

Series Temperature, DC Voltage and Scaled DC Indicators



Key Features

- Accuracy $\pm 3^\circ$ to $\pm 0.1^\circ$
- $1^\circ/0.1^\circ/0.01^\circ$ Resolution
- Plug-in Range Modules and Options
- $^\circ\text{F}/^\circ\text{C}$ Switch Selection
- Large, Easy-To-Read 0.8" Red LED Display
- High Noise Rejection
- Solid Die-Cast Aluminum Case
- Engineering Unit Labels Provided
- Compatible with Input Types:
 - Thermocouples J, K, T, E, R, S, B
 - Platinum RTD 100 Ω 0.00385, 0.00392
 - Thermistor YSI 700
 - Volts (i.e. -10 to 25 mV)
 - mA (i.e. 4 to 20 mA)

Temperature Measurement

Thermocouple, RTD and Thermistor Indicators

The Models 400A/410A measure industrial temperatures with laboratory accuracy. Signals from thermocouples, RTD and thermistors can be displayed, switch-selectable for $^\circ\text{C}/^\circ\text{F}$. High instrument accuracy is achieved with a superior combination of low noise analog to digital conversion, multi-segment linearization conformity, and isolated electronics. The Model 400A provides 1° resolution (0.1° with some thermistors); the high-resolution Model 410A, provides a 0.1° resolution (0.01° for some thermistors).

Thermocouple Multi-Input Indicators

The 402A/412A provides for front panel selection and display of any one of five thermocouple inputs of a common type (e.g. type k thermocouples). The Model 402A offers standard 1° resolution; the 412A, 0.1° resolution.

Thermocouple Multifunction Indicators

Models 403A and 415A provide for selection between six thermocouple input types from a convenient row of easy to operate front panel pushbuttons. These six function models allow selection without recalibration between thermocouple types J, K, T, R, S and B. The Model 403A offers standard 1° resolution; the 413A, 0.1° resolution.

The Doric 400A Series of digital indicators sets the standard for quality, reliability, and cost-effective performance.

Thanks to its modular "plug-in range" capability, the Doric 400A Series is the answer to a host of temperature, process and voltage measuring applications. A comprehensive selection of options, including alarms and analog output, allow you to do more than just measure and display. Multi-input switching options cut the cost of measuring to fractions. Isolated electronics and rugged metal chassis insure that the Doric 400A provides reliable performance, even in harsh operating environments.

DC and Scaled DC Indicators

DC Voltage Single Range Indicators

The Models 400A/410A can be configured for direct measurement of DC voltages in four ranges from 25mV to 25V with laboratory accuracy, resolution and repeatability. The 400A displays the voltage within -1000 to +2500 counts with 1 count accuracy. The higher resolution Model 410A provides an additional decade of resolution (-10000 to + 25000) and accuracy to 0.01% of reading. Both instruments offer exceptional 1 count repeatability.

Scaled DC Voltage and Current Loop Single Range Indicators

The 400A/410A can also display process parameters with laboratory accuracy. Signals from current transmitters, signal conditioners or other DC voltage sources can be scaled and displayed in engineering units.

Plug-in modules are available for 0-100% display of 4-20mA or for engineering unit representation of 4-20mA or 0-5V inputs. Decimal point position can be changed via a "DIP" switch behind the front panel and various engineering units are included.

DC Voltage Multi-Input Indicators

The 402A/412A provides for front panel selection and display of any one of five inputs. All channels are configured for the same input range (e.g. -10 to +25 volts). The Model 402A offers standard 0.1% resolution; the 412A, 0.01% resolution.

Scaled DC voltage Multi-Input Indicators

In addition, the 402A/412A can be specified with the 0-5V range to provide the ability to switch between five inputs scaled and displayed to the same engineering units. A row of five pushbutton switches permits easy switching between input readings.

Thermocouple Range Table

Sensor Type	Range/Display	Accuracy (\pm)*		Resolution	
		400 / 402 / 403	410 / 412 / 415	400 / 402 / 403	410 / 412 / 415
Iron-Constantan	J -328 to +1712°F -200 to +933°C	1.0° 1.0°	0.6° 0.5°	1° 1°	0.1° 0.1°
Chromel®**-Alumel®**	K -208 to +2552°F -133 to +1400°C	1.5°<0°<1° 1.0°	1.2°<0°<0.8° 0.8°<0°<0.5°	1° 1°	0.1° 0.1°
Copper-Constantan	T -328 to +752°F -200 to +400°C	2.0°<0°<1° 1.0°	1.5°<0°<0.6° 1.0°<0°<0.4°	1° 1°	0.1° 0.1°
Chromel**-Constantan	E -328 to +1952°F -200 to +1066°C	1.0° 1.0°	0.7° 0.4°	1° 1°	0.1° 0.1°
Platinum-Platinum 13%, Rhodium	R +32 to +3252°F 0 to +1788°C	3°<350°<2° 2.0°	3°<350°<1.5° 2°<200°<1° 0.6° from 800° to 1300°	1° 1°	0.1° 0.1°
Platinum-Platinum 10%, Rhodium	S +32 to +3252°F 0 to +1788°C	3°<600°<2° 2.0°	3°<600°<1.5° 2°<315°<1° 0.5° from 800° to 1300°	1° 1°	0.1° 0.1°
Platinum 30%, Rhodium- Rhodium 6% Rhodium	B +912 to +3392°F +489 to +1866°C	4.0° 2.5°	2.5° 1.0°	1° 1°	0.1° 0.1°

