

NEW

AUTO-TRICOLOR BAR-DIGITAL CONTROLLER FOR NUCLEAR, MIL-SPEC AND INDUSTRIAL

**MODEL
HI-Q2000
& HI-Q2K**



**Replaces Form, Fit and Function
For Versatile (VMI 2000)**

SPECIFICATIONS @ 25°C

A/D CONVERTER:

- 16-Bit Plus Sign A/D(50K Counts)*
 - Display Resolution: 0.01% of F.S.
 - Accuracy: ±0.01% of Full Scale
 - Linearity: ±0.01% of Full Scale
 - Drift: ±50PPM/°C
 - Zero: Automatic/Programmable
 - SPAN: Programmable
 - F.S.Input: ±0.5 to ±50VDC
 - Current Range: ±0.5 to 50mADC
 - Sampling Rate: 16/sec. ÷ by Channels
 - Input Type: Single Ended/Diff.
 - Input Bias: 50pA
 - C.M.V.: ±2VDC
 - CMR: >90dB
 - Averaging (Weighted): None to 255
 - Input Impedance: See Ord. Info.
- * Note: Limited by display of model

FEATURES

- *Single or Dual Bar-Digital
- *Vertical or Horizontal Mount
- *Nuclear Qualified
- *Optional Relays (3)
- *Mathematical Functions
- *X-Y Tables & Polynomials
- *AC or DC Power Input
- *No Rewiring Required
- *Lifetime Warranted
- ***USB**, RS232, 422 & 485
- *Field Selectable Ranges
- *Custom Scales

DESCRIPTION:

HFE and HSI compliant display with OTEK's exclusive automatic tricolor bargraph. OTEK's new **HI-Q2K** not only replaces form fit and function the old units but includes the newest technology made popular by the **HI-Q** Series for ultra high reliability. Hence, its "Lifetime Warranty" (Ltd.).

The **HI-Q2K** is available in several configurations (and if not yours, we will make it) designed for "**Drop-In**" replacement of the old units without rewiring the existing connector. In fact, you can leave the existing casing on the panel, slide out the old and slide in the **HI-Q2K**!

The **HI-Q2K** was originally designed and fully approved for **10CFR50-B** (Class 1E) for a major Nuclear Power Plant in record time, so if you need to replace them, don't wait until the last minute, do it now!

What Is The Difference? See Note under ordering information for differences between the HI-Q2K and the HI-Q2000.

ON-OFF CONTROL OUTPUTS RELAYS

- Type: S.P.D.T. (1C) 500VAC Isolation
- Max. Switching Current: 10A Res.
- Max. Switching Voltage: 30VDC/240VAC@Rated Current
- Contact Protection: Included to 250VAC

ALARM SET POINTS

- Programmable with P.O.D. and Hysterisis

SERIAL COMMUNICATIONS

- Isolation to 5V or Other Power Inputs: 500VDC
- Baud Rate: to 19.2K Baud
- Protocol: Full ASCII (8N1 Setting)
- Concurrent Use of RS-232C & 422 or RS-232C & RS-485 I/O

POWER INPUTS

- 5VDC±5% Non-Isolated
- Or 10-32VDC (24VAC) Isolated
- Or 100-240VAC (100-300VDC) Isolated
- Power Consumption: 10 Watts

ENVIRONMENTAL (To Specs)

- Operating Temperature: -10-55°C
- Storage Temperature: -20-65°C
- Humidity 10-90% RH, N.C.
- MTBF: > 1000,000 Hrs. (Calculated)

