as BASIC. For computers that support standard ports such as RS-232C, no special machine language software drivers are necessary for operation.

RS-232C is not designed to be used as a multiparty system; however, the module can be daisy-chained to allow many modules to be connected to a single communications port. In this network, any characters transmitted by the host are received by each module in the chain and passed on to the next module until the information is echoed back to the host. If a module is correctly addressed and receives a valid command, it transmits a response on the daisy chain network. The response will be rippled through any other modules in the chain until it reaches the host.

RS-485 was developed for multidropped systems that can communicate at high data rates over long distances. For systems requiring many modules, high speed or long distances, RS-485 is recommended.

A1000 RS-232 to RS-485 converter/repeater

COMMAND SET

The D5000 Series uses a simple command/response protocol for communication. A module must be interrogated by the host to obtain data. A module can never initiate a command sequence. A typical command/response sequence could look like this:

Command: $1RD
Response: *+00075.00

A command is initiated with a command prompt, which may be a dollar sign ($) or a pound sign (#). Following the prompt, a single address character must be transmitted. Each module on a communications bus must be set up with a unique address. The command is directed in this case to module address '1'. The address is followed by a two-character command, which in this case is RD for Read Data. The command is terminated with a carriage return. The table below shows the D5000 commands. For each case, a sample command and response is shown. Notice that some commands only respond with an * acknowledgment.

S1000-SW UTILITY SOFTWARE

The S1000 utility software diskette contains executable programs that make the D5000 series easier to learn and use. The executable programs can be run on IBM PC/XT/AT or compatible computers. A menu-driven setup program is provided to simplify configuration of all user-selectable options such as address, baud rate and parity. Context-sensitive help is available during configuration for each selectable parameter.

The S1000-SW also contains programming examples written in high level languages such as Visual Basic, Turbo Pascal and C. The examples are easily configured for COM1: or COM:2: ports are provided in ASCII text format. One copy of the S1000 is provided at no charge on request with a purchase order.

D5000 Scaling

Each D5000 can output data in easy-to-understand engineering units that may be instantly read and interpreted, without software conversion, by a host computer. Using simple ASCII commands, the voltage or current input range of a D5000 module can be rescaled to represent desired engineering units such as degrees or psi.
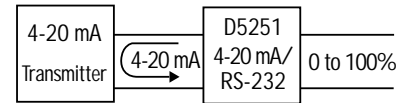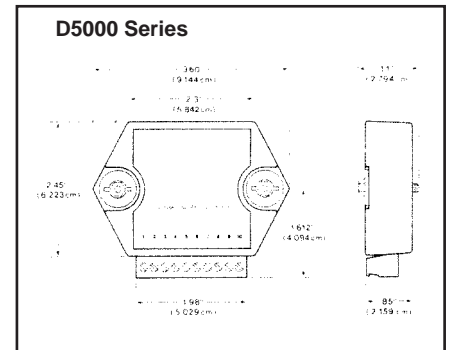

Scaling to desired engineering units.

For example, an application requires the displayed output values from a D5251 4-20 mA current input module to be rescaled to 0 to 100%. The D5251 module has an actual input range of 0-25 mA to make it easier to adjust for zero and span and to allow for drift in the end points of the input.

D5000 Mechanicals and Dimensions

Case: ABS with captive hardware
Connector: Screw terminal barrier plug (supplied)
NOTE: Spacing for mounting screws = 2.700" (6.858 cm). Screw threads are 6 X 32

D5000 Series Command Set

Command	Definition	Typical Command	Typical Response
RB	Read Block of Data	$1RB	*+00070.00 *+00112.00 *+00555.00
RD	Read Data	$1RD	*+00072.00
REA	Read Extended Address	$1REA	*3031
RID	Read IDentification	$1RID	*BOILER
RMN	Read Displayed MiNimum	$1RMN	*+00025.00
RS	Read Setup	$1RS	*31070142
RSU	Read Setup	$1RSU	*31070142
RZ	Read Zero	$1RZ	*+00000.00
WE	Write Enable	$1WE	*

Write Protected Commands

Command	Definition	Typical Command	Typical Response
CZ	Clear Zero	$1CZ	*
ID	IDentification	$1IDBOILER	*
RR	Remote Reset	$1RR	*
SU	Setup Module	$1SU31070142	*
TS	Trim Span	$1TS+00600.00	*
TZ	Trim Zero	$1TZ+00000.00	*
WEA	Write Extended Address	$1WEA3031	*
WMN	Write MiN Displayed Value	$1WMN+00000.00	*
WMX	Write MaX Displayed Value	$1WMX+00025.00	*

For greater data security, options are available to echo transmitted commands and to send and receive checksums.

