

NEW

**D. C. SIGNAL POWERED FOR V, 4-20 & mADC
(& EXTERNALLY POWERED FOR OTHER SIGNALS)
3 1/2" ANALOG METER REPLACEMENT**

**MODEL
DCS**



3 1/2 Digits

FEATURES:

- *>20 Signal Conditioners
- *0.6" 3 1/2 Digit LED
- *Fits Standard 3 1/2 Barrel Meter
- *Same 2-Wire Connection
- *Zero & Span Adjustment
- *Replaces OTEK's "590" Series
- *Also Externally Powered for > 30 Inputs
- *Lifetime Warranted

DESCRIPTION:

By popular demand we bring back the old "**590**" but with *New Patented Technology* so you can replace the old needle, fragile and inaccurate 19th Century Technology analog meters without changing your panel or wiring.

Signal Powered: 4-20mA current loop and 4-30VDC, VAC, AAC, WAC & Hz-ideal for power line monitoring.

Externally Powered: V & mADC, V & mA RMS, TC, RTD, Frequency (40-20KHz), pH (0-14), %RH, and customs.

The external power options cover the entire industrial range of 5-32 VDC and 90-265VAC. Zero and Span adjustments (12 Turn Pots) are conveniently located on the front.

Signal Conditioners: 20+ signal conditioners are available (see description) for Powerless™(Signal Powered) or externally powered applications. The **DCS** performs a self-test (C.O.P.) on power up for approximately 2 seconds.

SPECIFICATIONS @ 25°C :

Signal Powered:

- *Accuracy & Linearity: $\pm 0.05\%$ of F.S.
- *4-20mA Loop Burden: <5VDC
- *VDC Current Burden: LED: $\leq 15\text{mA}$
- *Intensity: Brightest at 20mA, Dimmest at 4mA
- *Min.-Max. VDC Signal: 3-52VDC
- *Measuring Method: RMS Calibrated
- *Humidity: 5-95% RH, N.C.
- *CMBTF: >100,000 Hours
- *Connector: #10 Lug

Externally Powered:

- *Loop Burden: 0.5V @ 20mA
- *VDC Signals: 10M Ohm Impedance
- *Power Consumption: 0.075W
- *A/D Technique: Sigma-Delta
- *CMRR: 100dB @ 50-60Hz
- *Hz V Range: 5-200VRMS, 50-20KHz
- *TC, RTD, pH & %RH Specs.: Same as Sensor
- *Op/Storage Temp.: 0-70°C/-20 + 80°C
- *Case: ABS, 94VO Black

OTHER RELATED PRODUCTS:

- ACS: AC Signal Powered Meters, V, A, W, Hz, AC
- LPE: LED 4 1/2 Digit Loop Powered
- LPI: Loop Powered Isolator
- LPT: Loop Powered Wireless Transmitter
- LPX: Loop Powered Explosion Proof

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



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DCS continued

HOW IT WORKS:

Current Loop Powered: We use a Zener to clamp the voltage to 5V max. and monitor the Loop's current (we invented it in 1974). (Digit 2, Option 0).

VDC Signal Powered: We monitor the voltage with high impedance and clamp it to a safe level to power the **DCS**. (Digit 2, Option 2).

AC Signal Powered (Pat. #: 4,908,569): For VAC & Hz we use a capacitor limiting rectifier to power the **DCS** and monitor the VAC with an RMS-DC converter. For Hz we use an F-V for accurate conversion. For A.A.C. we invented (Pat. # 7,626,378) a C-V converter to extract the current from your C.T. for power and monitor the signal with RMS-DC. (Digit 2, Options Q-T).

Externally Powered: Non-Isolated 5VDC or isolated 7-32VDC or 90-265VAC 50/60Hz is optional (Digit 3, Options 1-7). Max Power: 150mW.

THE SIGNAL CONDITIONERS: (2nd Digit)

Option 0: 4-20mA Loop Powered:

First introduced in 1975, the current flows through a Zener and "Shunt" resistor. The Zener clamps the voltage to about 3.5 Volts and the voltage across the Shunt is measured and displayed. Because an LED acts as a Zener, instead of a Zener the LEDs of the backlite are used to power the meter. If the "burden" (3.5 - 4.5V) is too high for your application, use the externally powered version.

Accuracy: $\pm 0.05\%$ of F.S.