RTD Range Table

Sensor Type	Range/Display	Accuracy (\pm)*		Resolution	
		400	410	400	410
Platinum 100Ω 3-wire and 4-wire α 0.00385 and α 0.00392	-388 to +1632°F -233 to +888°C	1.0° 1.0°	0.7°<-328°<0.4° 0.3°<-200°<0.2°	1° 1°	0.1° 0.1°

Thermistor Range Table

Sensor Type	Range/Display	Accuracy (\pm)*		Resolution	
		400A	410A	400A	410A
YSI 700	+32 to +212°F 0 to +100°C	0.4° 0.2°	0.4° 0.2°	0.1° 0.1°	0.01° 0.01°

DC Voltage Range Table

Sensor Type	Range/Display	Accuracy (\pm)		Resolution	
		400 / 402	410* / 412*	400 / 402	410 / 412
DC mV	-10 to +25 mV	10 μV	0.01%	0.01	0.001
DC mV	-100 to +250 mV	100 μV	0.01%	0.1	0.01
DC Volts	-1 to +2.5 V	1 mV	0.01%	0.001	0.0001
DC Volts	-10 to +25 V	10 mV	0.01%	0.01	0.001
0 to 5 Vdc	Adjustable scaling to engineering units representation	5 counts	50 counts	-1000 to +2500 (100 count minimum)	-10000 to +25000 (1000 count minimum)

Scaled DC Range Table

Sensor Type	Range/Display	Accuracy (\pm)		Resolution	
		400	410*	400	410
4 to 20 mA	0 to 100%	1 count	0.01%	0.1%	0.01%
4 to 20 mA	Adjustable scaling to engineering units representation	5 counts	50 counts	-1000 to +2500 (100 count minimum)	-10000 to +25000 (1000 count minimum)

*Accuracy percentage of reading, ± 1 digit.

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Doric 400 Series

Options and Accessories

Ten-Input Switch Unit



Models 405A and 409A are options, which add ten-point pushbutton selection to the base instruments 400A and 410A. Each unit has two rows of five mechanically interlocked switches. Multiple units can be daisy-chained together to provide more input switching and lower cost-per-channel measurement. The Model 405A is design for thermocouple and voltage switching. Ten sets of easy-to-wire screw terminals are provided for attaching these 2-wire type inputs. The 409A are specifically designed for the added wiring needs of thermistor and RTD sensors. Ten sets of 3- or 4-wire type of sensors can be attached. Three different versions of front panel numbers can be ordered for the 405A model by appending a dash number to the model number (Models 405A-10, 405A-20, and 405A-30 correspond to switches numbered from one to ten, eleven to twenty, and twenty-one to thirty).

Switch Error Indication

The -01 Switch Error Indication option prevents erroneous readings if two or more buttons from different rows on the multi-point model options 405A or 409A are accidentally pushed at the same time. If this does occur the option causes the indicator display to blank out so erroneous readings cannot be taken.

Single Limit Digital Alarm/Setpoint

The -03 option card offers a single switch-selectable alarm limit comparator. This option includes a completely isolated 0.5A, 115VAC Form C contact closure. When a thumbwheel-set limit (between -3999 to +3999) is reached, the relay changes state and an LED lamp is illuminated. Resetting of the alarm can be either manual or automatic.

Doric 400 Series General Specifications

Repeatability:	R, S, B, ranges $\pm 0.2^{\circ}\text{C}$ or $^{\circ}\text{F}$; T range below 200°F , $\pm 0.2^{\circ}\text{F}$; all other ranges, ± 1 digit
Inputs:	Thermocouple (J, K, T, E, R, S, B), Platinum RTD (.00385 and .00392), Thermistor ($+32$ – 212°F or 0 – 100°C)
Scale Resolution Display:	-1000 to +2500 (400A/402A) or -10000 to +25000 (410A/412A)
Noise Rejection:	NMR, >60 dB at 58–62Hz, >56 dB at 50Hz; 3-pole, low-pass filter with 6 Hz poles; CMR, >120 dB at 58–62Hz, >110 dB at 50Hz with 250Ω unbalance
Overload Protection:	230VDC or VAC without damage, for at least 5 minutes; 115VDC or VAC continuous
Input Impedance, (code 3-61):	12.5Ω (4–20mA)
Input Impedance, (code 3-63):	6Ω (4–20mA)
Input Impedance, (codes 3-51, 3-52, 3-53):	$1000\text{M}\Omega$ (voltage)
Input Impedance, (codes 3-54, 3-55):	$10\text{M}\Omega$ (voltage)
Point Update Rate:	From 3 readings per second at low magnitudes; up to 1.5 seconds per reading at upper limit
Linearization:	100% digital using 42–46 segments, depending on range selected
Input Connections:	Screw terminals
Environmental Ranges:	Operating temperature, 0° to 50°C ; storage temperature -40°C to $+60^{\circ}\text{C}$; humidity, $\leq 70\%$ RH
Weight:	Net, 2lb 15oz (1.33kg); shipping, 4lb 8oz (2.04kg)
Power:	100–125VAC OR 190–250VAC (jumper selectable), 48–400Hz, 1.5W typical, 4W with all segments lit; a 6-foot detachable power cord is supplied.
Size (H x W x D):	2.63" x 5.34" x 6.38" (6.7 cm x 13.6 cm x 16.2 cm)

