Custom / Special Analog Panel Indicators

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Just Tell Us The Features You Need

Shortly after Simpson began manufacturing panel meters in 1936, requests were made for various modifications and/or special features not found in the standard product line. This continues to be a substantial part of our business, and we invite inquiries for this type of product.

Our standard product line of panel meters encompasses a variety of physical sizes and styles. Case enclosures from as small as approximately 1-1/2" through 8" are available. The case and cover material of most meters are phenolic with a glass viewing window. One style uses a phenolic case and acrylic cover. Some are all acrylic. A few are metal cased with glass windows. Where acrylic or glass is used, lexan can be substituted on special order, at a nominal additional cost.

If none of our available case designs are acceptable for the meters you wish to order, we invite your inquiry to design, tool and manufacture an enclosure to your specifications.

Custom / Special Analog Panel Indicators

Mechanical

Custom Dials

When ordering analog panel meters, you may want the dial marked to your specifications. If a logo is required, please submit a good quality reproducible copy with your order.
Frequently, the dial must be marked in units of measurement specific to the application. Please furnish data indicating scale points vs. electrical input to the meter.
Standard marked colors are black, white, red, yellow, green and blue. Other colors can be specially ordered.
Dials are printed by offset lithography using a chemically etched plate made from the original. Each color requires a separate plate. A one-time dial artwork charge for each plate may be applicable with the initial order.

Mirror Dial

When precision readings are required, a mirror is suggested. This curved segment, located near the scales, reflects the pointer and eliminates reading errors due to parallax. It is not available on 1-1/2", 8" size, Edgewise or 250° meters.

Indicating Pointers

Pointer tips usually are spade, lance or knife-edge. Refer to the “How to Specify and Get the Most for Your Money” in the Analog Panel Meters and Controllers section C. The spade is most visible at a distance. Knife-edge gives greatest precision in reading. The pointer type is optional on all meters except the 1-1/2" meter and the Edgewise type, where the spade is not available.

Electrical

Accuracy

Accuracy is the measure of a meter's ability to indicate the absolute value of electrical energy applied.
Standard accuracy tolerance of most commercial panel meters is ±2% of full scale. Accuracy of ±1% is available.

Symmetry

Symmetry (which applies only to offset zero meters) is a meter's ability to provide corresponding indications on each side of zero when polarity of applied energy is reversed. Symmetry is expressed as a percentage of full scale. Full scale is the arithmetic sum of the two end scale values. Standard symmetry is specified at ±4T.

Tracking

Tracking accuracy is the meter's ability to indicate, at the scale mark being checked, when the meter is energized by a proportional value of the actual end scale excitation. Tracking is expressed as a percentage of full scale value. Actual maximum tracking error possible is double the full scale accuracy. Therefore, a ±2% meter may have as much as a 4% tracking error at a specific point on the scale.

Figure 1. Zero Right

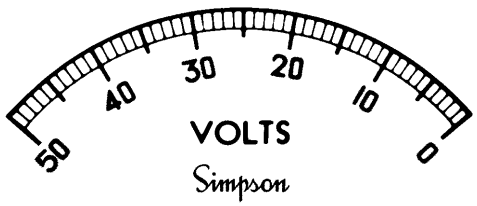
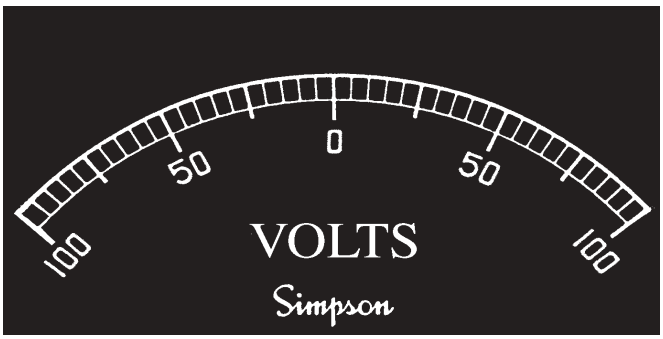


Figure 2. Zero Center



When specifying meters for end equipment with a calibration adjustment, you can specify tracking accuracy instead of a specified full scale accuracy.

Ranges

Many specified ranges can be supplied in all types and models.

Zero Right Movement

Meters except the zero center and offset zero types have their zero indication at the left end of the scale. With some applications, having the zero position on the right end of the scale is best. Example: 50-0 instead of 0-50 (Figure 1).