Option 1: 4-30VDC

Signal Powered:

Another **OTEK** innovation. The voltage signal powers an **LDO** to protect the **DCS** and a divider network is used to measure and display the signal. If the input resistance of this Option is too low (~ 500 Ohms), use option 9 and specify. Power Input must be Option 0 (Powerless).

Accuracy: $\pm 0.1\%$ of F.S.

Option 2: 4-20mA Externally

Powered: It only drops 0.1V @ 20mA (5 Ohms) but the "**DCS**" needs 5VDC @ 20mA to operate (including the backlight or LEDs). Power Input must be Option 0 (Powerless).

Accuracy: $\pm 0.05\%$ of F.S.

Options 3-6: VDC & mADC

Externally Powered:

Input impedance is 1 Mega Ohms on all VDC ranges and 100 Ohm on 2mA and 1 Ohm on 200 mADC ranges.

Accuracy: $\pm 0.05\%$ of F.S.

Options 7, 8 & A:

V & mA RMS: Here we use a **True RMS-DC** Converter for accurate ($\pm 0.05\%$) measurement of sine waves up to 10KHz ($\pm 0.1\%$ for 10-20KHz) and SCR's fired to $\pm 1\%$. Input impedances vs. range are the same as for VDC & mADC ranges. **Warning: No Isolation!**

Accuracy: $\pm 0.05\%$ of F.S.

Option 9: Custom: Use this option to describe any custom input, scale or modification to the **DCS** and contact us for feasibility and cost.

Option B: 5Amps AC:

Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.05 Ohm, 0.1% 5 Watt resistor. You can mount the "Shunt" at your **C.T.** or next to the **DCS** but make sure the connections are "Perfect" to electrical codes. The C.T. might have "**Lethal**" **High Voltage** without a "Shunt" (Open) and the **DCS** will "Smoke". See **OTEK's** New **ACS** & **CTT** models for **C.T.** powered instruments (Patented.)

Warning: No Isolation!

Accuracy: $\pm 0.05\%$ of F.S.

Option E: RTD (PT100):

We excite your 2 wire RTD with 200 μ A to avoid the "self heating" effect.

The range of the **DCS** is the same as your **RTD** typically -200 $^{\circ}$ C to +800 $^{\circ}$ C (-328 + 1562 $^{\circ}$ F). You can place the decimal point at will (typically -200.0 to 800.0 (-328.0 to 1562.0)). The **PT100** has a temperature coefficient of 0.00385 Ohms/Ohm/ $^{\circ}$ C. To change from PT100 to ANSI 392, or $^{\circ}$ C to $^{\circ}$ F, use simple commands via serial port.

Accuracy: $\pm 0.5\%$ of F/C plus sensor's error.

Option F: RTD (PT1000): Same as PT100 except it is 1000 Ohms at 0 $^{\circ}$ C instead of 100 Ohms @ 0 $^{\circ}$ C. The same technique is used. For copper **RTD** (10 Ohm), contact **OTEK**. Same connection as Option E apply. Max Distance <30' (10M).

Accuracy: $\pm 0.5\%$ of F/C plus sensor's error.

Note: For long distances use a 4-20mA transmitter such as our **900** or **LPT** series.

DCS continued

Options G & H: Frequency Input:

We use an **F-V** to accept frequencies from 40 - 20KHz and amplitudes from 1-400V peak or dry contact or open collector transistor (O.C.T.). For 50 or 60Hz power line frequency measurement. Use Option H or S.

Accuracy: $\pm 0.05\%$ of F.S.

Option J: Thermocouple (Type

J): This **TC** has a range of -210 to +760°C (-350 + 1390°F). Its color is white (+) and Red (-), cold junction (CJ) is inside the **DCS** at the connector base. Make sure the connections from the **DCS** and your **TC** are as close to the **DCS's** entrance as possible to avoid errors.

If you short out the **DCS's** **+TC** & **-TC** together, the **DCS** will read the ambient temperature due to its built-in C.J.C. (Cold Junction Compensation).

Accuracy: $\pm 2^0$ F/C of signal input.

Option K: TC (Type K): This is yellow (+) and red (-) and has a range of -270 + 1370°C (-440 + 2500°F). The same notes as Option J applies.

Accuracy: $\pm 2^0$ F/C of signal input

For Other TC use #9 and Specify

Option L: %RH: This conditioner is designed to interface to a typical (capacitance type) 2-3pF/% of **RH** made by several manufacturers. Use Option 9 and contact **OTEK** to specify your sensor's specifications.

Accuracy: $\pm 2\%$ RH of signal input.

