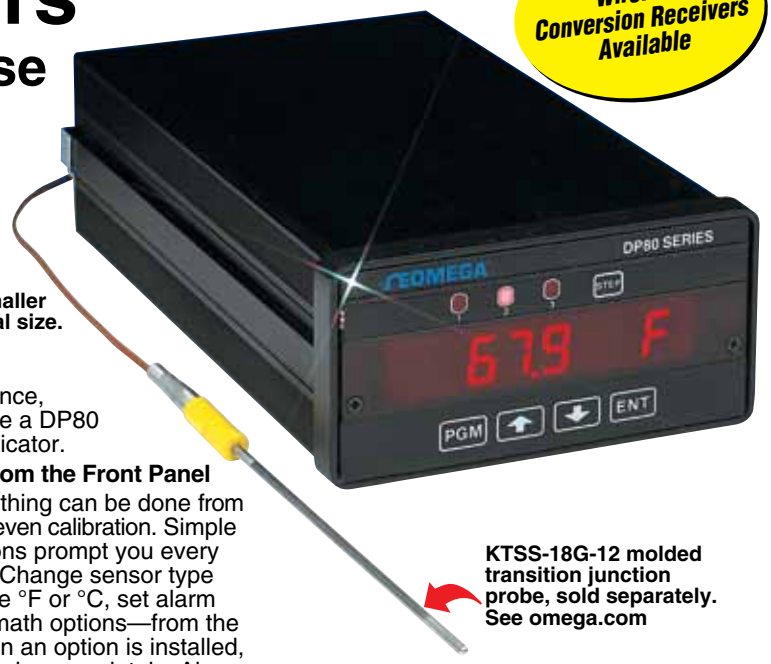
Single- or Multi-Channel Digital Process Indicators

For Panel or Benchtop Use

Wireless Conversion Receivers Available

DP81 Series

1 YEAR WARRANTY



DP81T shown smaller than actual size.

KTSS-18G-12 molded transition junction probe, sold separately. See omega.com

- **High Accuracy**
- **14 Thermocouple Input Types**
- **6 RTD Inputs: 4 Platinum, 10 Ω Copper, and 120 Ω Nickel Types**
- **Thermistor Inputs: YSI 400 and 700 Series**
- **Process Inputs: 4 Voltage and 2 Current**
- **Modular Construction Allows Options to Be Field-Installed**
- **Single- or Double-Width Panel**
- **Multiple Inputs up to 24 Thermocouple or 12 RTD Input**
- **Latching or Non-Latching Alarms**
- **Isolated Analog Output**
- **Fully Isolated RS232/ 20 mA Digital Outputs**
- **Math Expressions: Display the Rate Change, Max/Min or Timed Average of Measurements**
- **DC Power: Fully Isolated 12 or 24 Vdc Power Can Be Used with Floating or Grounded Sensors**

The DP80 Series offers repeatability, reliability, and compatibility with most sensors. Temperature can be measured from -273 to 2318°C (-460 to 4206°F), or 0 to 2592 K, all with 0.1° resolution. DC voltage can be measured to 1 µV and ranges are available up to 100V. Process voltage and current loops can easily be scaled from the front panel, within 99999 display counts. Strain-gage indicators measure load cells, pressure, torque, thrust, and force with 0.01% precision. Whether you're measuring the temperature of molten metal or testing jet engine performance, make your choice a DP80 Series digital indicator.

Convenience From the Front Panel

Just about everything can be done from the front panel—even calibration. Simple display instructions prompt you every step of the way. Change sensor type selection, change °F or °C, set alarm points, or reset math options—from the front panel. When an option is installed, you'll be prompted appropriately. Also, all output options are fully isolated, keeping unwanted ground loops from affecting the instrument's measuring system. This further maintains the instrument's high accuracy and increases your confidence in the displayed value.

Unique Sensor Error Compensation

Compensate for sensor offset errors such as those that commonly occur with thermocouples. The DP80 Series corrects offset errors inherent in sensors, lead-wires, and deviations from reference operating conditions. Use it to optimize measuring systems at a single-measurement point, such as monitoring a calibration bath.

