

**NOW  
USB**

# **SINGLE/DUAL AUTOMATIC TRICOLOR BARGRAPH/CONTROLLER WITH SERIAL I/O, ANALOG I/O & RELAYS**

**MODEL  
HI-Q116**

NUCLEAR, SEISMIC & MIL-SPEC versions of the "**HIQ116**" are available, including **NVG-3** (Night Vision 3<sup>rd</sup> Generation).  
Contact OTEK For Specific Information

**DESCRIPTION:** The **HI-Q116** was specifically designed to replace (form & fit) the old electromechanical T.A. Bailey's "RY" and Dixon's BG101/202P with 21<sup>st</sup> Century Technology exclusive to **OTEK**, the originator of the Automatic Tricolor Bargraph P.I.C. (Programmable Intelligent Controllers). The only similarity is the panel cut out, mounting (rack) and bezel, (same edge connector on request) the rest is all OTEK's proven design with thousands of units installed from Outerspace (MIR & I.S.S. Stations) to Military, Petrochemical, Pharmaceutical, Transportation and other critical industries (all products are **LIFE-TIME WARRANTEED (LTD)**.)

The New "**HIQ116**" is housed in an all metal case with standard 6" depth and plug-in screw terminal connectors for all I/O except the Serial "RS" has a "**DB-9**" Connector. It can be used as a remote display (serial input) for PLC, DCS, SCADA or Stand Alone, Compliance Output (To Power Transmitters), Power Inputs for 10-32VDC, 100-240VAC (5VDC on Request) are available.

The 51 Segment Bargraphs change color automatically upon reaching a programmable limit(s) and can be configured for dimming, blinking, pointers and off. The digital (4 digits) are color coded (red & green, yellow & blue optional) for ease of identification. The Math Functions (Floating Point Math) allow scientific calculations, such as Polynomials (9<sup>th</sup>), X-Y Tables (TC & RTD) and Flow Calculations.

### **New USB V2.0 Compatible:**

The USB-232 converter plugs into the **DB9** connector and extends 1.25" on the rear. Has standard "Client" connector.

**SPECIFICATIONS:** See Pages C-D

**OTEK's Exclusive Windows Navigator G.U.I.  
100% configuration within minutes without  
lengthy Instruction Manuals (AND IT IS  
FREE!)**