Option M: pH (Acidity): We use a FET input (10^{15}) amplifier and calibrate the **DCS** for 0-14.00 pH using the Industry's standard ± 413 mV = ± 7 pH coefficient.

Note: Not temperature compensated.

Accuracy: $\pm 0.05\%$ of F.S.

Option N: ORP (Oxygen Reduction Potential): Our FET amplifier (10^9) accepts the industry standard 2000mV F.S. of the probe and the **DCS** displays it in % (0-100.00%).

Accuracy: $\pm 0.05\%$ of F.S.

Note: Options Q-T only available with Powerless™ Signal power input (Option 0, Digit 3). (PAT. #: 4,908,569)

Option Q: VAC Signal Powered:

Warning! No Isolation! This option uses the AC Voltage Signal to power the **LBD**. Since the **LBD** uses about 30mA @ 5VDC, we use a coupling capacitor AC-DC converter to generate 5VDC and not to "Load" the signal with a transformer. Consequently, your signal source should be capable of producing about 150mW without overloading it, otherwise use Options 7 or 8 (externally powered). Range: 50-150VAC; Method: RMS Calibrated; Accuracy & Linearity: $\pm 0.5\%$ of F.S. Best and safest when driven by a P.T. (Potential Transformer. **Always turn power off before connecting!**

Option R: AAC Signal Powered:

Warning! No Isolation! (Pat. #7,626,378)

OTEK's Patented technique permits the extraction of power from a regular **C.T.** (Current Transformer) to power the **DCS** without distorting the signal. Since this option is designed to be powered from a C.T., it should not be connected directly to the mains without limiting the current and proper electrical grounding. **Lethal Voltage** might be present at the C.T. secondary (output) if the secondary is open.

Always turn power off before connecting! Range (at C.T. output): 0.1-5AAC; Overload: 50%/30 seconds; Peak: 100%/1 second; Conversion: True RMS; Accuracy & Linearity: $\pm 0.05\%$ of F.S.; Burden on C.T.: <150mW. Hz: 45-65.

Option S: Hertz (Frequency)

Signal Powered: **Warning! No**

Isolation! This option uses the same power technique as Option Q above and the same precautions and warnings apply. Here we use a "Zero Crossing" detector and a F-V converter to give you the **A.C.** line frequency display with 0.1 Hz resolution. Range: VAC: 50-150VAC/ Frequency: 50-440 Hz; Accuracy & Linearity: $\pm 0.05\%$ of F.S.

Option T: Signal Powered AC

Watts: **Warning! No Isolation!**

Here we combine the powerless VAC & AAC options to arrive at real power calculations through our **CPU** and **DAC**. The same warnings and precautions of Options Q & R apply. Range: VAC: 50-150; AAC: 0.1 - 5A; Frequency: 40-450Hz; Accuracy & Linearity: $\pm 0.1\%$ of F.S.; Conversion: True RMS. Hz: 45-65. Contact **OTEK** for other functions.

Power/Input (Digit 3):

Option 0: Powerless™: The **DCS** is powered from the signal that it measures. **ONLY** available for options 0, 2, and Q through T of input signal (Digit 2).

WARNING: Options Q-T (Digits 2 & 3) could have lethal potentials!

DCS SERIES continued

Option 1 &2: Non-Isolated 5 or 7-32 VDC Power:

