# KLEIN TOOLS MM420 Digital Multi-Meter Instruction Manual



Contents



## KLEIN TOOLS MM420 Digital Multi-Meter


## Product Information

The Klein Tools MM420 is an auto-ranging digital multimeter that uses True RMS measurement technology. It has a measurement range of 600V for voltage, 10A for current, and 50M for resistance. The device also has the capability to measure temperature, capacitance, frequency, duty-cycle, and test diodes and continuity. The MM420 is  designed for use in CAT III 600V environments.

## Product Usage Instructions

1. Before using the MM420, read the user manual and become familiar with the device's functions and capabilities.
2. To measure voltage, connect the test leads to the circuit or device being measured. The MM420 will automatically detect the voltage range and display the reading.
3. To measure current, set the function switch to the desired current range and connect the test leads in series with the circuit or device being measured.
4. To measure resistance, set the function switch to the resistance range and connect the test leads to the component being measured.
5. To measure temperature, insert the temperature probe into the device being measured and select the temperature function on the MM420.
6. To measure capacitance, set the function switch to the capacitance range and connect the test leads to the capacitor being measured.
7. To measure frequency or duty-cycle, set the function switch to the desired range and connect the test leads to the circuit or device being measured.
8. To test diodes and continuity, set the function switch to the diode or continuity range and connect the test leads accordingly.
9. Always use caution when working with electrical circuits and devices. Follow all safety precautions outlined in the user manual.

## GENERAL SPECIFICATIONS

Klein Tools MM420 is an auto-ranging, true root mean squared multimeter that measures AC/DC voltage, AC/DC current, and resistance. It can also measure temperature, capacitance, frequency, duty-cycle, and test diodes and continuity.

- **Environment**: Indoor. DO NOT expose to moisture, rain, or snow.
- **Operating Altitude**: 6562 ft. (2000m)
- **Relative Humidity**: <80% non-condensing
- **Operating Temp**: 32°F to 104°F (0°C to 40°C)
- **Storage Temp**: 14°F to 140°F (-10°C to 60°C)
- **Accuracy**: Values stated at 65°F to 83°F (18°C to 28°C)
- **Temp Coefficient**: 0.1 x (Quoted Accuracy) per °C above 28°C or below 18°C, corrections are required when ambient working temp is outside of Accuracy Temp range
- **Dimensions**: 6.41″ × 3.13″ × 1.83″ (162.7 × 79.4 × 46.6 mm)
- **Weight**: 8.8 oz. (250 g)
- **Calibration**: Accurate for one year
- **Standards**: Conforms to: UL STD 61010-1, 61010-2-030, 61010-2-033.
    - **Certified to**: CSA STD C22.2 # 61010-1, 61010-2-030, 61010-2-033.
    - IEC EN 61010-1, 61010-2-030, 61010-2-033, 61326-1.
- **Pollution degree**: 2
- **Accuracy**: ± (% of reading + # of least significant digits)
- **Drop Protection**: 6.6 ft. (2m)
- **Safety Rating**: CAT III 600V, Class 2, Double insulation
    - **CAT III**: Measurement category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation
- **Electromagnetic Environment**: IEC EN 61326-1. This equipment meets requirements for use in basic and controlled electromagnetic environments like residential properties, business premises, and light-industrial locations.

#### ELECTRICAL SPECIFICATIONS

### VOLTAGE (AUTO-RANGING)

| Function | Range | Resolution | Accuracy |
|---|---|---|---|
| AC Voltage (V AC) | 4.000V | 1mV | ±(1.0% + 3 digits) |
| | 40.00V | 10mV | |
| | 400.0V | 100mV | |
| | 600V | 1V | ±(1.2% + 5 digits) |
| DC Voltage (V DC) | 400.0mV | 0.1mV | ±(0.5% + 5 digits) |
| | 4.000V | 1mV | |
| | 40.00V | 10mV | |
| | 400.0V | 100mV | ±(0.8% + 3 digits) |
| | 600V | 1V | ±(1.0% + 3 digits) |

- **Input Impedance**: 10M
- **Frequency Range**: 50 to 400Hz
- **Maximum Input**: 600V AC RMS or 600V DC

