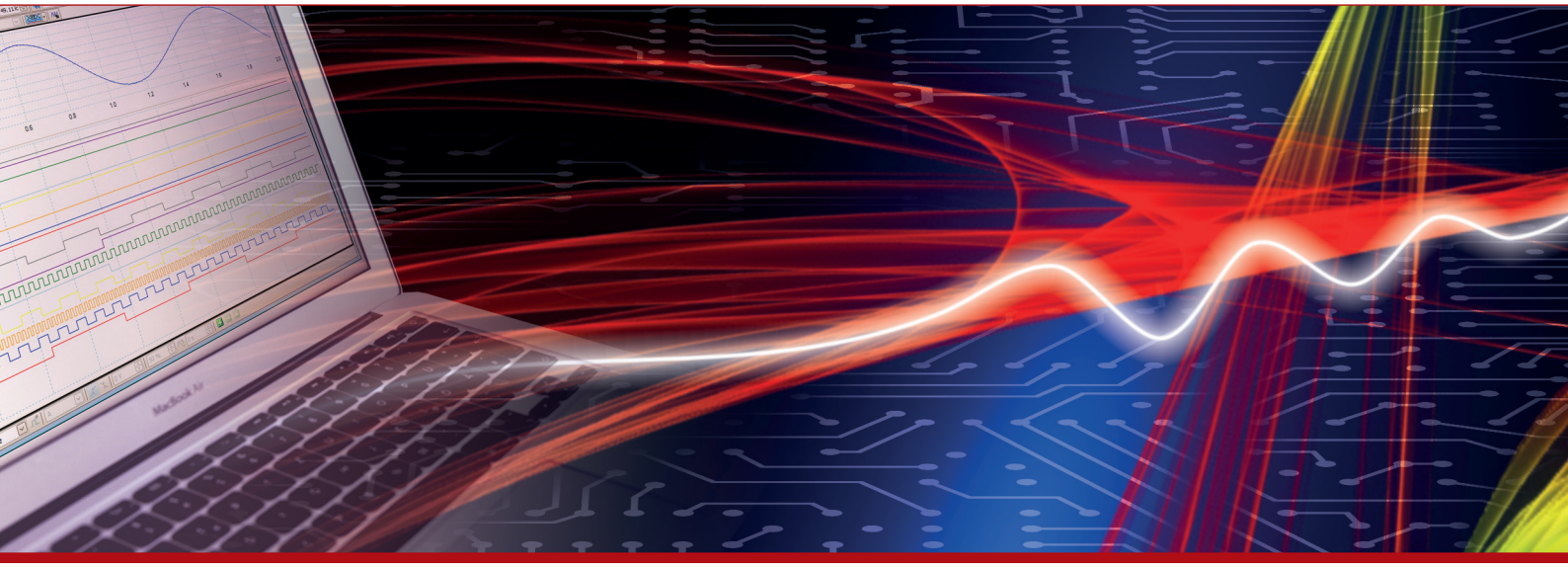
Product Datasheet - Technical Specifications



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Specifications

All specifications are subject to change without notice.
Typical for 0 °C to 50 °C unless otherwise specified.