Temperature Indicators

Thermocouple models accommodate 14 types of thermocouples (shown in the range table). RTD models accommodate 6 types of RTD sensors, and thermistor models accommodate both 400- and 700-type thermistors. They offer 0.1° resolution with thermocouples and RTD sensors and provide 0.01° to 0.02° resolution for thermistors. The front panel keypad is also used to select °F, °C, or Kelvin display units and input type. The DP80 Series can measure and display 1 input point or, with the multi-input option, as many as twenty-four inputs. The DP81 is a single-input instrument for rack or panel mounting and can accommodate up to 2 option cards. The DP82 is an expanded, double-width indicator that accommodates up to 5 options. Both are compatible with a wide selection of temperature sensors.

DC Voltage Indicators

Functioning as a digital voltmeter, the DP80 Series provides precision measurement and display of dc voltages. Four ranges, 100 mV, 1V, 10V, and 100V, are standard. Each range is displayed to its highest resolution within the full 99999 counts. With 0.01% accuracy and 1-digit repeatability, lab quality measurements are possible with a panel mount or benchtop indicator. For scaled DC voltages, the DP80-SCL option can be specified for use with models with V input code (DC voltage input). All DC input ranges shown in the DC voltage range table can be scaled, offset, have engineering units assigned, and have decimal position changed (e.g., 1 to 5 Vdc input can be displayed as 200.0 and 750.0 psi).

Current Loop Indicators

The DP80 Series can accurately measure and display process signals to proportional engineering units. For current loop measurements, models with "C" input code (current input) allow selection of either 4 to 20 mA or 10 to 50 mA. This input is pre-scaled and displayed as 0.00 to 100.00%. To display something other than 0 to 100%, you can add the scaling and offset option DP80-SCL. This option allows you to scale the display within ±99999 counts, change the engineering units, and reposition the decimal point location (e.g., 4 to 20 mA displayed as 0.00 to 560.0 gpm).

Strain Gage Indicators

The DP87 and DP88 Series of digital strain gage indicators are compatible with lower output-bonded foil-type transducers and high-output semiconductor transducers (up to 100 mV). Each instrument allows selection from one of 4 full-scale voltage ranges to optimize sensitivity. The measuring technique used is a unique voltage-to-frequency