### ACTUAL SIZE

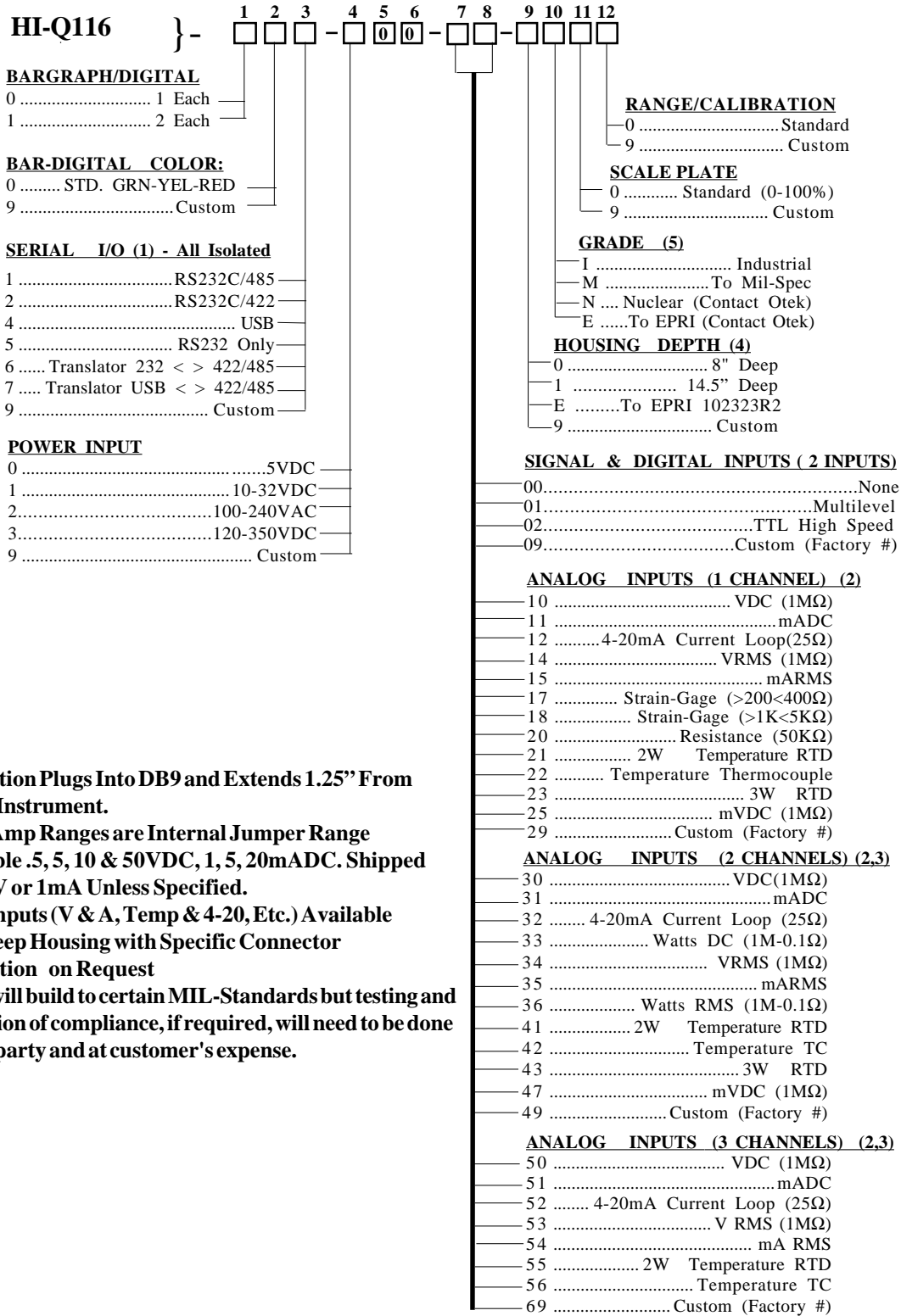


### **• Replaces T.A. Bailey's "RY" And Dixon's "BG101/202P"**

(+ MORE)  
FOR FOXBORO'S MODEL 257  
SEE OUR **HIQ-118**  
FOR T.A. BAILEY'S "775"  
SERIES SEE OUR **HIQ-117**

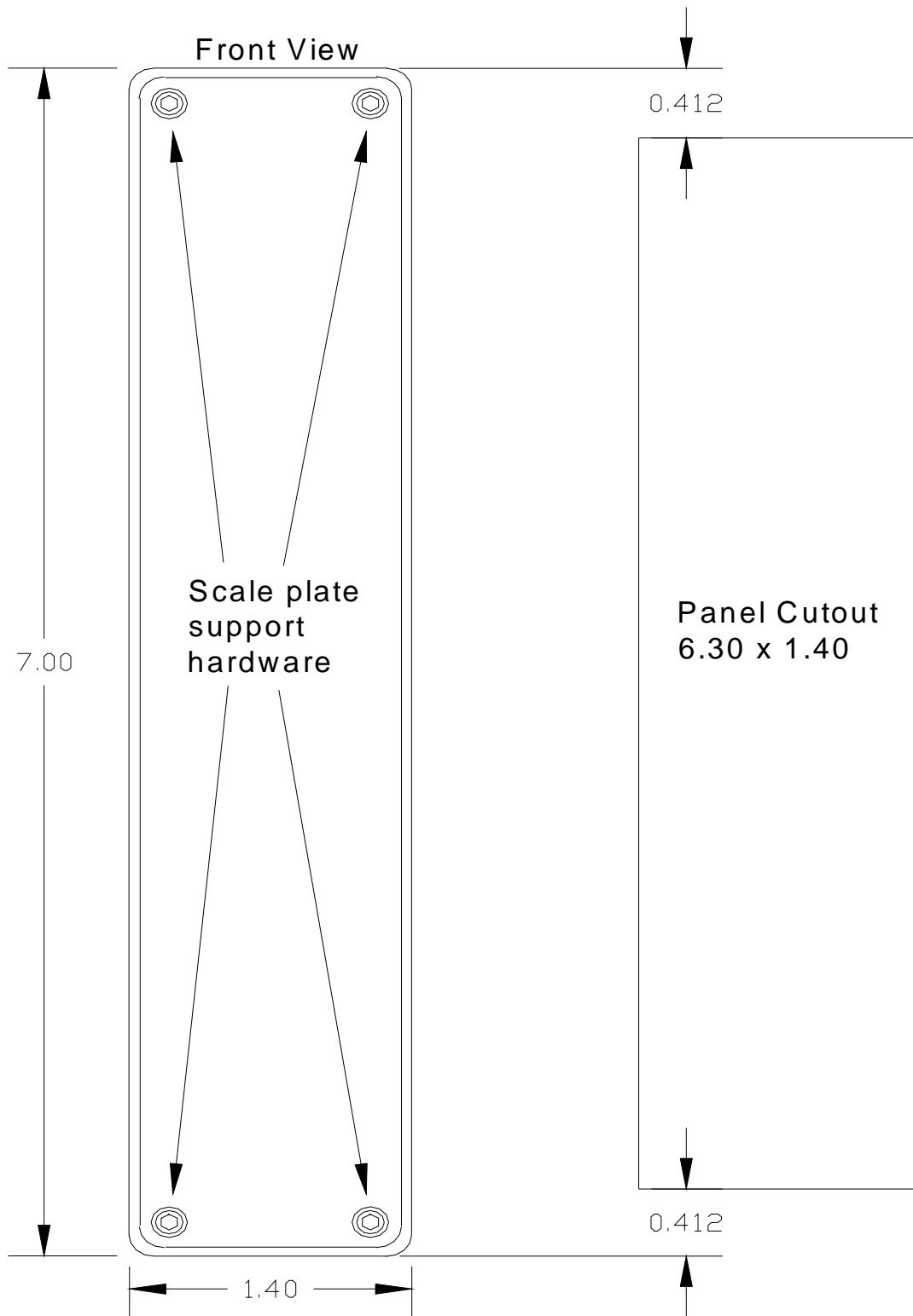
- **Math Functions**  
+, -, x, √, ÷
- **1, 2 or 3 Analog Inputs (18 Bits)**
- **1 or 2 Tricolor Bargraphs & 4 Digit Displays**
- **Front Panel Replaceable Filter & Scale**
- **Optional RFI/EMI Shielding**
- **All Metal Construction**
- **Optional 30VDC For Transmitters**
- **Isolated USB RS232C/422/485**