COMMON SPECIFICATIONS

ANALOG

Channels: Four analog input
Maximum CMV:
Input to output at 60 Hz: 500 V rms
Leakage: Input to output at 115 V rms, 60 Hz: <2µA rms
Resolution: 15-bit measurement
Conversion Speed: 8 conversions per second

Common Mode Rejection:
100 dB at 50/60 Hz
Calibration: Autozero, no adjustment pots.

DIGITAL
Microcomputer: 8-bit CMOS
Filtering: Small and large signal digital filtering with user selectable time constants

COMMUNICATIONS
Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Data Format: NRZ asynchronous; 1 start bit, 7 data bits, 1 parity bit and 1 stop bit
Parity: Odd, even, none
Address: User selectable address
Protocol: ASCII format
Multidrop Modules: Up to 30 per host serial port
Communications: Distance up to 4,000 feet (RS-485)
Transient Suppression:
On RS-485 communication lines
Communications Error: Checking via checksum
Communications Setups: Stored in EEPROM

POWER REQUIREMENTS
Unregulated: +10 V to +30 Vdc, 0.75W max. Protected against power supply reversals.

ENVIRONMENTAL
Temperature Range:
Operating: -25 to +70°C
Storage: -25 to +85°C
Relative Humidity:
0 to 95% non-condensing

D5100 VOLTAGE INPUTS
Input Ranges: ±100 mV, ±1 V, ±5 V, ±10 V, ±100 Vdc
Resolution: 0.01% of FS (4 digits)
Accuracy: ±0.02% of FS max
Zero Drift: ±1 count max (autozero)
Span Tempco: ±50ppm/°C max
Input Burnout Protection:
To 250 Vac.
Input Impedance:
$\leq$ +1 V input = 100 MΩ min
$\geq$ +5 V input = 1 MΩ min

D5200 CURRENT INPUT
Current: 4-20 mAdc
Resolution: 0.04% of FS
Accuracy: 0.04% of FS
Zero Drift: ±1count max (autozero)
Span Tempco: ±50ppm/°C max
Voltage Drop: ±1.0V max

D5300 THERMOCOUPLE INPUTS
Thermocouple Types:
J, K, T, E (factory set)
Ranges:
J= -200 to 760°C
K= -150 to 1250°C
T= -200 to 400°C
E= -100 to 1000°C
Resolution: ±1°
Overall Accuracy:
(error from all sources) from
0 to 40°C Ambient: ±1.0°C Typical
Input Impedance: 100 MΩ min
Lead Resistance Effect:
<20μV per 350Ω
Open thermocouple and overrange indication
Input Burnout: Protection to 250 Vac
User Selectable: °C or °F

D5450 THERMISTOR INPUTS
Thermistor Types: 2252Ω at 25°C
Range: 0 to + 100°C
Resolution: 0.01°C or °F
Accuracy: ± 0.1°C
Input Protection: To 30 Vdc
User Selectable: °C or °F

To Order *(Specify Model Number)*

Model No. RS-232C Output	Model No. RS-485 Output	Price	Input
D5111	D5112	$250	100 mV
D5121	D5122	250	1 V
D5131	D5132	250	5 V
D5141	D5142	250	10 V
D5151	D5152	250	100 V
D5251	D5252	250	4-20 mA
D5311	D5312	275	J T/C
D5321	D5322	275	K T/C
D5331	D5332	275	T T/C
D5341	D5342	275	E T/C
D5451	D5452	250	2252Ω Thermistor

Each unit supplied with operator's manual.
Ordering Example: *D5111 Four Channel 100 mV Input Module with RS-232C output* **$250**

Accessories

Model No.	Price	Description
A1000	$250	RS-232 to RS-485 Converter, 115 Vac power
A1000-230	250	RS-232 to RS-485 Converter, 230 Vac power
A2000	200	RS-232 to RS-485 Converter, 10-30 Vdc power

Each unit supplied with operator's manual.
Ordering Example: *A1000 RS-232 to RS-485 converter, 115 Vac power,* **$250.**