Zero Center

Zero Center meters have their zero at the top center of the scale, and the meter measures equal amounts in either direction. Example: 100-0-100 (Figure 2).

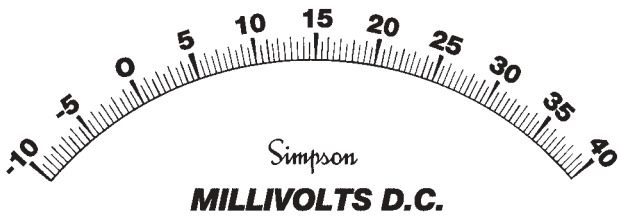
Suppressed Zero

This specially made meter does not display or measure the beginning portion of the range. Instead of a typical zero, the meter's scale displays some value above zero. An example is a range of 15-40, in which 15 replaces zero and the meter does not indicate until 15 or greater is reached. The pointer continues to a maximum of 40 at full scale. This improves readability by having 30 units on a scale which would normally have 100. This feature is available on DC meters or AC rectifier type, with suppression up to 50% of full scale. AC moving iron vane type meters, 30% maximum (Figure 3.)

Figure 3. Suppressed Zero



Figure 4. Offset Zero



Offset Zero

This type locates the zero at any place on the scale except scale ends or center scale. Example: -10-0-40 (Figure 3).

Internal Resistance and Sensitivity

All meters have electrical resistance. Many can be special-ordered with higher or lower values than specified in this publication.

Also DC and AC rectifier type voltmeters are available in higher sensitivities than mentioned herein.

Sensitivity relates to the maximum current required by the voltmeter to indicate full scale. It is expressed in “Ohms Per Volt.” This can be critical when voltmeters are used in circuits having little total current. The most convenient way of converting ohms per volt into current is to divide the number one by the number of ohms per volt. Example: 1000 ohms per volts = 1.000 ÷ 1000 = .001, or 1mA.

Temperature Compensation

Internal temperature compensation of Simpson meters meets or exceeds requirements of specification ANSI C39.1-1981, “Requirements for Electrical Analog Indicating Instruments,” which specifies that accuracy shall be held at 23°±10°C. Meters that maintain accuracy over a broader temperature span usually can be provided.

Multi Range Meters (self-contained)

Panel space limitations, convenience and/or cost may call for a meter capable of measuring more than one range of electrical quality. For example, a voltmeter with a double range of 0-100, 0-200 volts, or triple range of 0-100, 200 and 300 volts. The back of the meter would contain the necessary connections, one common, and one additional for each range. Thus, a dual range meter would have three connections and a triple range four. This type meter is available for voltage measurements and for many ranges of microamps and milliamps.

Controllers (Analog Type)

A few of our analog panel meters are available with on/off control. These meters combine standard analog display with adjustable on and off electronic switch and output relays.

The analog controller can be supplied to respond to practically any current or voltage input. The input signal is amplified in solid state circuitry and is continuously displayed on a rugged high torque pivot and jewel or taut band suspension type D'Arsonval meter.

All voltage ranges have a 20,000 ohm per volt sensitivity, and current ranges have a 50 millivolt drop.

The input signal, indicated by the meter, is constantly monitored and compared to the set point position by the electronic circuit. When the two coincide, the electronic circuit either energizes or de-energizes the self-contained output relays, depending on the direction of the input signal.

A high gain transistor switch circuit provides switching with a "dead band" no more than 0.5% of full scale. Fail safe circuitry opens the output relay in the event of a power failure

Ballistics

Damping

Damping is the manner in which the pointer settles at its steady indication after a change in the value of the measured quantity. The two general classes of damped motion are:

a. Periodic, in which the pointer oscillates about the final position before coming to rest;

b. Aperiodic, in which the pointer comes to rest without overshooting the rest position.

The point of change between periodic and aperiodic damping is called "critical damping."

Critical damping is when the overshoot present does not exceed an amount equal to one half the rated accuracy of the meter. Simpson meters are periodic and in accordance with ANSI C39.1-1981.

Standard meters have a damping factor of 2.5 minimum. Higher damping factors, for less overshoot, can usually be supplied.

Response Time

Response Time is the time required after an abrupt change of the measured quantity to a new constant value, until the pointer first comes to rest in its new position.

Often, meter applications require a special damping and/or response time. Variations from standard are available on many different types and ranges of meters. This is obtained by meter design. Besides specifying the physical size of the meter, its electrical range, and desired damping and response time, furnish the approximate resistance of the external circuit in which the meter will operate.

