

api INSTRUMENTS

INSTRUCTION MANUAL

LOCKING-COIL METER-RELAYS

REFER TO DRAWING NO. 14

DESCRIPTION

Meter-relays are proven indicating-controlling instruments with a wide range of potential applications. The API locking-coil meter-relay is a precision D'Arsonval mechanism with a set of contacts in series with a special "locking" coil to provide auxiliary contact pressure. When contact is made, a small current flows through the locking coil. As this current increases, it produces a torque which forces the contacts together, wiping the contacts to create lower contact resistance, and "locks" the contacts. The contacts may be unlocked by de-energizing the locking coil circuit. Upon interruption of the locking current, the spring action of the contacts will thrust the contacts in a snap action fashion. The API locking contact meter-relay principle permits control of an external load relay with very small input power levels while providing visual indication of the magnitude of the input signal and easy adjustment of the set point value.

SPECIFICATIONS

Ranges: 0-5 microamperes to 0-30 amperes, DC; 0-10 microamperes to 0-50 amperes, AC. 0-3 millivolts to 0-500 volts, DC; AC ranges start at 0-250 millivolts. NOTE: AC milliamperes and ampere ranges are supplied with transformer. Extra transformer is required for AC ranges above 50 amperes. DC ranges above 30 amperes require an external shunt, except on ruggedized meters, which require a shunt for DC ranges above 9 amperes. AC signals in the 0-250 millivolt range require a step-up transformer.

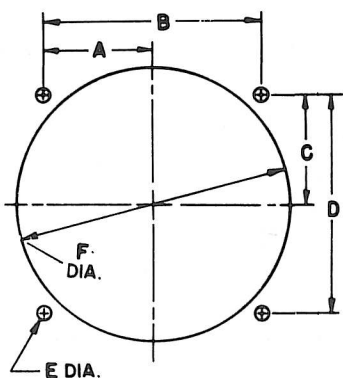
Indication Accuracy: $\pm 2\%$ DC; $\pm 3\%$ AC of full scale at 75°F.

Control Repeatability: Within $\pm 1\%$ or better.

Contact Ratings: 10 to 25 milliamperes standard; optimum open-circuit voltage is 100 volts (rated 75-150 VDC).

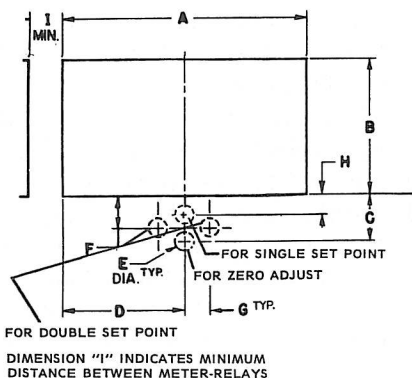
INSTALLATION

MOUNTING CUTOUTS - PANELIST



MODEL	A	B	C	D	E	F
202-C	.880 ±.010	1.765 ±.005	.72 ±.010	1.50 ±.005	.156 ±.010 -.000	1.92 ±.010
302-C	1.125 ±.010	2.250 ±.005	1.125 ±.010	2.250 ±.005	.125 ±.010 -.000	2.82 ±.010
303-C	1.125 ±.010	2.250 ±.005	1.125 ±.010	2.250 ±.005	.125 ±.010 -.000	2.82 ±.010
502-C	2.000 ±.010	4.000 ±.005	2.020 ±.010	3.560 ±.005	.156 ±.010 -.000	2.82 ±.010
503-C	2.000 ±.010	4.000 ±.005	2.020 ±.010	3.560 ±.005	.156 ±.010 -.000	2.82 ±.010
602-C	2.625 ±.010	5.250 ±.005	2.150 ±.010	3.000 ±.005	.156 ±.010 -.000	2.82 ±.010
603-C	2.625 ±.010	5.250 ±.005	2.150 ±.010	3.000 ±.005	.156 ±.010 -.000	2.82 ±.010