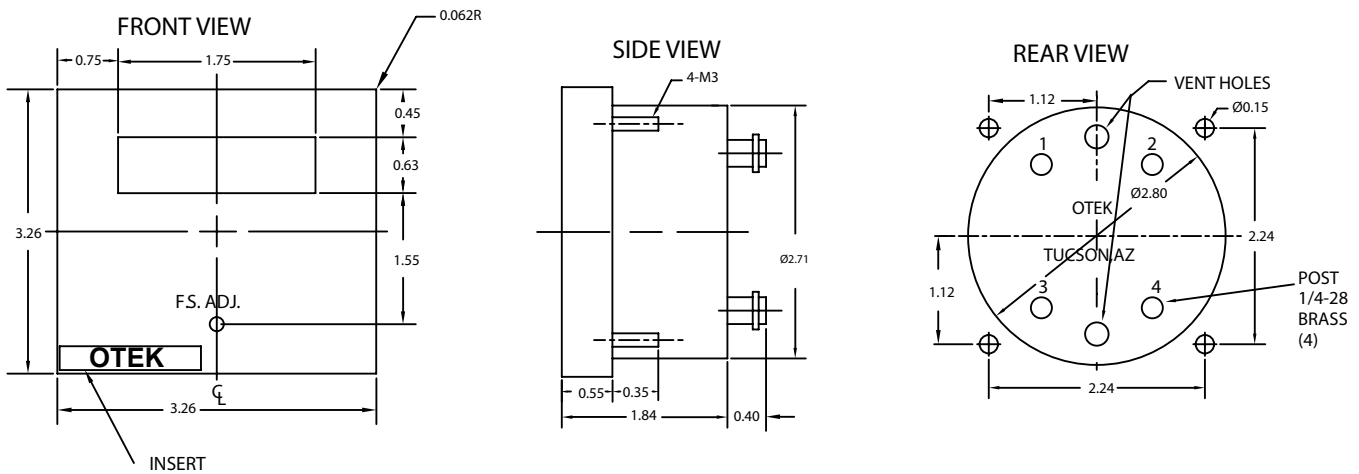
All listed I/O options (except Powerless™) are available. Power requirements vary with options included. The **DCS** requires under 150 mW (30 mA@5VDC).

Options 3-7: Isolated Power (7-32VDC & 90-265VAC):

These options offer minimum isolation of 500 VAC or DC and their efficiency is about 80%. All input ranges are +/-5%.

Decimal Points (Digit 4): The DCS has internal D.P. selection, specify or open unit and change jumpers on display board.

DCS MECHANICALS



TYPICAL CONNECTIONS

- 1: +/-Hi Signal Input
- 2: +/-Lo Signal Input
- 3: +/-Hi Power Input
- 4: +/-Lo Power Input

NOTE: Use 1 & 2 for signal/loop powered models
Use 3 & 4 for powered models



DCS ORDERING INFORMATION 9/9/14

NOTE: Please READ BEFORE building part number:

1. If digit 2 is option 0, 1, Q, R, S or T, then digit 3 must be option 0.
2. See notes at bottom of page.

	1	2	3	4	
	□	□	□	□	
Model: DCS -					
<u>DISPLAY & BACKLITE (3)</u>			<u>DEC. POINT / RANGE / CALIBRATION (5)</u>		
0.....3 1/2 Digit LED			0.....Standard with NO DEC. POINT		
9.....Custom (Contact OTEK)			1.....1.XXXX & Std		
			2.....1X.XXX & Std		
			3.....1XX.XX & Std		
			4.....1XXX.X & Std		
			9.....Custom (Contact OTEK)		
<u>F.S. INPUT SIGNAL/Z in (1,4,5,7)</u>			<u>POWER INPUT (1)</u>		
0.....4-20mA Loop Powered			0.....Signal/Loop Powered		
1.....4-30VDC Signal Powered			1.....Non-Isolated 5VDC		
2.....4-20mA External Powered			2.....Non-Isolated 7-32VDC		
3.....200mVDC/1M Ohms			3.....Isolated 5VDC		
4.....500 VDC/1M Ohms			7.....Isolated 90-265VAC		
5.....2mADC/100 Ohms			8.....Isolated 7-32VDC		
6.....200mADC/1 Ohms			9.....Custom (Contact OTEK)		
7.....200mVRMS/1M Ohms					
8.....500VRMS/1M Ohms					
9.....Custom (Contact OTEK)					
A.....2mARMS/100 Ohms					
B.....5ARMS/0.05 Ohms					
E.....2 Wire RTD PT100 (100 Ohms)					
F.....2 Wire RTD PT1000 (1K Ohms)					
G.....Frequency 40-20 KHz					
H.....Frequency 50-440Hz Line					
J.....TC Type J					
K.....TC Type K					
L.....%RH (Specify Sensor)					
M.....pH (0-14.00)					
N.....ORP (0-2000 mV)					
Q.....VAC Signal Powered (P.T.)					
R.....AAC Signal Powered (5A C.T.)					
S.....50-440 Hertz Signal Powered (P.T.)					
T.....Watts AC Signal Powered (P.T. & C.T.)					

DOWNLOADS: For manuals, user-software or drivers: www.otekcorp.com

NOTES:

3. Option 2 on digit 1 only requires 1mA.
4. See data sheet. Use #9 and specify for input not listed.
5. Specify calibration if other than standard 0-F.S. (1999 or 19999). Decimal point is internally selectable.
6. Specify sensor manufacturer and type for pH & % RH.
7. Zero adjustment is internal.