Thermocouple input

Table 1. Thermocouple input specifications

Parameter	Condition	Specification
Number of channels		16 thermocouple channels 1 internal auto zero channel 1 internal cold-junction compensation channel
ADC resolution		24 bits
Type of ADC		Delta-Sigma
Sampling mode		Scanned
Voltage measurement range		±78.125 mV
Temperature measurement ranges		Works over temperature ranges defined by NIST (J, K, T, E, N, B, R, S thermocouple types)
Timing mode	Automatically set for either high-resolution or high-speed mode based on the requested scan rate, regardless of the number of channels.	High resolution mode: ■ Requested scan rate: ≤1 Hz ■ Conversion Time (per channel): 55 ms ■ Sample Rate (all channels): 1 S/s
		High-speed mode: ■ Requested scan rate: >1 Hz ■ Conversion Time (per channel): 740 µs ■ Sample Rate (all channels): 75 S/s
Common-mode voltage range		Channel-to-COM: ±1.2 V min COM-to-earth ground: ±250 V
Common-mode rejection ratio (CMMR)	High-resolution mode at DC and 50 to 60 Hz	Channel-to-COM: 100 dB COM-to-earth ground: >170 dB
	High-speed mode at 0 to 60 Hz	Channel-to-COM: 70 dB COM-to-earth ground: >150 dB
Input bandwidth	High-resolution mode	14.4 Hz
	High-speed mode	78 Hz
High-resolution noise rejection	50 Hz and 60 Hz	60 dB
Overvoltage protection		±30 V between any two inputs
Differential input impedance		78 MΩ
Input current		50 nA
Input noise	High-resolution mode	200 nVrms
	High-speed mode	7 µVrms
Gain error	High-resolution mode	0.03% typ at 25 °C 0.07% typ at 0 °C to 60 °C 0.15% max at 0 °C to 60 °C
	High-speed mode	0.04% typ at 25 °C 0.08% typ at 0 °C to 60 °C 0.16% max at 0 °C to 60 °C
Offset error	High-resolution mode	4 µV typ, 6 µV max
	High-speed mode	14 µV typ, 17 µV max
Offset error from source impedance	0 °C to 60 °C	Add 0.05 µV per Ω, when source impedance >50 Ω

Parameter	Condition	Specification
Cold-junction compensation accuracy		0.8 °C typ, 1.7 °C max
Warm-up time	The device is lying flat or facing upward and is in a constant ambient temperature.	15 minutes recommended

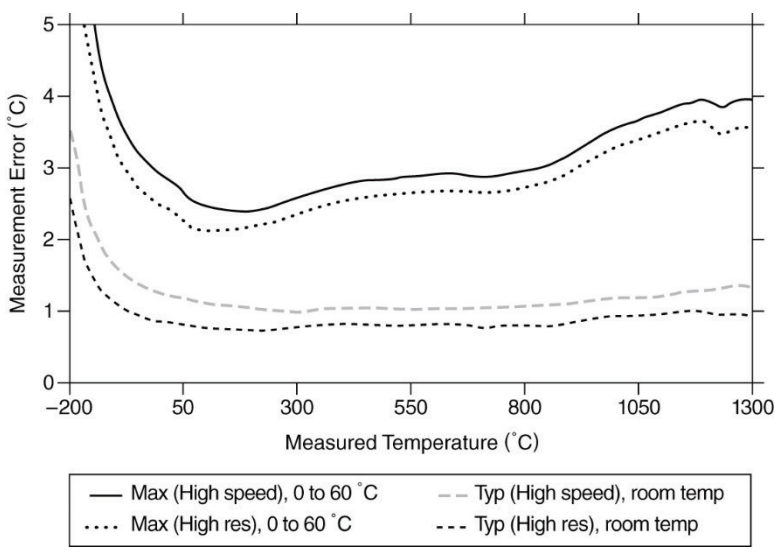
Temperature measurement accuracy

Measurement sensitivity represents the smallest change in temperature that a sensor can detect. It is a function of noise. The values assume the full measurement range of the standard thermocouple sensor per ASTM E230-87.

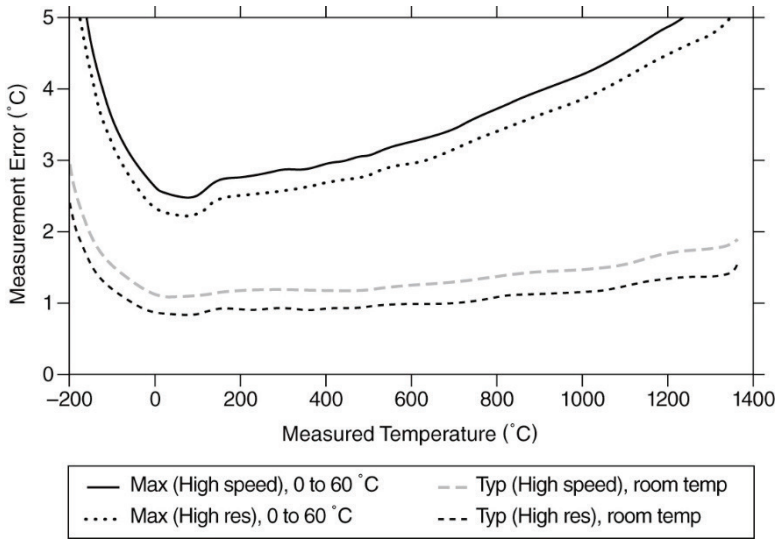
Table 2. Temperature accuracy specifications