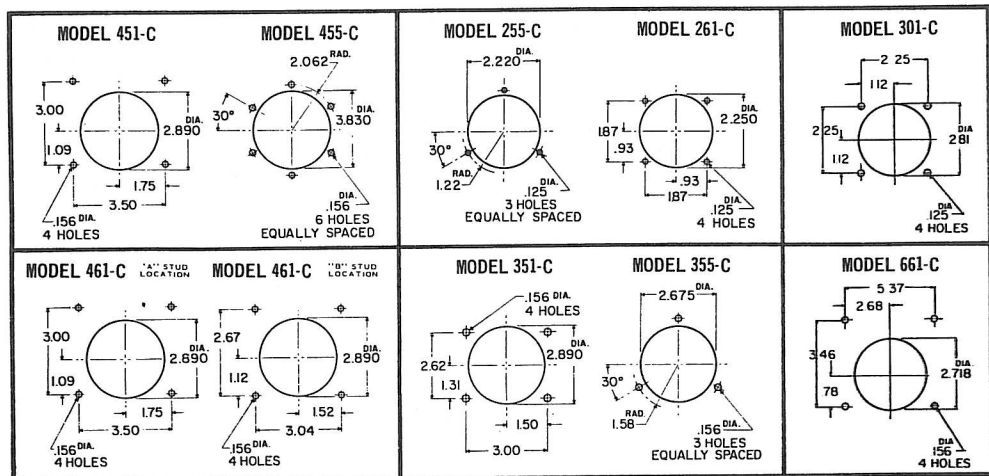
MOUNTING CUTOUTS - STYLIST



MODEL	1202-C	1302-C	1502-C	1602-C
A	2.44 +1/32 -.000	3.34 +1/32 -.000	4.81 +1/32 -.000	5.86 +1/32 -.000
B	1.29 +1/32 -.000	1.85 +1/32 -.000	2.78 +1/32 -.000	3.14 +1/32 -.000
C	.634 ±.005	.600 ±.010	.590 ±.010	.745 ±.010
D	1.22 +1/64 -.000	1.67 +1/64 -.000	2.40 +1/64 -.000	2.93 +1/64 -.000
E	.280 +0.010 -.000	.280 +0.010 -.000	.280 +0.010 -.000	.280 +0.010 -.000
F	.313 ±.010	.230 ±.010	.290 ±.010	.355 ±.010
G	.175 ±.010	.170 ±.010	.170 ±.010	.170 ±.010
H	.302 ±.010	.230 ±.010	.290 ±.010	.355 ±.010
I	1.09	.95	1.43	1.43

APPROXIMATE ARC LENGTH: 1202-C: 1.98"; 1302-C: 2.62";
1502-C: 3.76"; 1602-C: 4.68"

MOUNTING CUTOUTS



MOUNTING

Mount the meter-relay per the appropriate Model mounting cutout dimension. NOTE: See API Instruction Manual 955-31 for details concerning the installation and thermocouple adjustments for indicating pyrometers.

WIRING

The proper simplified internal schematic for your meter-relay has been checked off on the front cover of this instruction manual. Refer to the appropriate drawing on page 5 or 6. Signal polarity as shown will drive the indicating pointer upscale or on zero center units in a clockwise direction.

Many meter-relays are supplied with a special dial that does not match the range of the instrument. In such cases, the range will be indicated in the lower corner of the dial, i.e., F.S. = $100\mu\text{a DC}$. Some meter-relays require accessories to indicate the scale range. When required, such accessories (external multiplier, external transformer or external shunt) are noted in the lower corner of the scale. Since meter-relays may be damaged by operation without the proper accessory, be sure that your instrument has been installed correctly.

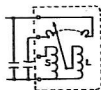
Zero Setting: If the meter-relay should require rezeroing, this may be done by turning the zero adjustment screw on the front of the meter-relay until the unenergized position of the indicating pointer coincides with the zero position on the scale. NOTE: DO NOT REZERO A SUPPRESSED ZERO INSTRUMENT unless it can be checked with a precision calibration standard. Pyrometers should be adjusted to 75°F (25°C on centigrade only scales).

CONTACT CONSIDERATIONS

The locking-coil of a standard meter-relay is designed for use with a locking supply of 75-150 volts DC and with a contact current of 10-25 milliamperes. If you have ordered a special locking current rating (such as 50 milliamperes at 24 volts DC) please check and use your instrument under these ratings. All non-standard locking-coil current ratings are identified on the meter-relay scale.