NOTE: Conformal Coating EMI/RFI Shield On Request

**IF YOU DON'T SEE IT
ASK FOR IT!**



520-748-7900

FAX: 520-790-2808

E-MAIL: sales@otekcorp.com

http://www.otekcorp.com

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CORP.
SINCE 1974

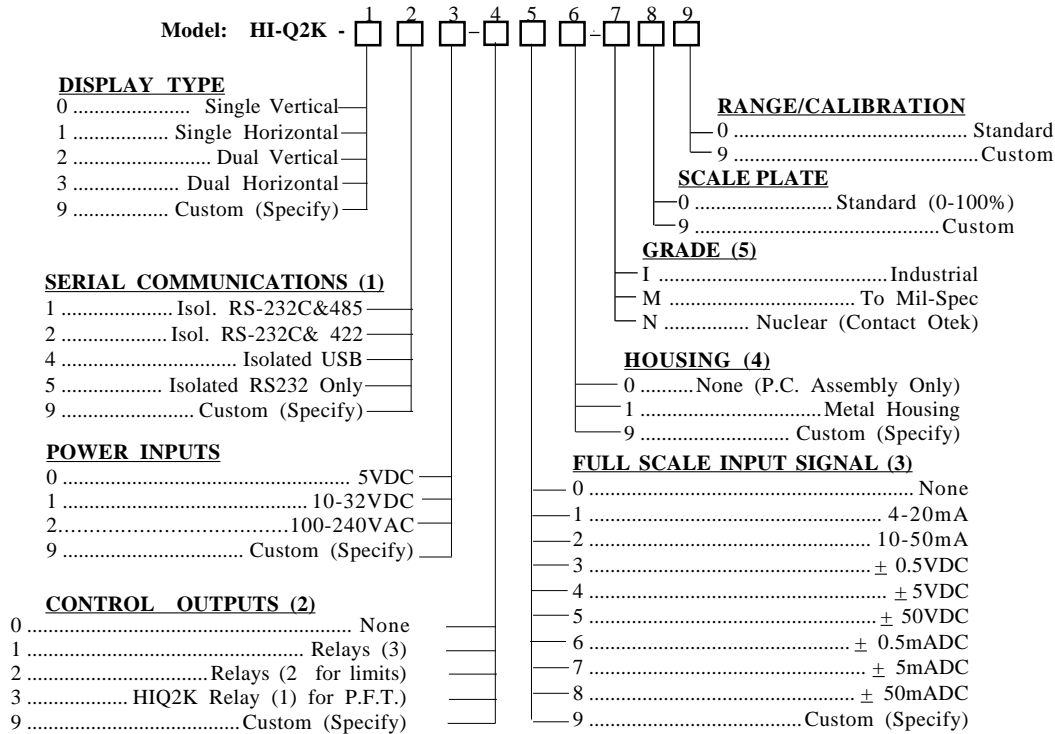
4016 E. TENNESSEE ST.
TUCSON, AZ. 85714 U.S.A.

MADE
IN
USA



HI-Q2K/HI-Q2000 ORDERING INFORMATION

6/5/09



NOTE: Present Model **HI-Q2K** uses existing **VM2000** case and connector without wiring change. For New Installations contact **OTEK** for custom case.

NOTES:

1. Only RS232C available on the front behind the filter. All others require modification to existing back plate for **DB9/USB** connectors. **Ethernet** on request.
2. 3rd Relay internally connected for power fail test.
3. Option "0" (none) only as serial input remote display. RTD, RMS, TC, S-G inputs on request.
4. Housing includes fixed matting connector on the rear. Option "0" for installing on existing VMI case.
5. Otek will build to certain MIL-standards but testing and confirmation of compliance, if required, will need to be done by a third party and at customer's expense.

HI-Q2K Vs. HI-Q2000

1. The HI-Q2K has internal circuitry (TTL) to simulate µC, A/D & power failure for simulator room. The HI-Q2000 does not.
2. The HI-Q2K is an upgrade of the HI-Q2000.
3. The HIQ2K has either 2 limit relays or 1 power fail test relay but not both.

MECHANICAL (ALL VERSIONS)

Note: Naked Module Fits In Existing VMI2000 Housing and Connector Mates With Back Plate

520-748-7900
 FAX: 520-790-2808
 E-MAIL:sales@otekcorp.com
 http://www.otekcorp.com



4016 E. TENNESSEE ST.
 TUCSON, AZ. 85714 U.S.A.



BENEFITS

OF THE

HI-QTM
(High I.Q.)

DESCRIPTION: The HI-Q Controllers consist of several products with sub-products. All the products share similar hardware and software with the main difference being their package and display. Once you have familiarized yourself with one, you will know them all! By using common software and hardware, we realize R&D and production savings that we pass on to you.

INTERFACE

OPERATOR:

* **Bargraphs** are used for quick trend indication. The operator can, at a glance, tell where the process is.