Parameter	Condition	Specification
Measurement sensitivity	High-resolution mode	Type J, K, T, E, N: <0.02 °C Type B, R, S: <0.15 °C
	High-speed mode	Type J, K, T, E: <0.25 °C Type N: <0.35 °C Type B: <1.2 °C Type R, S: <2.8 °C

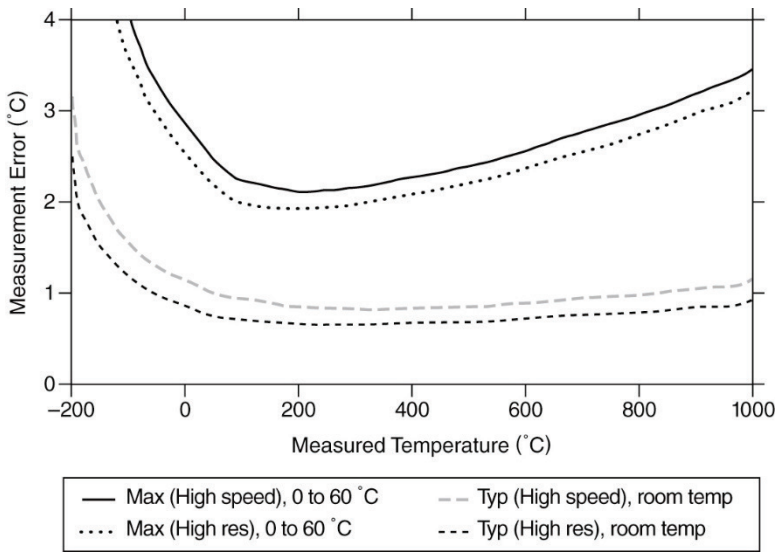
The following figures show the errors for each thermocouple type when connected to the WebDAQ 316 with auto zeroing performed. The figures display the maximum error over a full temperature range, and the typical error at room temperature. The figures account for gain errors, offset errors, differential and integral nonlinearity, quantization errors, noise errors, 50 Ω lead wire resistance, and cold-junction compensation errors. The figures do not account for the accuracy of the thermocouple itself.