- **Standard 8" Deep/Optional 14.5" Deep for Direct Replacement**  
**MAXIMUM POWER CONSUMPTION: 10 WATTS**



**NOTES:**

1. USB Option Plugs Into DB9 and Extends 1.25" From Rear of Instrument.
2. Volt & Amp Ranges are Internal Jumper Range Selectable .5, 5, 10 & 50VDC, 1, 5, 20mADC. Shipped with .5V or 1mA Unless Specified.
3. Mixed Inputs (V & A, Temp & 4-20, Etc.) Available
4. 14.5" Deep Housing with Specific Connector Termination on Request
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.



# BENEFITS

OF THE

**HI-Q**<sup>TM</sup>  
(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!

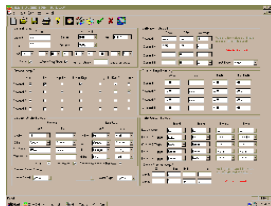
\* **Low Cost-High Performance:** When you buy the HI-Q, you buy a "Computing Controller", not just an instrument. Its performance to price ratio is unsurpassed in the industry. Only the specific functions that you will need are selected and included, no need for unnecessary extras.

### 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 Navigator**<sup>TM</sup> 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 9<sup>th</sup> 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



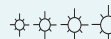
Full Scale-Range



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 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

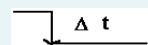
...!! \* Process Predictability

(Signal(s) vs Time

\* **Some Models**

+,-,x,÷,√,Σ

Fixed or Variables



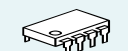
Alarm w/or w/out Delay



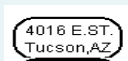
Watchdog Timer



COP-Computer Operating Properly



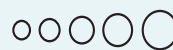
Store any Fix Value or Command in Memory



Any Address Alphanumeric or Either



Any speed 1.2 to 19.2 KBPs



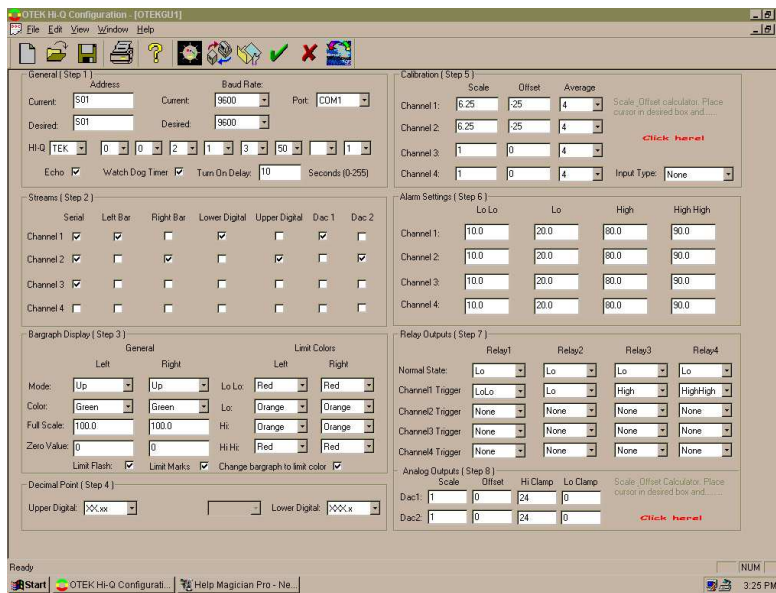
Any Resolution (1 to 50,000)

