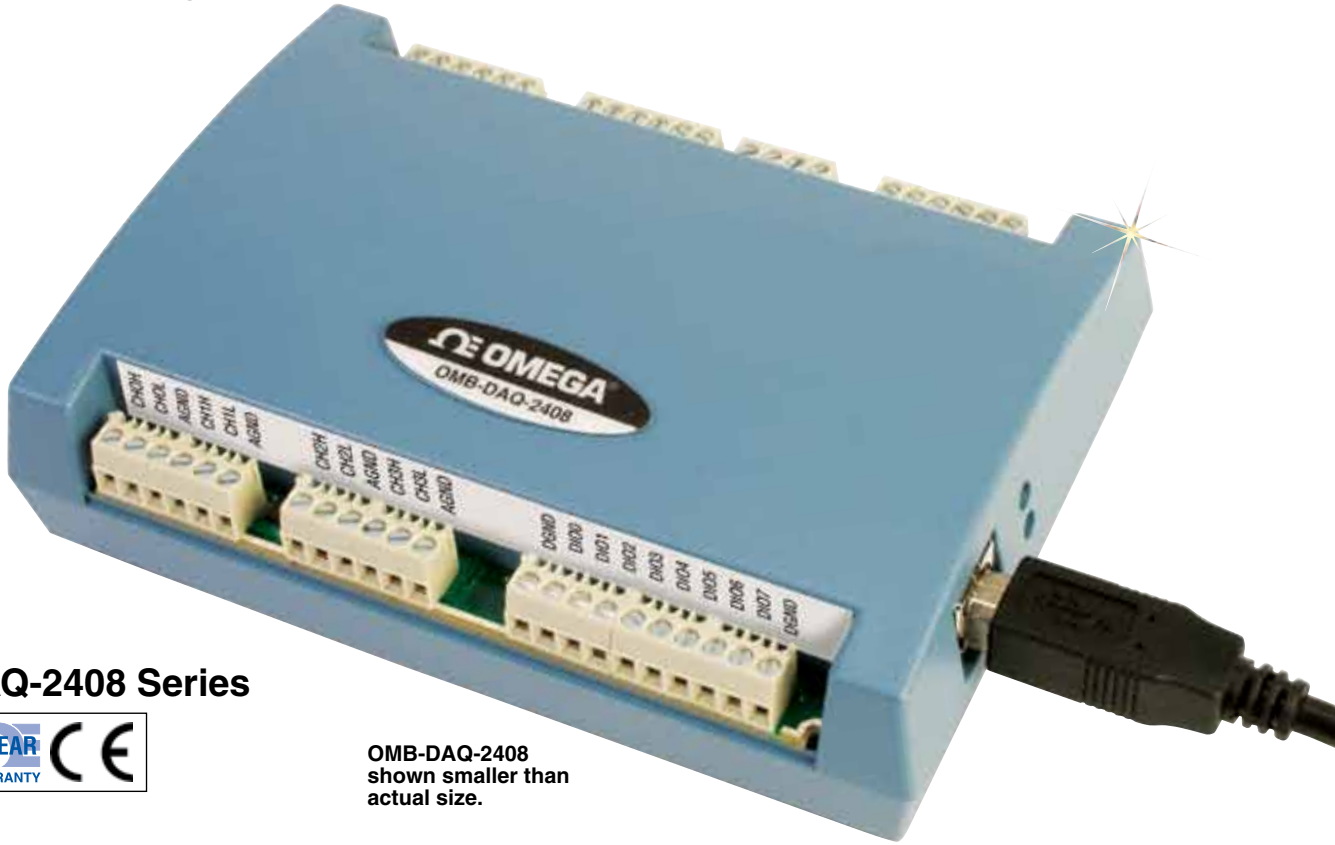
24-Bit Multifunction USB Data Acquisition Modules for Temperature and Voltage Measurement



OMB-DAQ-2408 Series

1 YEAR WARRANTY

OMB-DAQ-2408 shown smaller than actual size.

- **Measures Thermocouples or Voltage**
- **Up to 16 Analog Inputs**
- **24-Bit Resolution**
- **Up to 1 kS/s Sampling**
- **Two Counters**
- **Supports Thermocouple Types J, K, T, E, R, S, B, N**
- **Built-In Cold Junction Compensation and Open Thermocouple Detection**
- **Eight Digital I/O**
- **Up to 2 Analog Outputs**
- **500 Vdc Isolation Between Field Wiring and the USB Interface**

The OMB-DAQ-2408 Series are multifunction DAQ devices designed for highly-accurate voltage or temperature measurements. Each device features up to 16 single ended (SE)/8 differential (DIFF) analog inputs. Each device includes 8 digital I/O and two counter inputs.