**CURRENT (AUTO-RANGING)**

| | | | |
|---|---|---|---|
| AC Current (µA and mA) | 400.0µA | 0.1µA | ±(1.0% + 5 digits) |
| | 4000µA | 1µA | |
| | 40.00mA | 10µA | |
| | 400.0mA | 100µA | |
| | 4.000A | 1mA | ±(2.0% + 3 digits) |
| | 10.00A | 10mA | ±(2.0% + 5 digits) |
| DC Current (µA and mA) | 400.0µA | 0.1µA | ±(1.0% + 5 digits) |
| | 4000µA | 1µA | |
| | 40.00mA | 10µA | |
| | 400.0mA | 100µA | |
| | 4.000A | 1mA | ±(2.0% + 5 digits) |
| | 10.00A | 10mA | |

- **Overload Protection:** 500mA / 600V and 10A / 600V Fuses
- **Frequency Range**: 50 to 400Hz
- **Maximum Input**: µA/mA setting: 400mA AC RMS / DC 10A setting: 10A AC RMS / DC

**RESISTANCE (AUTO-RANGING)**

| Range | Resolution | Accuracy |
|---|---|---|
| 400.0O | 0.1O | ±(1.2% + 5 digits) |
| 4.000kO | 1O | |
| 40.00kO | 10O | |
| 400.0kO | 100O | |
| 4.000MO | 1kO | |
| 40.00MO | 10kO | ±(2.0% + 10 digits) |
| 50.0MO | 0.1MO | ± ( 2.8% + 10 digits ) |

**Maximum Input**: 600V DC or 600V AC RMS

**CAPACITANCE (AUTO-RANGING)**

| Range | Resolution | Accuracy |
|---|---|---|
| 40.00nF | 10pF | ±(3.5% + 10 digits) |
| 400.0nF | 0.1nF | ±(3.0% + 5 digits) |
| 4.000µF | 1nF | |
| 40.00µF | 10nF | |
| 400.0µF | 0.1µF | ±(3.5% + 5 digits) |

**Maximum Input**: 600V DC or 600V AC RMS

**FREQUENCY (AUTO-RANGING)**

| | | |
|---|---|---|
| 9.999Hz | 0.001Hz | ±(1.0% + 5 digits) |
| 99.99Hz | 0.01Hz | |
| 999.9Hz | 0.1Hz | |
| 9.999kHz | 1Hz | |
| 50.00kHz | 10Hz | |

- **Voltage Range**: >2V to 220V RMS
- **Maximum Input**: 600V DC or 600V AC RMS

**DUTY CYCLE**

| | | |
|---|---|---|
| 1.0% to 99.9% | 0.1% | ±(1.2% + 2 digits) |

- **Pulse Width**: 0.1 to 100ms
- **Frequency Width**: 5Hz to 10kHz
- **Voltage Range**: >2V to 220V RMS
- **Maximum Input**: 600V DC or 600V AC RMS

**TEMPERATURE**

| | | |
|---|---|---|
| -40° to 10°F | 1°F | ±(1.2% + 7°F) |
| 11° to 1832°F | 1°F | ±(1.2% + 6°F) |
| -40° to -12°C | 1°C | ±(1.2% + 4°C) |
| -11° to 1000°C | 1°C | ±(1.2% + 3°C) |

- **Diode Test**: 1.8 mA max, open circuit voltage 3.9V DC
- **Continuity Check**: Audible signal <50
- **Sampling Frequency**: 3 samples per second
- **Overload:** “OL” indicated on display, overload protection 600V RMS in all settings
- **Polarity**: “-” on display indicates negative polarity
- **Display**: 3 ¾ digit, 4000 Count LCD

**WARNINGS**
To ensure safe operation and service of the meter, follow these instructions. Failure to observe these warnings can result in severe injury or death

- Before each use verify meter operation by measuring a known voltage or current.
- Never use the meter on a circuit with voltages that exceed the category based rating of this meter.
- Do not use the meter during electrical storms or in wet weather.
- Do not use the meter or test leads if they appear to be damaged.
- Use only with CAT III or CAT IV rated test leads.
- Ensure meter leads are fully seated, and keep fingers away from the metal probe contacts when making measurements.
- Do not open the meter to replace batteries while the probes are connected.
- Use caution when working with voltages above 25V AC RMS or 60V DC. Such voltages pose a shock hazard.
- To avoid false readings that can lead to electrical shock, replace batteries when a low battery indicator appears.
- Do not attempt to measure resistance or continuity on a live circuit.
- Always adhere to local and national safety codes. Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