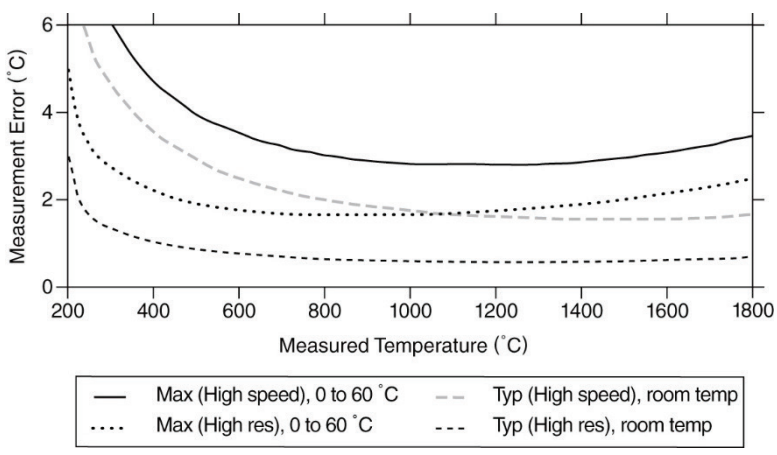
Thermocouple Types J and N Errors



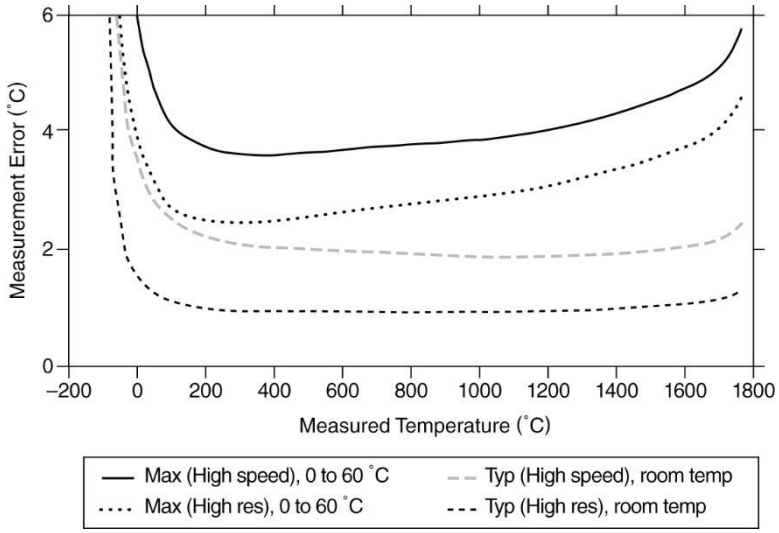
Thermocouple Type K Errors



Thermocouple Types T and E Errors



Thermocouple Type B Errors



Thermocouple Types R and S Errors

Digital input/output

Table 3. Digital input/output specifications

Parameter	Specification
Digital type	CMOS (Schmitt trigger) input / open drain output
Number of I/O	One port of 4 bits
Configuration	Each bit can be independently configured for input or output
Power on conditions	Power on reset is input mode
Pull-up configuration	Each bit is pulled up to 5 V with a 100 kΩ resistor
Input frequency range	DC – 10 kHz (Note 1)
Input high voltage threshold	1.9 V min, 3.6 V max
Input low voltage threshold	2.3 V max, 1.0 V min
Schmitt trigger hysteresis	0.6 V min, 1.7 V max
Input high voltage limit	15 V max
Input low voltage limit	–0.5 V absolute min 0 V recommended min
Output voltage range	0 V to +5 V (no external pull up resistor) 0 V to +15 V max (Note 2)
Output off state leakage current	10 µA max
Output sink current capability	100 mA max (continuous) per output pin
Output transistor on-resistance (drain to source)	1.6 Ω

Note 1: Applying a signal with a frequency higher than this specification will adversely affect system performance and could cause errors.

Note 2: The external pull-up resistor is connected between the digital output bit and an external supply. Adding an external pull-up resistor connects it in parallel with the internal 100 kΩ pull-up resistor of that particular digital input/output bit to the internal 5 V supply. Careful consideration should be made when considering the external pull-up resistor value and the resultant pull-up voltage produced at the load.

Network

Ethernet connection

Table 4. Ethernet connection specifications

Parameter	Specification
Ethernet type	100 Base-TX 10 Base-T
Communication rates	10/100 Mbps, auto-negotiated
Connector	RJ-45, 8 position
Cable length	100 meters (328 feet) max
Additional parameters	HP Auto-MDIX support

Network interface

Table 5. Factory default specifications

Parameter	Specification
Network IP configuration	DHCP, link-local, static DHCP may be disabled by the user and a static IP address assigned If DHCP is enabled but is unsuccessful at obtaining an IP address, the device will fall back to link-local and request the IP address 169.254.100.100.
Network name	The default name is `webdaq-xxxxxx`, where `xxxxxx` are the lower 6 digits of the device MAC address. This name may be changed using the web interface.
Network name publication	By mDNS

Network factory default settings

Table 6. Factory default specifications

Parameter	Specification
Factory default IP address	192.168.0.101
Factory default subnet mask	255.255.255.0
Factory default Gateway	192.168.0.1
Factory default DHCP setting	DHCP + link-local enabled
Factory default password	admin, case sensitive; can be modified with the web interface
Factory default user name	admin, case sensitive; cannot be changed.