Although locking circuit voltages below 75 volts are not recommended for API meter-relays, a voltage booster module has been developed that provides satisfactory operation at voltages down to 12 volts. This module which is a plug-in component is strongly recommended for locking circuit voltages between 12 and 75 volts DC. The addition of a capacitor across the meter-relay contact circuit is recommended for locking voltages from 75 to 250 volts when contact trouble develops because of high ambient temperature (100°F or more) or hot and cold cycling. The capacitor produces self-cleaning of the contact. These capacitor values are recommended (higher values should not be used).

75-125 volts DC _____ .01 microfarads
126-175 volts DC _____ .005 microfarads
176-250 volts DC _____ .001 microfarads



Typical
Capacitor
Connection

CONTACT CONSIDERATIONS (CONT'D)

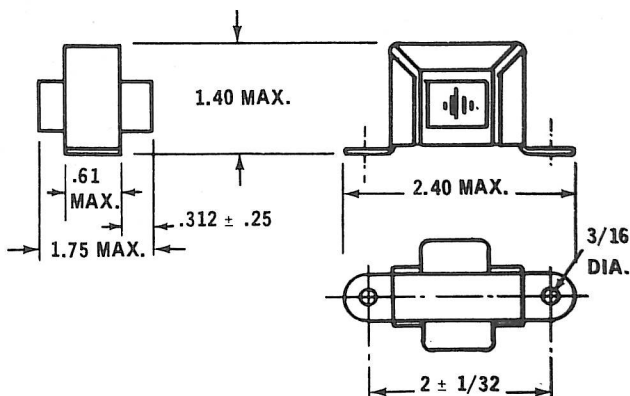
Locking action is a direct result of the flow of DC current of a polarity such as to cause low resistance contact action. If the contacts repel each other, locking voltage polarity should be reversed. If the contacts bounce, check for contact current over-rating or an insufficient filter capacitor on the power supply. AC or poorly filtered DC should never be applied to the contacts.

Standard API meter-relays are supplied with non-isolated coils. Such instruments have a common connection between the indicating and the locking coil(s). Meter-relays with 50 volts DC isolation may be supplied on special order (higher isolation voltages available). Insulating the indicating and locking coil(s) by bringing each out to a separate terminal prevents the locking coil current from upsetting the accuracy of external instruments in the signal circuit and is required in an application where there are other meter-relays operating from a common power supply and a difference in potential exists between signal circuits.

CAUTION: The isolation voltage is the maximum rated potential which may be applied continuously between coils. **DO NOT EXCEED THIS RATING.** Carefully check all circuitry to insure safe operation within the rating and look for sources of transient voltages which may puncture the insulation. (Diode suppression of auxiliary coils is recommended.)