The OMB-DAQ-2408-2AO also features two analog outputs. Each device in the series offers 24-bit resolution for ultra-accurate voltage or thermocouple measurements.

Analog Input

Each device includes 16 SE/8 DIFF analog inputs which you can configure for voltage or thermocouple input on a per-channel basis. Eight software-selectable voltage input ranges are provided. You can configure these ranges on a per-channel basis from ±10V to ±0.078V. When measuring thermocouples, configure analog inputs in DIFF mode. All devices also include open thermocouple detection to identify improperly working thermocouples.

Sample Rate

OMB-DAQ-2408 modules can sample analog input channels at up to 1 kS/s.

Digital I/O

Eight digital I/O channels are included with each OMB-DAQ-2408 and you can read from or write to each individual bit.

Counters

Two 32-bit counters are included with OMB-DAQ-2408 modules. The TTL level inputs are capable of read/write rates of up to 500 Hz and an input frequency of up to 1 MHz.

Analog Output

(OMB-DAQ-2408-2AO Only)

The OMB-DAQ-2408-2AO includes two 16-bit analog outputs. Each output has a ±10V range. Both outputs can be updated at a rate of up to 500 S/s per channel; one output can be updated at a rate of 1 kS/s.

OMB-DAQ-2408 Series Selection Chart

Model	Analog Inputs	Throughput Rate	Analog Outputs	Digital I/O	Counters
OMB-DAQ-2408	16 SE/ 8 DIFF	Up to 1 kS/s	—	8	2
OMB-DAQ-2408-2AO	16 SE/ 8 DIFF	Up to 1 kS/s	2	8	2

Software

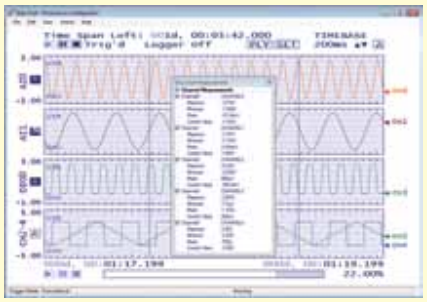
The OMB-DAQ-2408 Series modules ship with an impressive array of software, including TracerDAQ®, a full-featured, out-of-the-box data logging, viewing, and analysis application. Driver support and detailed example programs are included for Universal Library programming libraries for Microsoft® Visual Studio® programming languages, and other languages, including DASYLab®, and ULx for NI LabVIEW® (comprehensive library of VIs and example programs compatible with 32-bit and 64-bit LabVIEW 2010 or later) and InstaCal™ installation, calibration and test utility-powerful solutions for programmers and nonprogrammers alike. These modules operate under Microsoft Windows® VISTA/7/8/10 (32-bit and 64-bit) operating systems.

The OMB-DAQ-2408 Series data acquisition modules are supplied with TracerDAQ software which is a collection of four virtual instrument applications used to graphically display and store input data and generate output signals:

- Strip Chart—Log and graph values acquire from analog inputs, digital inputs, temperature inputs and counter inputs
- Oscilloscope—Display values acquired from analog inputs
- Function Generator—Generate waveforms for analog outputs
- Rate Generator—Generate waveforms for counter outputs

TracerDAQ PRO is an enhanced version of TracerDAQ and is available as a purchased upgrade (SWD-TRACERDAQ-PRO). A comparison of some of the features included in TracerDAQ vs TracerDAQ PRO is shown below.

TracerDAQ Strip Chart.



SWD-TRACERDAQ-PRO Strip Chart with Measurements (sold separately).

Features Comparison

Strip Chart

Features	TracerDAQ	TracerDAQ Pro
Channel Types	Analog input, temperature input, digital input, event counter	Analog input, temperature input, digital input, event counter
Number of Channels	8	48
Number of Lanes	2	8
Maximum Samples per Channel	32,000	1 million
Alarm Conditions	No	Yes
Measurements Window	No	Yes
Enter Annotations	No	Yes
Software Triggering	No	Yes
Hardware Triggering	No	Yes
Time-of-Day Triggering	No	Yes
Linear Scaling	No	Yes

Oscilloscope

Features	TracerDAQ	TracerDAQ Pro
Channel Type	Analog input	Analog input
Number of Channels	2	4
Measurements Window	No	Yes
Reference Channel	No	Yes
Math Channel	No	Yes

Rate Generator

Features	TracerDAQ	TracerDAQ Pro
Channel Type	Counter output	Counter output
Number of Channels	1	20