Analog Output

For output to recorders or other analog input instruments, the -05 option card provides a linearized analog output voltage of 1 mV per display count of the standard resolution indicators 400A, 402A or 403A (e.g. 1mv per 1°F with temperature). If specified with a high-resolution model, 410A, 412A or 415A, the output is 1mv per 10 counts of display (e.g. 1mv per 1.0°F with temperature). The output is completely isolated at the rear screw terminals with automatic polarity sensing. Accuracy is $\pm 0.25\%$ of reading; impedance is 5k ohms.

Extender Chassis

For increased application versatility, the Model 416A Extender Chassis, provides space for up to two additional option cards for any of the 400A Series indicators.

Bench Mount Tilt Stand

Model 400-W5 is a bench-mount tilt stand available for bench-top mounting of the 400A Series instruments. Tilt stand, hardware and rubber feet are included.

Custom Configurations

With your help, our engineers can build a digital panel indicator that meets your specification requirements. Please consult VAS Engineering for more information.

Accessories Ordering Guide

Code	Accessory
405A-10	Ten input switch box for T/C and volts, buttons #1–10
405A-20	Ten input switch box for T/C and volts, buttons #11–20
405A-30	Ten input switch box for T/C and volts, buttons #21–30
409A-10	Ten input switch box for RTD and thermistors, buttons #1–10
416A	Extender Chassis
400-W5	Bench Mount Tilt Stand

Ordering Guide

Model	Description
400A	STD resolution, single range type, choice of any range, 1°F/C switchable on temperature ranges, will accommodate one option built into same chassis.
410A	High resolution, single range type, choice of any range, 0.1°F/C switchable on temperature ranges, will accommodate one option built into same chassis.
402A	STD resolution, five-input push-button switchable, single range thermocouple 1°F/C switchable
412A	High resolution, five-input push-button switchable, single range thermocouple 0.1°F/C switchable
403A	STD resolution, six-range temperature indicator, push-button select 1°F/C switchable T/C types K, J, T, R, S, and B
415A	High resolution, six-range temperature indicator, push-button select 0.1°F/C switchable T/C types K, J, T, R, S, and B

Code	Line Voltage
1	100 to 125VAC, 48 to 400Hz
2	190 to 250VAC, 48 to 400Hz

Code	Input Range
3-12	Type J Thermocouple (Iron-Constantan)
3-01	Type K Thermocouple (Chromel-Almel)
3-13	Type T Thermocouple (Copper-Constantan)
3-04	Type E Thermocouple (Chromel-Constantan)
1-05	Type S Thermocouple (Platinum-Platinum 10% Rhodium)
1-06	Type R Thermocouple (Platinum-Platinum 13% Rhodium)
1-07	Type B Thermocouple (Plat. 30%, Rhod.-Plat 6% Rhodium)
1-00	Specify with Models 403A and 415A only
3-21	3-Wire, 100Ω Platinum RTD, .00385
3-22	4-Wire, 100Ω Platinum RTD, .00385
3-23	3-Wire, 100Ω Platinum RTD, .00392
3-24	4 Wire, 100Ω Platinum RTD, .00392
3-41	Thermistor YSI series 700, F only
3-42	Thermistor YSI series 700, C only
3-51	-10 to +25 mV, displays -10.00(0) to +25.00(0) mV
3-52	-100 to +250 mV, displays -100.0(0) to +250(0) mV
3-53	-1 to +2.5V, displays -1.000(0) to +2.500(0) Volts
3-54	-10 to +25V, displays -10.00(0) to +25.00(0) Volts
3-55	0 to 5V, adjustable display for engineering units
3-61	4–20 mA, Display 0–100%
3-63	4–20 mA, Adjustable Display for Engineering Units

Code	Display
-01	°F Display, for temperature inputs
-02	°C Display, for temperature inputs
-03	Linear Display, use with current and voltage inputs

Code	Options (only one option per unit may be specified)
-01	Switch error indication, recommended when switching accessories 405A or 409A are used
-03	Single limit digital alarm/setpoint
-05	Analog output: linearized 1mV output per standard resolution unit

400A	-1	-3-63	-03	
410A	-1	-3-12	-02	-05
402A	-1	-1-06	-01	
415A	-1	-1-00	-01	