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

NEW

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: $\leq$ 15mA

*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!**

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 200µA to avoid the "self heating" effect. The range of the **DCS** is the same as your **RTD** typically -200^{0}C to +800^{0}C (-328 + 1562^{0}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/^{0}C. To change from PT100 to ANSI 392, or °C to °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^{0}C instead of 100 Ohms @ 0^{0}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 + 760^0C ($-350 + 1390^0$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 + 1370^0C ($-440 + 2500^0$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 $\pm$ 413 mV = $\pm$ 7pH 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
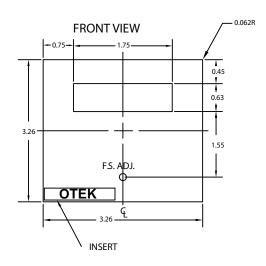
Option 1 &2: Non-Isolated 5 or 7-32 VDC Power:

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

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

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.

$$\text{Model:}\quad \text{DCS -}\quad \boxed{}\ \boxed{}\ \boxed{}\ \boxed{}$$

1 2 3 4

DISPLAY & BACKLITE (3)
0.......................................3 1/2 Digit LED
9..........................Custom (Contact OTEK)

DEC. POINT / RANGE / CALIBRATION (5)
0......................Standard with NO DEC. POINT
1..1.XXXX & Std
2..1X.XXX & Std
3..1XX.XX & Std
4..1XXX.X & Std
9...................................Custom (Contact OTEK)

F.S. INPUT SIGNAL/Z in (1,4,5,7)
0.................................4-20mA Loop Powered
1............................4-30VDC Signal Powered
2...........................4-20mA External Powered
3..................................200mVDC/1M Ohms
4....................................500 VDC/1M Ohms
5.................................... 2mADC/100 Ohms
6.................................... 200mADC/1 Ohms
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.)

POWER INPUT (1)
0...........................Signal/Loop Powered
1............................. Non-Isolated 5VDC
2...................Non-Isolated 7-32VDC
3.................................. Isolated 5VDC
7..............................Isolated 90-265VAC
8..................................Isolated 7-32VDC
9.......................Custom (Contact OTEK)

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.