Function Generator

Features	TracerDAQ	TracerDAQ Pro
Channel Type	Analog output	Analog output
Number of Channels	1	16
Waveform Types	Sine	Sine, square, triangle, flat, pulse, ramp, random, arbitrary
Duty Cycle	No	Yes
Phase	No	Yes
Gate Ratio	No	Yes
Rate Multiplier	No	Yes
Sweep (Linear and Exponential)	No	Yes

Specifications

ANALOG INPUT

A/D Converter Type: ADS1256, 24-bit Sigma Delta

A/D Data Rates: 3750 S/s, 2000 S/s, 1000 S/s, 500 S/s, 100 S/s, 60 S/s, 50 S/s, 25 S/s, 10 S/s, 5 S/s, 2.5 S/s

Throughput (Software-Selectable for Single Channel and Multiple Channels)

Single Channel: 2.5 to 1102.94 S/s

Multiple Channels: 0.16 to 1102.94 Hz

Number of Channels: Up to 16 channels individually software-selectable as single ended (SE) or differential (DIFF); thermocouples require differential mode; for each channel configured as differential, you lose one single-ended channel

Input Isolation: 500 Vdc minimum between field wiring and USB interface

Channel Configurations: Temperature sensor input, software-selectable to match sensor type; voltage input

Input Voltage Range

Thermocouple Mode: ±0.078125V

Voltage Mode (Software-Selectable): ±10V, ±5V, ±2.5V, ±1.25V, ±0.625V, ±0.3125V, ±0.15625V, ±0.078125V

Absolute Maximum Input Voltage

CxH-CxL Relative to GND: ±22V max (power on), ±10V maximum (power off)

Input Impedance: 10 MΩ (power on), 390 Ω (power off)

Input Leakage Current: ±20 nA

Input Voltage: >±22V (power on/off): ±1µ A maximum

Input Capacitance: 590 pf

Maximum Working Voltage (Signal + Common Mode)

Voltage Mode: ±10.25V maximum

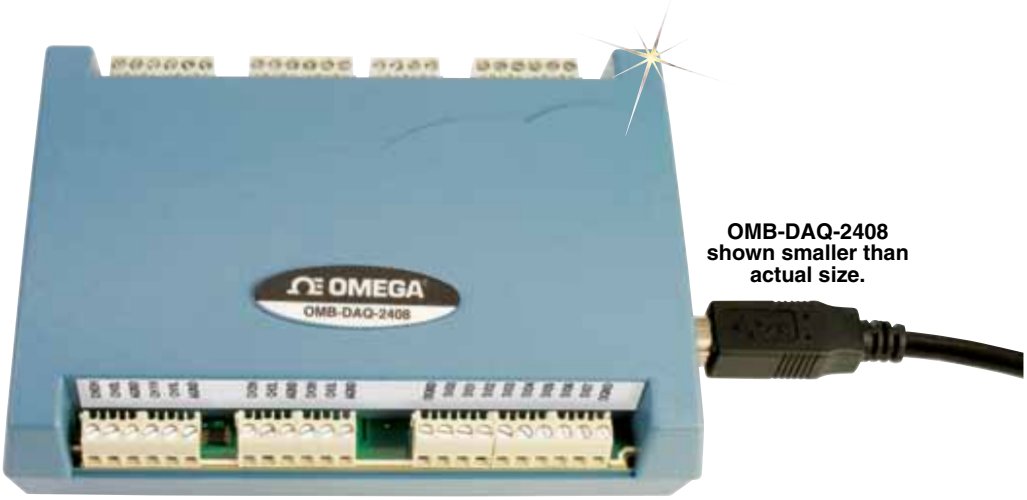
Common Mode Rejection Ratio

Thermocouple Mode (f_{IN} = 60 Hz): 110 dB

Voltage Mode (f_{IN} = 60 Hz, All Input Ranges): 90 dB

ADC Resolution: 24 bits

Crosstalk: Adjacent channels, 100 dB



OMB-DAQ-2408 shown smaller than actual size.

Input Coupling: DC

Channel Gain Queue: Up to 64 elements, software-selectable channel and range

Warm-Up Time: 45 minutes min

Open Thermocouple Detect: Software-selectable for each channel

CJC Sensor Accuracy

15 to 35°C: ±0.5°C typ

0 to 55°C: ±1.0°C maximum

THROUGHPUT RATE

The maximum throughput of an OMB-DAQ-2408 module is 1.1 kS/s aggregate. The OMB-DAQ-2408 provides the ability to set conversion rates on a per-channel basis. This feature gives the user flexibility and control over noise averaging for each channel.