* **Digital Display(s)** are used to give accurate process indication and set point control or calculate values in engineering units. They are also used to display the menu driven prompts.

PROCESS:

All HI-Q intelligent controllers offer five methods of controlling your process:

- a) Current: 4-20mA, 1-5mA, 0-20mA (including PID), directly or inversely proportional.
- b) Voltage: 0-5VDC & 1-5VDC (or 5-0 & 5-1VDC) or any other ranges in between.
- c) Four (4) or six (6) SPDT 10Amp relays.
- d) Open collector Bi MOS outputs.
- e) The serial port (USB, RS232, 422 & 485)

Applications: See Technical Brief on Page 27

BENEFITS

* **SV & V:** The HI-Q Series software has been verified & validated as trouble/glitch free per IEEE Std. The Hardware has passed several Mil-Std's, such as 461, 462, 617, EPRI 102323 & others. If we don't have it, we'll make it!

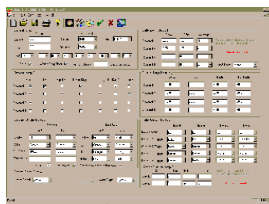
* **Low Cost-High Performance:** When you buy the HI-Q, you buy a "Computing Controller", not just an instrument. Its performance to price ratio is unsurpassed in the industry. Only the specific functions that you will need are selected and included, no need for unnecessary extras.

SYSTEM:

* **Use the Isolated RS Translator** to interface with other industry standard USB, RS-232C/RS-422 or RS-485 devices with open or proprietary protocols. If they are "RS" and "ASCII" compatible, the HI-Q can communicate with them.

* **Stand Alone: as Single or Multi Loop Controller** Whether under the protection of a factory environment or in the open field, the HI-Q will meet and exceed your expectations.

CONFIGURATION: Just Upload OTEK's **FREE Windows NavigatorTM** and configure or re-configure your HI-Q without an Instruction Manual, in minutes!



COMMON FEATURES

* **Ready to Use:** Just apply power, select the commands, set your limits and start controlling.

* **Automatic Tricolor:** Changes colors (Red, Blue, Purple, Green, Amber) upon reaching a limit. **Flashing & dimming** of the displays are under your control. (Some Models)

* **Password Security:** You can enable or disable the front panel keypad (Optional Keypad) on some models.

* **Emergency Shut Down:** Any three keys held down simultaneously will shut down the controller sending all outputs to a "Fail Safe" (Off) state.

* **Power on Test (POT):** Will test every major section of its hardware, software and firmware and flag any malfunctions.

* **C.O.P. (Computer Operating Properly):** Checks the operation of its internal algorithms. You can disable it.

* **R.T.C (Real-time Clock):** Indispensable for time keeping functions, such as time, event alarms, etc... (only on some models).

* **Mathematical Functions:** Insert the math function. Transmit and/or control with the result.

* **Polynomials and Look Up Tables:** Make your own or use the preprogrammed polynomials to 9th order.

* **Self Diagnostics:** The HI-Q will detect major software/hardware failure & warn you via its display/serial port.

* **Modular Design For Long Life Expectancy**

* **Lifetime Warranted**

Some Commands You Can Enter Via the Keypad (More Via the Serial Port) or GUI



Security Code-Restricted Access



Zero Offset-Tare



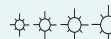
Full Scale-Range



Colors (LED or LCD backlight)



Intensity-None to Max.



Blinking None, Slow, Fast



Filtering (averaging)



Danger Alarms (Warning-Stop)

Relays (4 or 6) Bi Mos (8) On-Off

Current Loops 4-20mA(0-5V out)

* Timer, Real-time Clock Alarm(s)

Calendar: * Date, Month, Year, Stamp

1 → 3 Assign any Channel to any
4 → 2 Display & Relays to Channels
or External Commands