Thermocouple Input and Range Table

Input Code	Sensor Type	Range	Accuracy (all ±, includes maximum linearization error)
T	Iron-Constantan J	-336.0 to 2193.3°F -204.4 to 1200.7°C 68.8 to 1473.9 K	0.5°F 0.3°C 0.3 K
	CHROMEGA®–ALOMEGA® K	-299.9 to 2503.5 °F -184.4 to 1373.1°C 88.8 to 1646.3 K	0.6°F 0.3°C 0.3 K
	Copper–Constantan T	-373.2 to 753.7°F -225.1 to 400.9°C 48.1 to 674.1 K	0.4°F 0.2°C 0.2 K
	CHROMEGA®–Constantan E	-358.6 to 1835.2°F -217.0 to 1001.8°C 56.2 to 1275.0 K	0.6°F 0.3°C 0.3 K
	Platinum–Pt13% Rhodium R	32.0 to 3219.1°F 0.0 to 1770.6°C 273.2 to 2043.8 K	1.2°F *(above 79.0°F)* 0.7°C *(above 26.0°C)* 0.7 K *(above 299.2 K)*
	Platinum–Pt10% Rhodium S	32.0 to 3216.7°F 0.0 to 1769.3°C 273.2 to 2042.5 K	1.2°F *(above 79.0°F)* 0.7°C *(above 26.0°C)* 0.7 K *(above 299.2 K)*
	Pt30% Rhodium–Pt6% Rhodium B	899.5 to 3309.6°F 481.9 to 1820.9°C 755.1 to 2094.1 K	2.0°F 1.1°C 1.1 K
	Nicrosil–Nisil N	32.0 to 2301.5°F 0.0 to 1260.8°C 273.2 to 1534.0 K	0.5°F 0.3°C 0.3 K
	Tungsten 5% Re–Tungsten 26% Re C	-10 to 4200.4°F -23.3 to 2315.8°C 249.9 to 2589.0 K	1.1°F 0.6°C 0.6 K
	Tungsten–Tungsten 26% Re G	295.0 to 4206.0°F 146.1 to 2318.9°C 419.3 to 2592.1 K	1.1°F 0.6°C 0.6 K
	W 3% Rhenium–W 25% Rhenium D	-8.4 to 4203.8°F -22.4 to 2317.7°C 250.8 to 2590.9 K	1.1°F 0.6°C 0.6 K
	CHROMEGA® Gold .07% Atomic Iron	-460.1 to 44.9°F -273.4 to 7.2 °C 0.0 to 280.4K	0.4°F 0.2°C 0.2 K
	Iron–Constantan J DIN	-330.6 to 1654.7°F -201.4 to 901.5°C 71.8 to 1174.7 K	0.9°F 0.2°C 0.5 K
	Copper–Constantan T DIN	-331.3 to 1114.4°F -201.8 to 601.3°C 71.4 to 874.5 K	0.9°F 0.5°C 0.5 K
R	Platinum 100 Ω at 0°C 3- or 4-wire α = 0.00385/ DIN 43670 curve	-332.3 to 1571.7°F -202.4 to 855.4°C 70.8 to 1128.6 K	0.2°F 0.1°C 0.1K
	Platinum 100 Ω at 0°C 3- or 4-wire α = 0.00392	-401.0 to 1572.0°F -240.6 to 855.4°C 32.6 to 1128.6 K	0.2°F 0.1°C 0.1K
	Platinum 200 Ω at 0°C 3- or 4-wire α = 0.00392	-330.1 to 1566.2°F -201.2 to 852.3°C 72.0 to 1125.5 K	0.2°F 0.1°C 0.1K
	Platinum 1000 Ω at 0°C 3- or 4-wire α =0.00375/HYCAL Ultra 7 curve	-330.4 to 1025.6°F -204.4 to 1200.7°C 68.8 to 1473.9 K	0.2°F 0.1°C 0.1K
	Copper 10 Ω at 25°C 3- or 4-wire per Minco table 16-9	-337.2 to 507.2°F -205.1 to 264.0°C 68.1 to 537.2 K	0.8°F 0.4°C 0.4K
	Nickel 120 Ω at 0°C 3- or 4-wire per Minco table 7-120	-112.0 to 608.2°F -80.5 to 320.1°C 192.7 to 593.3 K	0.4°F 0.2°C 0.2K

Current Input Range Table

Input Code	Input Type	Range	Res.
C	4 to 20 mA	-5.00% to 105.00%	0.01%
	10 to 50 mA	-15.00% to 105.00%	0.01%

Note: *Accuracy for voltage and current inputs: 0.01% rdg ±1 digit.*

Voltage Input and Range Table

Input Code	Input Type	Range	Res.
V	mVdc	-15.000 to 99.999 mV	10 µV
	mVdc	-150.00 to 99.999 mV	100 µ
	Vdc	-1.5000 to 9.999 V	1 m
	Vdc	-15.000 to 99.999 V	10 mV

Thermistor and Range Table

Input Code	Input Type	Range	Acc.	Res.
Y	400 Series 2252 Ω @ 25°C (77°F) 2-Wire	-42 to 221°F	0.02°F	0.4°F
		-42 to 105°C	0.4°C	0.01°C
		231 to 458 K	0.2 K	0.01
	700 Series 3-Wire	31 to 213°F	0.4°F	0.01°F
		0 to 100°C	0.2°C	0.01°C
		272.6 to 373.8 K	0.2 K	0.01 K

Strain Gage Models with Range Table

Model No.	Select Input Range	Accuracy	Res.
DP87	-15 to 100 mV	0.01% rdg ±1 digit	1 µV/count
DP88	-30 to 200 mV		2 µV/count
DP89	-75 to 500 mV -150 to 1000 mV		5 µV/count 5 µV/count

DP81T shown smaller than actual size.