Frequency Calibration

AC moving iron vane type voltmeters are calibrated on a 60Hz sine wave to an accuracy of ±2% of full scale, and are usable from 25 to 125 Hz. On special order, the meter can be calibrated for any specific frequency desired between 125 and 800Hz. Rectifier type meters have essentially flat response from 25 through 10,000 Hz. On special order, rectifier type can be provided that has flat response to 250 kHz.

Shunt and Transformer Rated Meters

DC Ammeters With External Shunts

DC ammeters, for use with external shunts, are calibrated for use with industry standard leads 5 feet long with resistance of .065 ohms. On special order, meters can be calibrated to any specific lead resistance.

AC Ammeters With External Transformers

AC ammeters, made for use with typical external ring/donut type transformers, are basically 0-5 AC ammeters. The transformers are designed to produce a 5 amp output for transformers are designed to produce a 5 amp output for each primary range. For example, if a 300 amp range is chosen, it is shown as a 300/5 amp, indicating that 300 amps in the end user's conductor (primary) will result in a 5 amp output from the transformer (secondary). The 0-5 amp meter would have a dial reading of 0-300 amps.

Readily available instrument transformers of this type are equipped with two connecting leads 2 feet long, and the transformer is rated at approximately 2 VA. Where necessary, this VA rating generally permits use of extension leads up to 10 feet additional using 12 gauge or larger wire. At longer distances, meter accuracy may noticeably deteriorate.

When distance is a problem and it is necessary to use an external transformer, an approach permitting distances up to 500 feet is required.

If the current to be measured is 50 AC amps or less, select the appropriate range of Simpson model 186 current transformer (refer to Accessory Section). This transformer's primary is connected in series with the circuit carrying the current to be measured.

Rated output of this transformer is 10 AC volts at full rated input current. The meter required must have an electrical range of 0-10 AC volts, with a sensitivity of approximately 2000 ohms per volt (rectifier type). The dial of the meter is captioned in AC current and the scale range corresponds to the transformer's range. Connecting conductors, from the meter to the transformer, could be as small as 18 gauge.

Amperages in excess of 50 amps can easily be measured using this method. A typical ring/donut transformer, however, becomes an added component. (A) Select the appropriate primary range of donut transformer (refer to Accessory Section). (B) The 5 amp model 186 transformer (Cat. #01312) must be used. The 5 amp output leads from the donut transformer are connected to the model 186. (C) The meter and its connecting wiring are as outlined above, except its dial scale is to correspond in range to the newly added donut transformers.

Quotation / Ordering Information

Meter movements only, i.e. no case enclosure or dial, calibrated or uncalibrated, can be supplied in a variety of microamp and low milliamp ranges. Pointer deflection angles can be as little as 10 angular degrees, or in one type, as high as 250 degrees. A complete review of your requirements to determine the feasibility must be made prior to a quotation.

The following are things to consider when identifying your special meter requirements:

(1) Physical size: (approx) and style, i.e. 3-1/2" square, etc.

(2) Type of Meter and Range(s): Example: AC voltmeter, 0-150 volts, or 50-0-50 DC amps, etc.

(3) Dial Markings: For quotation purposes, specify only the total number of colors to be printed on the dial. Standard colors are black, white, red, yellow, green and blue. If other, please specify, preferably using a Pantone number.

When ordering special markings, supply as much detail as possible. Where details lack, we will apply normal good practice procedure. If a special trademark or logo is required, a good reproducible positive or film is needed.

Upon request, for your approval, a laser proof (actual size) of the final layout can be furnished.

Changes can be made at this point, prior to etching the permanent dial printing plate.

(4) Special Features

(a) Type of Pointer: spade, knife edge or lance. Specify color. Standard is black, white or fluorescent red. If other, specify using a Pantone color number.

(b) Mirror Dial: A small mirror segment used to eliminate reading errors due to parallax. Not available on all models.

(c) Electrical: If a non-standard resistance is required, state the desired value and tolerance. If it is to be at other than room temperature, state temperature span.

(d) Ballistics (damping/response time): State requirements and furnish the approximate resistance of the circuit in which the meter will operate.

(e) Tracking/Symmetry: If other than standard, state requirement. For a detailed description, see the section on "Modification/Special Features."

(f) Accuracy: If other than standard, state requirement.

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