A/M * Auto/Manual Process Control

K Assign any Constant to any Channel

Δt Assign any Delay to any Output

P Proportional

I Integral

D Derivative

Your Own Custom Commands

oops! Reset to Default Parameters

Poly Ours or Your Polynomials/Tables

...!! * Process Predictability

(Signal(s) vs Time

* **Some Models**

+,-,x,÷,√,Σ

Fixed or Variables



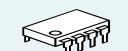
Alarm w/or w/out Delay



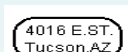
Watchdog Timer



COP-Computer
Operating Properly



Store any Fix Value or
Command in Memory



Any Address Alphanu-
meric or Either



Any speed 1.2 to 19.2
KBPs



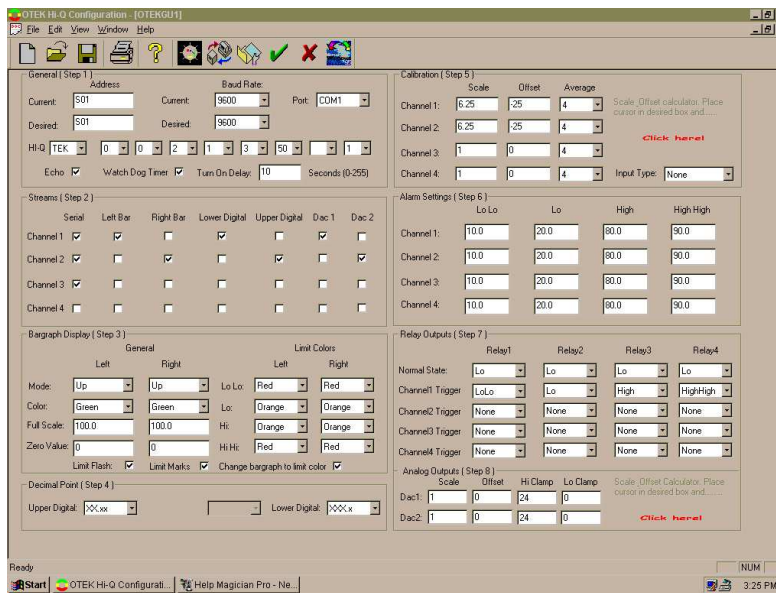
Any Resolution (1 to
50,000)

THE BENEFITS OF THE "HI-Q"

Now you can monitor and control your process from the comfort of your control room or at the site with an inexpensive PC & OTEK's complete line of **Programmable Intelligent Controllers**. Use them either as Stand-Alone or as part of your DCS or SCADA system.

CONFIGURATION with OTEK's New **Windows Navigator™** (PC G.U.I.) is so fast & easy that no instruction manual (other than connections) is required! Just Plug in your PC Terminal, upload our **FREE** Program and start selecting your configuration. Within minutes you will be done and you can even email it to remote locations!

For a **FREE** copy of the Windows Navigator™ visit our website at www.otekcorp.com then click on Windows Navigator™



OTEK's "HI-Q" line of **Programmable Intelligent Controllers** with their built-in and isolated signal conditioners will connect directly to your sensor and/or transducer and it will even power it. All you have to do is to connect & power up. We will even preprogram the "HI-Q" for you if so desired for **"Plug-N-Play"**.

Common Features of the "HI-Q™" Series:

- Math Functions: +, -, x, ÷, √ and More
- Isolated 18-bit A/D w/Signal Conditioners
- Isolated Analog Outputs (4-20mA & 0-5VDC)
- (4 or 6 each) 10A SPDT Relays for On-Off Control
- O.C.T. (250mADC) for Fast On-Off Control
- Isolated 10-32VDC (24VAC Also) Power Input
- Isolated 100-240VAC or (100-350VDC on Request) Power Input
- 5 VDC Power for Low Voltage Applications
- Look Up Tables for Thermocouples/RTDs
- Polynomials to the 9th Order
- Customer's X-Y (25X25) Tables
- ZERO • TARE • SPAN • AVERAGE
- All ASCII Characters for Open Protocol
- Programmable Baud Rate & Address
- Isolated RS-232C/422/485 Translator & USB
- Automatic Tricolor LED Displays with Dimming, Blinking & Pointers
- P.I.D. or Just Plain Proportional Control
- SV & V, Mil-Stds with Self-Diagnostic Capabilities
- Modular Design for Long Life Expectancy
- Lifetime Warranted

What Can the "HI-Q" Series Do for You?