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conversion, dual slope method with a true, four-wire ratio measurement. This method assures accurate and stable readings even in noisy environments that can occur with fluctuating excitation power. Also, it allows these indicators to be used with floating or grounded transducers. Three alphanumeric LED's are supplied either for display of engineering unit tables (e.g., psi, kg, lbs) or as "0" for active display of dead zeros.

Dual Engineering Units

The primary and secondary engineering unit displays are standard on all units and easily toggled from the front panel. For example, the primary could be pounds (lb) while the secondary a mathematically proportional kilograms (kg). Because of their math equivalency, all options function correctly, regardless of display selection. System calibration can be accomplished using a 3-point "live" load, such as actual weight on a scale, or via electronic instrument calibration using a dc voltage source. To reduce settling indications on the display or option outputs, the display can be rounded to count by 1, 2, 5, 10, or 100 counts via a simple program menu selection. Auto zero (tare) can be accomplished by the auto zero menu command or while the process is running. A simple, simultaneous push of the "down" arrow and "enter" keys will re-zero the indicator.

3 Strain Gage Models

There are 3 basic models of strain gage indicators from which you can select. The models vary by panel or benchtop design, isolated excitation power supply and the availability of option slots. The DP87, available with 1 option slot, includes a built-in excitation supply capable of driving 2 parallel 350 bridges. The excitation supply is switchable for 5, 10, or 15 Vdc. The DP88 and DP89 series have a larger double-width chassis which allows up to 4 option boards, and they include a higher output excitation power supply. This excitation supply is switchable for 5, 10, 15, or 20 Vdc with the capability to drive up to 8 parallel 350 Ω bridges.

Available Options Slot Summary:
DP87: 1, **DP81:** 2, **DP88:** 4, **DP89:** 4, **DP82:** 5, **DP85:** 5, **DP86:** 5

Multiple Input Options (DP80-206 and DP80-403)

Monitor as many as 24 inputs. The first multiple-input card provides an additional 5 channels of thermocouple or voltage, or 2 channels of RTD or thermistor input. Additional cards add 6 more thermocouple or voltage, or 3 more RTD or thermistor, inputs. The DP81 can use 1 card while the DP82, DP85, DP86 models can have a maximum of 4 cards. The multiple input options are not for use with "C"-current loop input or DP87 or DP88 strain gage versions.

DC Power Options (DP80-DC1 and DP80-DC2)

For automotive, marine, aviation, or plant DC power loops, the DP80 Series can be configured for 12 or 24 Vdc power operation. DP87 and DP88 models cannot be used with Vdc power.

Differential Measurement (DP80-2DI and DP80-4DI)

This card provides an additional input channel and the capability to display the differential (sT) between the 2 channels. The DP80-2DI card is used with thermocouple and voltage input models. The DP80-4DI option is specifically for use with RTD or thermistor configurations. This function can be combined with the DP80-MTH for maximum, minimum, and average deltas, or used with DP80-AOC or DP80-AOV for scaled analog output of differentials and alarm points based on differential limits. (The DP80-2DI and DP80-4DI cannot be used with the DP80-206 and DP80-403 options or with current loop or strain gage versions.) Order option DP80-2DI for DELTA and 2 thermocouple or voltage inputs, and DP80-4DI for DELTA and 2 RTD or thermistor inputs.

Alarms (DP80-ALM)

Each DP80-ALM option card provides 2 alarms with separate limits and relays. Up to 2 cards can be ordered per unit. Any combination of high, low, or ± values can be used to trigger the alarm from either actual or math processed inputs. Trigger delay and a programmable deadband are included standard.

Analog Output (DP80-AOC and DP80-AOV)

For output to recorders or other analog input instruments, you can choose from 2 fully isolated linearized analog outputs. Both output types, 4 to 20 mA or 0 to 10 Vdc, can be fully scaled. Output can be assigned to direct measurements or math values.