SPECIAL NOTE FOR AC AMMETERS

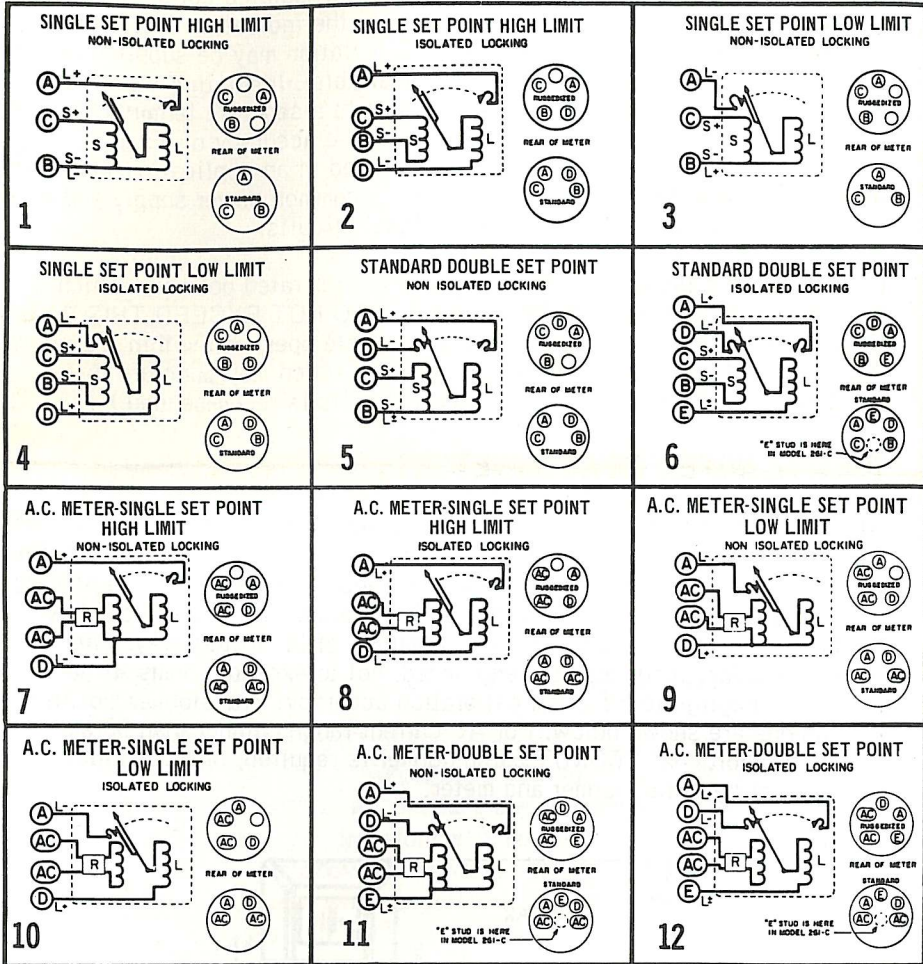
All locking-coil meter-relays calibrated for reading AC current from 100 milliamperes up require a small external current transformer (supplied with each meter-relay as standard). The black transformer leads are the primary winding and are connected in series with the load. The white secondary leads are connected to the AC input terminals of the meter-relay. The white secondary leads may be lengthened, not to exceed 5 ohms, if desired with negligible effect on calibration accuracy. Transformer mounting dimensions are shown below. For AC current ranges higher than 50 amperes, an additional "DONUT" transformer is required, operating into a 5 ampere current transformer and meter.



CONTROL CIRCUITS AND INTERNAL SCHEMATICS

A simple limit control system requires only three basic components: the meter-relay, a slave relay, and a DC power supply. By adding an interrupter to the circuit, it may be changed to an on/off control system. Many other variations are possible. Suggested components and circuits are available from API.

INTERNAL SCHEMATICS

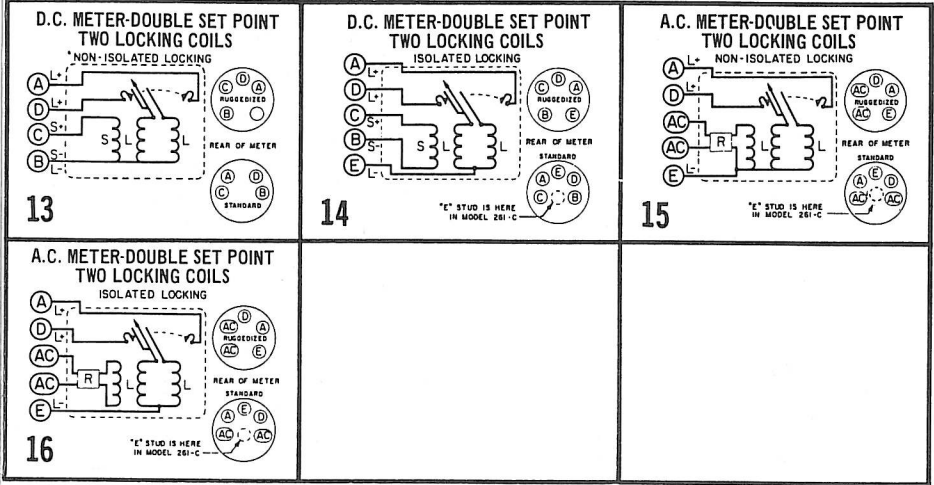


(Continued on Page 6)

L = LOCKING
S = SIGNAL

CONTROL CIRCUITS AND INTERNAL SCHEMATICS (CONT'D)

INTERNAL SCHEMATICS (Cont'd)



L = LOCKING
S = SIGNAL



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