It can accurately and reliably monitor and/or control your process as stand alone or as part of a DCS/SCADA for complete factory automation.

From the most basic form as a serial input **remote display** to the most complex as stand alone **Programmable Intelligent Controller**, the "HI-Q" Series will perform to specifications in the oceans, on earth or in outer space, in the Alaskan tundras or in the Tucson deserts.

MILITARY, NUCLEAR, SEISMIC & EPRI TR-102323R3 Models Are (Or Being) Approved. Contact OTEK™

Where Are the "HI-Qs" Being Used?

Only OTEK's HI-Q Series are in Outerspace (**Mir & I.S.S.**), Military Aircraft (**Night Vision**), Naval Warships (**Mil-Spec**), Nuclear Power Plants, Offshore Exploration/Drilling, Mass Transit (**Metro**), Biomedical (Non-Life Support), Pharmaceutical, Agricultural, Waste & Water Treatment, etc.

IS YOUR APPLICATION MORE CRITICAL?

IF YOU DON'T SEE IT, ASK FOR IT!

Our customers **THINK** of the products, we just design them!

B

HI-Q SERIES COMMON SPECIFICATIONS *for:*

**For: •DIN-BAR •TEK •TBS •114 •116 •117
•118 •119 •120 •121 •123 •124 •126 •127 •2K and 2000**

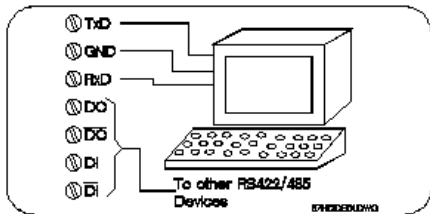
(All at 25°C) Also See Individual Specifications

FF

SERIAL COMMUNICATIONS

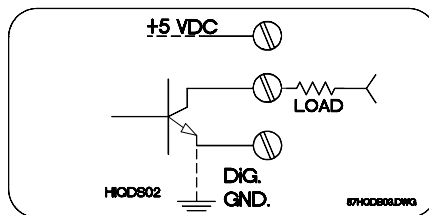
- Isolation to 5V or Other Power Inputs: 500VDC
- Baud Rate: to 19.2K Baud
- Protocol: Full ASCII
- Concurrent Use (Translator) of USB or RS-232C & 422 or RS-232C & RS-485 I/O & USB

NOTE: As a translator, you can use the com. port to translate from one protocol to another, so long as you only "talk" on anyone and listen on the others, ie talk on USB, listen on 485, or 422, talk on 232, listen on 485. Can NOT have 232&USB.



BiMOS OPEN COLLECTOR

- Type: Sink Driver (Transistor)
- Isolation to 5V Power: None
- Max. Current Sink: 250mA
- Vsat @250mA: .8V
- Standard VC: 5VDC
- External VC: <35VDC
- Switching Speed: 1µS

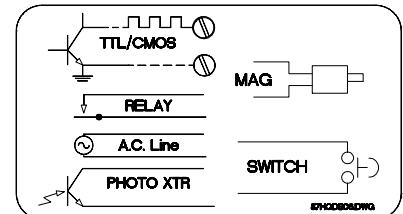


Multilevel (Option 01): (Low Speed)

- Dry Contact to 24VDC
- Isolation to 5V Power: None
- Response: DC to 100Hz
- Input Impedance: 1MΩ/27pF

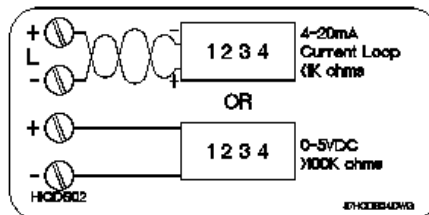
TTL Level (Option 02):(High Speed)

- 0<.8V; 1=>2.4V
- Response: DC-50KHz
- Isolation to 5V Power: None



ANALOG CONTROL OUTPUTS

- Accuracy & Linearity: ± 0.01% F.S.
- Resolution: 16 Bits
- Outputs: 0-5VDC (>100KΩ)
4-20mA (<1KΩ)
- Custom Output: 0-20mADC
- Compliance Output: 30VDC
- Isolation: 500VDC



ANALOG INPUT SIGNALS

(All Isolated to 500VDC & After 30min, Warm Up)
Note: Worst case accuracy & linearity are the sum of A/D and selected signal conditioner errors.