Math Expressions (DP80-MTH)

This card provides display of maximum, minimum, rate of change, or timed average value of measurements. Front panel keys allow you to view the math value or switch back to view the actual measured value.

Scaling and Offset Option (DP80-SCL)

Specifically designed for use with "V"-voltage and "C"-current loop versions of the DP81 and DP82 Series, the DP80-SCL option provides wide-range user scaling of the display for process units. With this option, you can re-scale and offset inputs for display in direct engineering units to ±99999 counts. In addition, you can assign alphanumeric labels or dead zeros to the displayed units. For example, 4 to 20 mA could be scaled to display "0.00-255.00 PSI", "LBS", "KG", "GPM", etc. It's that easy. Unlike other instruments, you need not perform any computations or enter any formulas. Simply enter upper and lower input and output values. The DP80 Series does the rest, adjusting the optimum slope and offset for you automatically. Since digital scaling is built-in, this option is not for use with Models DP87, DP88 or DP89.

3 Digital Output Modes are available for output to digital equipment.

RS232C/20 mA Serial Output Options (DP80-SER) RS232 serial output or 20 mA interface sends display information in serial ASCII format. 300 to 9600 baud rates are user-selectable.

Specifications

Display: 8-digit, 14-segment alphanumeric red LED's 13.7 mm H (0.54"), and 1 negative "-" LED at left of the array

Display Resolution:

DP81, DP82, DP86, DP87, DP88, DP89: 5-digit 0.1° resolution;
DP85: 4-digit 1° resolution

Repeatability: ±1 digit

Zero Stability: 0.5 µV/°C

Span Stability: 0.005% rdg/°C

Normal Mode Noise Rejection:

NMRR: 60 dB at 50 Hz/60 Hz ±0.1 Hz

Common Mode Noise Rejection: 120 dB at 50 Hz/60 Hz ±0.1 Hz

Overload Protection:

Power Lead to Ground: 1500 Vdc or Vac RMS
Input to Ground: 270 Vdc or Vac RMS
Across Inputs: 270 Vdc or Vac RMS continuous
4 to 20 mA Range: 80 mA
10 to 50 mA Range: 200 mA

Input Impedance:

Thermocouples: 22 MΩ (with 20 nA of break detect current)
RTDs: I1 to VinLo (10 MΩ), I2 to VinLo (12.3 kΩ), depending on range VinHi to VinLo (500 MΩ)
Thermistors: I1 to VinHi (3.2 kΩ), I1 to I2, (9.45 kΩ)
Voltage: 10 to 500 MΩ (depending on range)
Current: <15 Ω
Strain Gage: 10 to 500 MΩ (depending on range)

Environmental Ranges

Operating Temperature: 0 to 50°C (32 to 122°F)
Storage Temperature: -40 to 65°C (-40 to 149°F)
Humidity: <90% RH, non-condensing

Input Connections

Sensors: Screw terminal blocks
Multi-Input (Quick-Connect AC Power, Plug-in DC Power): Screw terminal blocks

Alarm Option (DP80-ALM):

2 alarm settings per alarm option—up to 2 alarm options per instrument, form "C" (SPDT) relay output (1 A at 120 Vac) reset auto, manual, remote, and over-ride selectable alarm delay and deadband

Multi-Input Options Accuracy (DP80-206) Thermocouple: ±10 µV to ±70 µV depending on thermcouple type and measurement point

(DP80-403) RTD:
Cu10: ±10 mΩ
All Others: ±50 mΩ
Current Loop and Thermistor: No effect

Point Update Rate: 2 readings/s, 1 reading/s for R, S, B, C, G, D, and CGI thermocouples

Program Storage: EEPROM

Case Construction: Metal, black anodized, extruded aluminum

Panel Mounting: Installation panel mounting from front, secured at sides by rail clamps supplied with each indicator