Processor / Memory

Table 7. Processor / memory specifications

Parameter	Specification
Microprocessor	Type: Quad core Broadcom BCM2837 Speed: 1.2 GHz
Memory	RAM: 1 GB LPDDR2 Flash: 4 GB eMMC (3 GB available for user data storage)

USB ports

Table 8. USB specifications

Parameter	Specification
Number of USB ports	Two
USB device type	USB 2.0 (high-speed)
Device compatibility	USB 1.1, USB 2.0, USB 3.0

Note 3: The USB ports are provided for connection to a mass storage device or approved WiFi adapter.

SD memory card slot

Table 9. SD card specifications

Parameter	Specification
Memory card type	SD, SDHC, SDXC, MMC, TransFlash
File systems supported	FAT16, FAT32, exFAT, ext2/3/4, NTFS

LED indicators

Table 10. LED specifications – normal operating mode

Label	State	Description
1: POWER	Steady yellow	Device is booting up.
	Steady green	Device boot is successful.
	Blinking yellow	Device is shutting down.
	Off	Device is off.
2: STATUS	Blinking yellow	Device is configuring hardware.
	Steady green	Hardware configuration is complete.
	Flashing green 100 ms on, 2s off	Waiting for the schedule start condition to be met. (Note 4)
	Blinking heartbeat	The configured schedule start condition is met; waiting for job start condition to be met. (Note 4)
	Blinking green	The configured job start condition is met – the job is running. (Note 4)
	Off	Device is off.
3: ERROR	Blinking yellow	Error condition is detected. LED blinks even when the software is configured to ignore the error. Error state is cleared on the next schedule start.
	Off	No error is detected, or the device is off
4: MEDIA	Blinking yellow	A job is configured to log to external media, but the job hasn't started yet; push button will not let you eject media.
	Steady yellow	External media is inserted into the SD card slot or USB storage port.
	Blinking green	Currently logging to an external SD card or USB storage device.
	Steady green	Media has been made safe for removal using the FUNC button, but is still inserted in the device.
	Off	No external media is detected, or the device is off.

Note 4: Use the WebDAQ software to configure start and stop settings for jobs and schedules.

Table 11. LED specifications – software update mode

LED	State	Description
All LEDs	Solid yellow	Software update is starting.
1. POWER	Blinking yellow	Software update is running.
2. STATUS	Blinking green	Update file is located; device is being updated.
	Blinking yellow	Update file cannot be located; insert media containing the update file.
3. ERROR	Blinking green	Update is successful; device reboot in approximately 5 seconds.
	Blinking yellow	Update failed; user must retry.

Push buttons

Table 12. Push button specifications

Component	Label	Description
Power button	POWER	Variable function: ■ Press briefly: turns the device on ■ Press for ~1 second: shuts down the device; release the button when the POWER LED blinks yellow ■ Press and hold ~4 seconds: forces the device to power off
Function button	FUNC	Dual function: ■ Ejects, or safely unmounts, all removable media for safe removal from the device (default) o This function is disabled when a job that uses external media is running o The MEDIA LED is steady green when all media is unmounted but still inserted in the device ■ Starts or stops an acquisition; requires configuration via the web interface
Factory reset button	CONFIG RESET	Restores network settings to factory default values

Ground connector

Table 13. Ground connector specifications

Component	Label	Description
Ground connector	#6-32	Connector port for the #6-32 ground screw

Power

Table 14. Power specifications

Parameter	Conditions	Specification
Input voltage	Center positive	6 VDC to 16 VDC
Input wattage		4 W typ, 10 W max
External power adapter	MCC p/n PS-9V1AEPS230V	9 V, 1.67 A, 110 VAC to 240 VAC input range
Battery		One 3 V button cell lithium battery (BR1225 or CR1225) required to maintain time of day clock when device is powered off.