ANALOG VOLTAGE OUTPUT (OMB-DAQ-2408-2AO ONLY)

Digital to Analog Converter: DAC8552

Number of Channels: 2

Resolution: 16-bits

Output Ranges

Calibrated: ±10 V

Uncalibrated: ±10.05V, software-selectable

Output Transient

Host computer is reset, powered on, suspended or a reset command is issued to device

Duration: 2 s

Amplitude: 2V p-p

Initial Power On

Duration: 50 ms

Amplitude: 5V peak

Differential Non Linearity: ±0.25 LSB typ, ±1 LSB maximum

Output Current: AOUTx pins, ±5.0 mA maximum

Power On and Reset State: DACs cleared to zero-scale, 0V, ±50 mV

Settling Time: To rated accuracy, 10V step, 75 µs

Slew Rate: 1.0 V/µs

Throughput

Single-Channel: 1000 S/s maximum, system-dependent

Multi-Channel: 1000 S/s /#ch maximum, system-dependent

Calibrated Absolute Accuracy

Range: ±10V

Accuracy (±LSB): 16.0

DIGITAL INPUT

Number of I/O: 8 channels

Configuration: Each DIO bit can be independently read from (DIN) or written to (DOUT). DIN bits can be read at any time whether the DOUT is active or tri-stated.

Input Voltage Range: 0 to 15V

Input Type: CMOS (Schmitt trigger)

Input Characteristics: 47 kΩ pull-up/pull-down resistor, 28 kΩ series resistor

Maximum Input Voltage Range: 0 to 20V maximum (power on/off, relative to DGND)

Thermocouple Accuracy Specifications* Includes CJC Measurement Error and Polynomial Linearization Error Specifications Valid for 1-Year or 3000 Operating Hours, Whatever Comes First				
Thermocouple	**Sensor Temp Range**	**Accuracy Error, Maximum °C**	**Accuracy Error, Typical °C**	**Tempco (°C/°C)**
J	-210°C	±2.572	±1.416	±0.022
	0°C	±0.935	±0.469	
	1200°C	±1.869	±1.45	
K	-210°C	±2.917	±1.699	±0.029
	0°C	±1.017	±0.526	
	1372°C	±2.478	±2.022	
N	-200°C	±3.480	±2.030	±0.029
	0°C	±1.201	±0.659	
	1300°C	±1.991	±1.600	
R	-50°C	±4.826	±3.133	±0.082
	250°C	±2.117	±1.424	
	1768°C	±2.842	±2.347	
S	-50°C	±4.510	±2.930	±0.089
	250°C	±2.165	±1.468	
	1768°C	±3.187	±2.597	
B	250°C	±5.489	±3.956	±0.14
	700°C	±2.283	±1.743	
	1820°C	±2.202	±1.842	
E	-200°C	±2.413	±1.352	±0.017
	0°C	±1.069	±0.551	
	1000°C	±1.575	±1.211	
T	-200°C	±2.821	±1.676	±0.027
	0°C	±1.050	±0.558	
	400°C	±0.957	±0.595	

**Each terminal block has a CJC sensor. The accuracy listed above assumes the screw terminals are at the same temperature as the CJC sensor.*

Pull-Up/Pull-Down Configuration: All pins pulled up to 5V through individual 47 kΩ resistors (the J6 shorting block default position is pins 1 and 2) Pull-down capability is available by placing the J6 shorting block across pins 2 and 3

Transfer Rate (Software Paced): 500 port reads or single bit reads per second typ

Input High Voltage: 1.3 to 2.2V

Input Low Voltage: 1.5 to 0.6V

Schmitt Trigger Hysteresis: 0.4V to 1.2

DIGITAL OUTPUT

Number of I/O: 8 channels

Configuration: Each DIO bit can be independently read from (DIN) or written to (DOUT). DIN bits can be read at any time whether the DOUT is active or tri-stated.

Output Characteristics: 47 kΩ pull-up, open drain (DMOS transistor) Each DMOS transistor source pin is internally connected to DGND

Pull-Up Configuration: All pins pulled up to 5V through individual 47 kΩ resistors (the J6 shorting block default position is pins 1 and 2).