Power: 90 to 132 Vac, 48 to 400 Hz

Optional 220 Vac Power:
190V to 262V: 48 to 400 Hz

Optional Low-Voltage Power:
9 to 16 Vdc and 18 to 32 Vdc

Excitation Supply

Model DP87: 5, 10, and 15 Vdc, switch selectable isolated, will drive two parallel 350 Ω strain gages at 15 Vdc (90 mA)

Models DP88 and DP89: 5, 10, 15, and 20 Vdc, switch selectable, isolated, will drive eight parallel 350 Ω strain gages at 15 Vdc (350 mA)

Dimensions

DP81, DP87: 67 H x 136 W x 250 mm D (2.63 x 5.34 x 9.87")

DP82, DP88: 67 H x 272 W x 250 mm D (2.63 x 10.69 x 9.87")

Panel Cutout:
DP81, DP87: 68 H x 138 mm W (2.68 x 5.44")
DP82, DP88: 68 H x 274 mm W (2.68 x 10.79")

OMEGACARE℠ Extended Warranty Program

OMEGACARE℠ extended warranty program is available for models shown on this page. Ask your sales representative for full details when placing an order. OMEGACARE℠ covers parts, labor and equivalent loaners.

To Order

Model No.	Description	Resolution	Maximum Number of Plug-In Option Boards: Maximum Total	Maximum Number of Plug-In Option Boards: Multi-Channel Input Boards
DP81(*)	Panel meter, single width	0.1°	2	1
DP82(*)	Panel meter, double width	0.1°	5	4

Comes complete with operator's manual.
***** *Specify Input Type: **"T"** temperature, **"V"** voltage, **"Y"** thermistor, **"C"** current, **"R"** RTD.*
*For 220 Vac power, add suffix **"-220"**; no additional cost.*
***Ordering Examples: DP82T-206-206-206-ALM-AOV-220,** DP82 configured for 18 channels of thermocouple input, with alarms and 0 to 10 Vdc analog input with 220 Vac power. Ranges and accuracies for signal conditioner boards on previous pages.*
***OCW-3,** OMEGACARE℠ extends standard 1-year warranty to a total of 4 years.*

Strain Gage Indicators

Model No.	Description	Maximum Total	Multi-Channel Input Board	Maximum Number of Plug-In Excitation Supply Specifications
DP87	Panel meter single width	1	N/A	2 parallel 350 Ω gages @ 150 Vdc (90 mA) switchable 5, 10, 15 Vdc power
DP88	Panel meter double width	4	N/A	8 parallel 350 Ω gages @ 150 Vdc (90 mA) switchable 5, 10, 15, 20 Vdc power

Comes with an excitation power supply which uses 1 option board slot.

Other Option Boards (Field Installable)

Model No.	Description	Option Availability: DP81 DP85	DP82 DP86	DP87 DP88, DP89
DP80-DC1†	9 to 16 Vdc power	✓	✓	—
DP80-DC2†	18 to 32 Vdc power	✓	✓	—
DP80-2DI*	2-wire delta input, differential 2-wire input	✓	✓	—
DP80-4DI*	4-wire delta input, differential 4-wire input	✓	✓	—
DP80-ALM	Alarms, dual limits (up to 2 per unit)	✓	✓	✓
DP80-AOC*	Analog output, 4 to 20 mA	✓	✓	✓
DP80-AOV*	Analog output, 0 to 10 Vdc	✓	✓	✓
DP80-MTH	Math, minimum, maximum, average, rate of change	✓	✓	✓
DP80-SCL	Scaling/offset, user selectable	✓	✓	—
DP80-SER	RS232C/20 mA serial output	✓	✓	✓

†, Mutually exclusive options.*

Multiple Input Board (Field Installable)

Model No.	Description
DP80-206	6-channel input board for thermocouple, voltage, current inputs
DP80-403	3-channel input board for RTD and thermistor inputs

Rack Mount Accessories

Model No.	Qty.	Use With
DP80-RK1	1	DP81
DP80-RK2	2	DP81
DP80-RK3	3	DP81
DP80-RKM	1	DP82

M