A/D CONVERTER

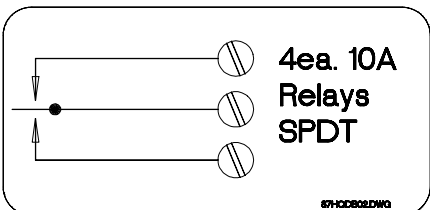
- 16-Bit Plus Sign A/D(50K Counts)*
- Display Resolution:±0.002% of F.S.*
- Accuracy: ±0.01% of Full Scale
- Linearity: ±0.01% of Full Scale
- Drift: ±50PPM/°C
- Zero: Automatic/Programmable
- SPAN: Programmable
- F.S.Input Voltage Range: ±0.5VDC
- Max.Current Range: ±1/2 AmpDC
- Sampling Rate:16/sec. ÷ by Channels
- Input Type: Single Ended/Diff.
- Input Bias: 50pA
- C.M.V.: ±2VDC
- CMR: >90dB
- Averaging (Weighted): None to 40
- Input Impedance: See Ord. Info.
- * Note: Limited by display of model

POWER INPUTS

- 5VDC±5% Non-Isolated
- Or 10-32VDC (24VAC) Isolated
- Or 100-240VAC or (100-300VDC on Request) Isolated
- Power Consumption varies from model to model and number of options selected. See Specific Models

ON-OFF CONTROL OUTPUTS RELAYS

- Type: S.P.D.T. (1C)
- Max. Switching Current: 10A Res.
- Max. Switching Voltage: 30VDC/240VAC@Rated Current
- Contact Protection:Included
- Life Expectancy: 10,000,000 Cycles
- Contact Isolation: 1000VRMS
- Initial Contact Resistance: 0.1Ω



MEASURING INPUTS

DIGITAL DISCRETE INPUTS

Functions Selectable:

Event, Timer, Period, Frequency, RPM and SPH

HI-Q SERIES COMMON SPECIFICATIONS (Cont'd)

For: •DINBAR •TEK •TBS •114 •116 •117
•118 •119 •120 •121 •123 •124 •126 •127 •2K and 2000

selected (# of digits) • Stability of Excitation: $\pm 0.05\%/^{\circ}\text{C}$

NOTE: All V/mA Input Models (Options 10, 11, 14, 15, 30, 31, 33, 34, 35, 36, 50, 51, 53 & 54) Have Internal Jumper Selected Input Ranges of .5, 5, 50 & 500V and .5, 5, 50, 500mA.

OPTIONS: (See Ord. Information)
10, 11, 12, 30, 31, 32, 50, 51 & 52

* Same Specifications As A/D

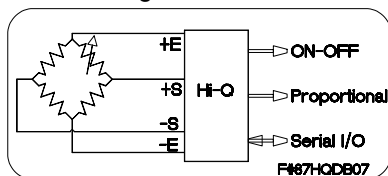
ANALOG SIGNAL CONDITIONERS

(All outputs set for $\pm 500\text{mVDC F.S.}$)

STRAIN-GAGE:

(Options 17, 18, 37 & 38)

- Accuracy and Lin.: $\pm 0.1\%$ of F.S.
- V Excitation(1): $\pm 2.5\text{VDC} \pm 0.5\%$
- I Excitation(2): $1\text{mADC} \pm 0.5\%$
- Stability of Excitation: $\pm 0.05\%/^{\circ}\text{C}$
- Maximum Current of VE: 30mA
- Maximum Voltage of IE: 5VDC
- (1) Typical for S-G of 200-400 Ω
- (2) Typical for Monolithic S-G to 5K Ω
- (3) Tare, Range, Zero Span Are User Programmable

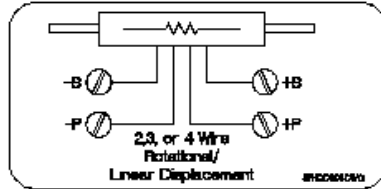


mVDC (Options 25 & 47)