# 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](http://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**

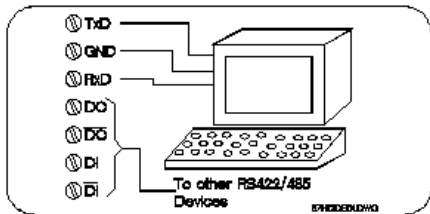
(All at 25°C) Also See Individual Specifications

FF

## SERIAL COMMUNICATIONS

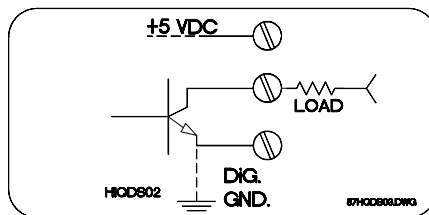
- Isolation to 5V or Other Power Inputs: 500VDC
- Baud Rate: to 19.2K Baud
- Protocol: Full ASCII
- Concurrent Use (Translator) of USB or RS-232C & 422 or RS-232C & RS-485 I/O & USB

*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

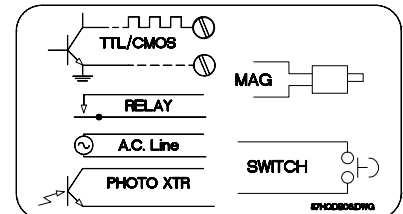


## Multilevel (Option 01): (Low Speed)

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

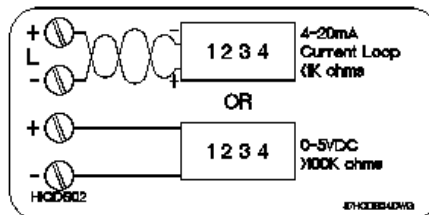
## TTL Level (Option 02): (High Speed)

- 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

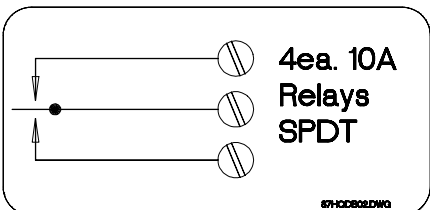
- 16-Bit Plus Sign A/D(50K Counts)\*
- Display Resolution:±0.002% of F.S.\*
- Accuracy: ±0.01% of Full Scale
- Linearity: ±0.01% of Full Scale
- Drift: ±50PPM/°C
- Zero: Automatic/Programmable
- SPAN: Programmable
- F.S.Input Voltage Range: ±0.5VDC
- Max.Current Range: ±1/2 AmpDC
- Sampling Rate:16/sec. ÷ 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

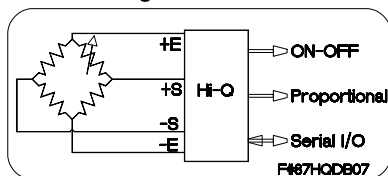
### ANALOG SIGNAL CONDITIONERS

(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:  $30\text{mA}$
- Maximum Voltage of IE:  $5\text{VDC}$
- (1) Typical for S-G of 200-400 $\Omega$
- (2) Typical for Monolithic S-G to 5K $\Omega$
- (3) Tare, Range, Zero Span Are User Programmable

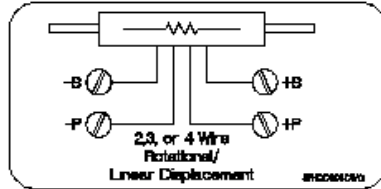


### mVDC (Options 25 & 47)

- 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:  $\pm 2\text{VDC}$

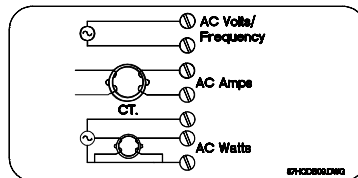
### RESISTANCE (Options 20 & 40)

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



### 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:  $2\text{Vrms}$
- Overvoltage Protection:  $500\text{VAC}$
- Overcurrent Protection:  $200\%$
- Input Impedance: See Ord. Info.
- Drift vs Temperature:  $\pm 50\text{PPM}/^{\circ}\text{C}$
- Input Bias Current:  $10\text{pA}$



### 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:  $0.1\text{mA}$  or  $1\text{mA}$  (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:  $0.1^{\circ}$
  - 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:  $<0.001^{\circ}/100^{\circ}$
  - 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