Mechanical

Table 15. Mechanical specifications

Parameter	Specification
Dimensions (L × W × H)	158.8 × 146.1 × 38.1 mm (6.25 × 5.75 × 1.50 in.) 177.0 × 146.1 × 38.1 mm (6.97 × 5.75 × 1.50 in.) includes spring terminal
Weight	635 g (1.45 lb)

Environmental

Table 16. Environmental specifications

Parameter	Specification
Operating temperature range	0 °C to 50 °C max
Storage temperature range	–40 °C to 85 °C
Ingress protection	IP30
Operating humidity	10% to 90% RH, noncondensing
Storage humidity	5% to 95% RH, noncondensing
Maximum altitude	2,000 m (6,562 ft)
Pollution Degree	2

Note 5: WebDAQ 316 operation is intended for indoor use only, but may be used outdoors if installed in a suitable enclosure.

Safety voltages

Connect only voltages that are within the limits specified in this table.

Table 17. Safety specifications

Parameter	Conditions	Specification
Between any two terminals		±30 V max
Channel-to-channel isolation		None
Channel-to-earth ground isolation	Continuous	250 Vrms, Measurement Category II (Note 6)
	Withstand	2300 Vrms, verified by a 5 second dielectric withstand test

Note 6: Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example 115 V for US or 230 V for Europe.

Caution! Do *not* connect the device to signals or use for measurements within Measurement Categories III or IV.

Signal connectors

Table 18. Screw terminal specifications

Parameter	Specification
Connector types	36-position spring terminal for thermocouple connections 6-position screw terminal for digital connections
Screw terminal wiring	14 to 30 AWG copper conductor wire with 5 to 6 mm (0.20 to 0.24 in.) of insulation stripped from the end
Spring terminal wiring	16 to 26 AWG copper conductor wire with 10 mm (0.39 in.) of insulation stripped from the end

Screw terminal

Table 19. Screw terminal pinout

Terminal			Terminal		
#	**Label**	**Use**	**#**	**Label**	**Use**
1	GND	Digital ground	4	DIO2	Digital bit 2
2	DIO0	Digital bit 0	5	DIO3	Digital bit 3
3	DIO1	Digital bit 1	6	GND	Digital ground

Spring terminal

Table 20. Spring terminal pinout

Terminal			Terminal		
#	**Label**	**Use**	**#**	**Label**	**Use**
1	NC	No connection	29	NC	No connection
2	TC0[+]	Channel 0 HI	30	TC0[–]	Channel 0 LO
3	TC1[+]	Channel 1 HI	31	TC1[–]	Channel 1 LO
4	TC2[+]	Channel 2 HI	32	TC2[–]	Channel 2 LO
5	TC3[+]	Channel 3 HI	33	TC3[–]	Channel 3 LO
6	TC4[+]	Channel 4 HI	34	TC4[–]	Channel 4 LO
7	TC5[+]	Channel 5 HI	35	TC5[–]	Channel 5 LO
8	TC6[+]	Channel 6 HI	36	TC6[–]	Channel 6 LO
9	TC7[+]	Channel 7 HI	37	TC7[–]	Channel 7 LO
10	TC8[+]	Channel 8 HI	38	TC8[–]	Channel 8 LO
11	TC9[+]	Channel 9 HI	39	TC9[–]	Channel 9 LO
12	TC10[+]	Channel 10 HI	40	TC10[–]	Channel 10 LO
13	TC11[+]	Channel 11 HI	41	TC11[–]	Channel 11 LO
14	TC12[+]	Channel 12 HI	42	TC12[–]	Channel 12 LO
15	TC13[+]	Channel 13 HI	43	TC13[–]	Channel 13 LO
16	TC14[+]	Channel 14 HI	44	TC14[–]	Channel 14 LO
17	TC15[+]	Channel 15 HI	45	TC15[–]	Channel 15 LO
18	COM	Common	46	COM	Common