- Accuracy & Lin.: $\pm 0.1\%$ of F.S.
- Full Scale Input: $\pm 10\text{mVDC}$
- Typical Gain: 50 (see A/D Sec.)
- Common Mode Voltage: $\pm 2\text{VDC}$

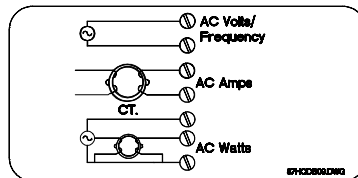
RESISTANCE (Options 20 & 40)

- Accuracy & Lin.: $\pm 0.1\%$ of F.S.
- Full Scale Input: $50\text{K}\Omega$
- Excitation Current: 0.01mA



TRUE RMS VOLTS, AMPS & WATTS (Options 14, 15, 34, 35, 36, 53, 54, 55, 60 & 61)

- Accy. & Lin.: $\pm 1.0\%$ of F.S. DC-50KHz Sine Wave
- Accy. & Lin.: $\pm 0.5\%$ of F.S. DC-10KHz Sine Wave
- Accy. & Lin.: $\pm 2.0\%$ of F.S. 10KHz-50KHz Sine Wave
- Resolution: $\pm 0.01\%$ of F.S.
- Common Mode Voltage: 2Vrms
- Overvoltage Protection: 500VAC
- Overcurrent Protection: 200%
- Input Impedance: See Ord. Info.
- Drift vs Temperature: $\pm 50\text{PPM}/^{\circ}\text{C}$
- Input Bias Current: 10pA



RTD (Options 21 & 41)

- Din ($\alpha=0.00385$): $-200^{\circ}\text{ to }+800^{\circ}\text{C}$
- ANSI ($\alpha=0.003923$): $-200\text{ to }+600^{\circ}\text{C}$
- Accuracy: $\pm 0.1^{\circ}\text{C}$
- Resolution: $\pm 0.1^{\circ}\text{C}$
- Scale: User Selectable $^{\circ}\text{F}$, $^{\circ}\text{C}$ or $^{\circ}\text{K}$
- Linearization: Polynomial to 9th
- Open Sensor: +Overrange/Flash
- Connections: 2 Wire (3 or 4 Wire On Request)
- Excitation: 0.1mA or 1mA (Cu)
- Open RTD: Burn-up

THERMOCOUPLE (Opt. 22, 42 & 56)

- Thermocouple Type: User Selectable but Specify When

- Ordering (J, K, T, R, S, B, C, E,)
- Accuracy of HI-Q: $\pm 0.1\%$ of F.S.
- Resolution: 0.1°
- Full Scale: Same as Thermocouple
- Open TC: (Burn Up)
- Input Impedance: $>100\text{M}\Omega$
- Scale: User Selectable $^{\circ}\text{F}$, $^{\circ}\text{C}$ or $^{\circ}\text{K}$
- Lead Resistance Effect: $<0.001^{\circ}/100\Omega$
- Linearization: Polynomial to 9th

Notes:

1. No isolation exists between channels.
2. Do not use grounded thermocouple.

ENVIRONMENTAL (To Specs) INDUSTRIAL & NUCLEAR:

- Operating Temperature: $-10\text{ to }55^{\circ}\text{C}$
- Storage Temperature: $-20\text{ to }65^{\circ}\text{C}$
- Humidity: $10\text{ to }90\% \text{RH}$, N.C.
- MTBF: $>100,000\text{HRS}$ (Calculated)
- NEMA4X(IP65)

MILITARY: TO SPECIFIC MIL-STD (I.E. 461, 462, 901, 167, ETC.)

CUSTOMS: OTEK CUSTOMIZES ANY OF ITS PRODUCTS TO YOUR EXACT SPECIFICATIONS.

POWER CONSUMPTION (WORST CASE)

DIN-BAR	5W
HI-QTBS:	10W
HI-QTEK:	15W
HI-Q114:	10W
HI-Q116:	10W
HI-Q117:	15W
HI-Q118:	15W
HI-Q119:	15W
HI-Q120:	15W
HI-Q121:	15W
HI-Q123:	5W
HI-Q124:	5W
HI-Q126:	10W
HI-Q127:	5W
HI-Q2000:	15W
HI-Q2K:	15W