Transfer Rate (Software Paced)

Digital Output: 500 port writes or single bit writes per second typ

Output Voltage Range: 0 to 5V (no external pull up resistor, internal 47 kΩ pull-up resistors connected to 5V by default); 0 to 15V maximum

Drain to Source Breakdown Voltage: 50V minimum

Off State Leakage Current: 1.0 µA

Sink Current Capability: 150 mA max (continuous) per output pin 150 mA maximum (continuous) for all eight channels

DMOS Transistor On-Resistance (Drain to Source): 4 Ω

COUNTER

Pin Names: CTR0, CTR1

Number of Channels: 2 channels

Resolution: 32-bits

Counter Type: Event counter

Input Type: Schmitt trigger, rising edge triggered

Input Source: CTR0 (pin 44), CTR1 (pin 42)

Counter Read/Writes Rates (Software Paced)

Counter Read: System dependent, 500 reads per second

Counter Write: System dependent, 500 writes per second

Input Characteristics: Each CTRx input pin has 562 kΩ resistor pulled up to 5V and a 10 kΩ series resistor

Input Voltage Range: ±15V maximum

Maximum Input Voltage Range: CTR0, CTR1 relative to GND and DGND, ±20V maximum (power on/off)

Input High Voltage: 1.3 to 2.2V

Input Low Voltage: 1.5 to 0.6V

Schmitt Trigger Hysteresis: 0.4 to 1.2V

Input Bandwidth (-3 dB): 1 MHz

Input Capacitance: 25 pf

Input Leakage Current: ±120 nA @5V, ±1.6 mA @±15V

Input Frequency: 1 MHz, maximum

High Pulse Width: 500 ns, minimum

Low Pulse Width: 500 ns, minimum

Analog Input DC Voltage Measurement Accuracy						
Range	Gain Error (% of reading)	Offset Error (% of range)	INL Error Accuracy	Absolute	Gain Temperature Coefficient (% reading/°C)	Offset Temperature Coefficient (µV/°C)
±10V	±0.0037	50 µV	±0.0008	500 µV	±0.0006	3
±5V	±0.0047	25 µV	±0.0008	300 µV	±0.0006	2
±2.5V	±0.0059	20 µV	±0.0008	200 µV	±0.0006	1
±1.25V	±0.0056	20 µV	±0.0008	100 µV	±0.0006	1
±0.625V	±0.0068	15 µV	±0.0005	60 µV	±0.0006	1
±0.3125V	±0.0104	15 µV	±0.0006	50 µV	±0.0006	1
±0.15625V	±0.0184	10 µV	±0.0005	40 µV	±0.0006	1
±0.078125V	±0.0384	10 µV	±0.0009	40 µV	±0.0006	1

MEMORY

EEPROM: 4096 bytes isolated micro reserved for sensor configuration, 256 bytes USB micro for external application use

MICROCONTROLLER

Type: One high-performance 8-bit RISC microcontroller with USB interface (non-isolated); one high-performance 16-bit RISC microcontroller for measurements (isolated)

POWER

Supply Current: Quiescent current, 275 mA (includes up to 10 mA for the status LED; does not include any potential loading of the digital I/O bits, 5V user terminal or the AOUTx outputs).

5V User Output Voltage Range: Available at terminal block pin 40, 4.75 to 5.25V

5V User Output Current: Available at terminal block pin 40, 10 mA maximum

Isolation: Measurement system to PC, 500 Vdc minimum

USB SPECIFICATIONS

USB Device Type: USB 2.0 (full-speed)

Device Compatibility: USB 1.1, USB 2.0

USB Cable Length: 3 m (9.8') maximum

ENVIRONMENTAL

Operating Temperature Range: 0 to 50°C (32 to 12°F)

Storage Temperature Range: -40 to 85°C (40 to 185°F)

Humidity: 0 to 90% RH non-condensing

MECHANICAL

Dimensions: 127 L × 89.9 W × 35.6 mm D (5.00 × 3.53 × 1.40")

Weight 160 g (5.6 oz)

SCREW TERMINAL CONNECTOR

Connector Type: Fixed screw terminal

Wire Gauge Range: 16 to 30 AWG

OMEGA CARE℠ Extended Warranty Program

OMEGACARE℠ extended warranty program is available for models shown on this page. Ask your sales representative for full details when placing an order. OMEGACARE℠ covers parts, labor and equivalent loaners.

To Order

Model No.	Description
OMB-DAQ-2408	24-bit, isolated, 16 SE/8 DIFF temperature and voltage USB data acquisition module, 8 digital I/O; 2 counters
OMB-DAQ-2408-2AO	24-bit, isolated, 16 SE/8 DIFF temperature and voltage USB data acquisition module, 8 digital I/O; 2 counters, 2 analog outputs
SWD-TRACERDAQ-PRO	TracerDAQ Pro software

Comes complete with a 2 m (6') USB cable, Quick Start Guide, TracerDAQ software and operator's manual on CD.

***Ordering Example: OMB-DAQ-2408-2AO** 24-bit temperature and voltage USB data acquisition module, 2 analog outputs and **OCW-1** OMEGACARE℠ 1-year extended warranty adds 1 year to standard 1 year warranty.*