## SYMBOLS

**SYMBOLS ON METER**

| | | | |
|---|---|---|---|
| ≂ | AC/DC Voltage or Current | Ω | Resistance (in Ohms) |
| •)) | Audible Continuity | ▶\| | Diode |
| ⊣⊢ | Capacitance | Hz | Frequency |
| % | Duty-cycle | ▣ | Double Insulated Class II |
| °F/°C | Temperature (Fahrenheit / Celsius) | ⏚ | Ground |
| ▭ | Fuse (with rating below symbol) | ☼ | Backlight |
| ⚠ | Warning or Caution | 🛈 | Read Instructions |

*To ensure safe operation and service of this meter, follow all warnings and instructions detailed in this manual.*

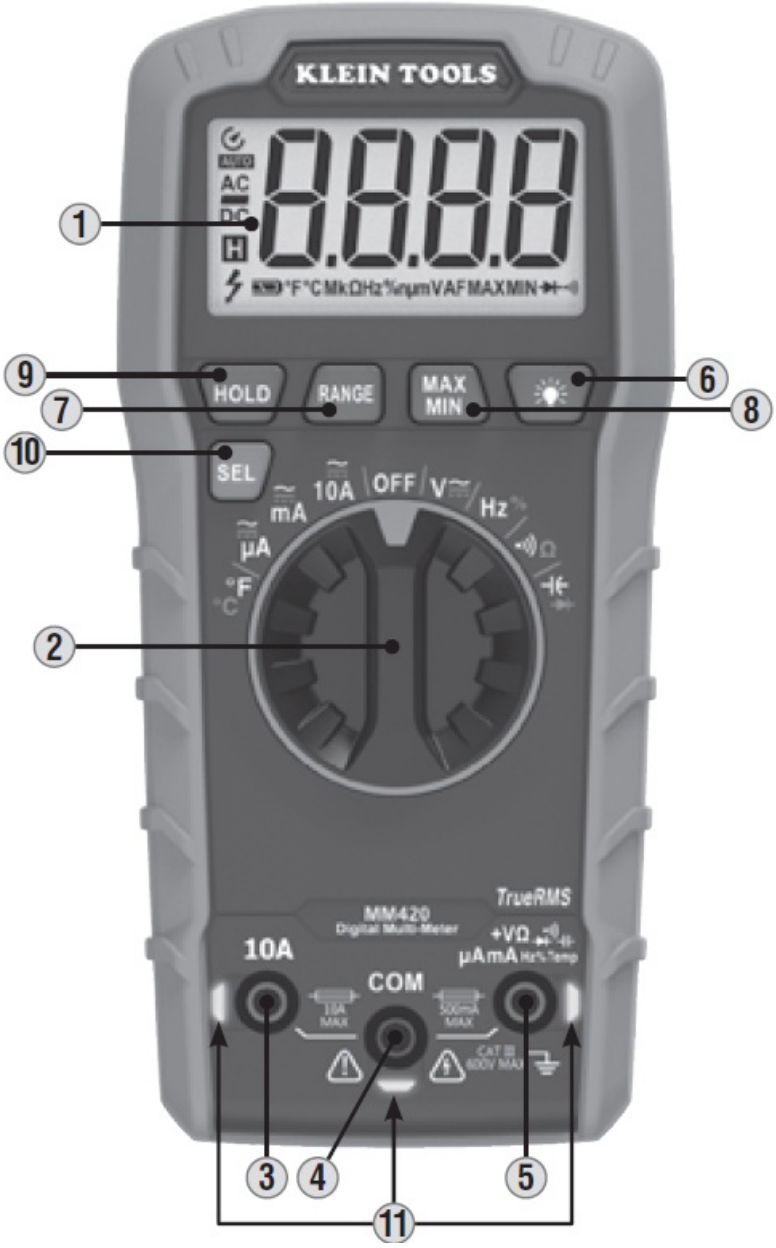
⚠ **Risk of Electrical Shock**

*Improper use of this meter can lead to risk of electrical shock. Follow all warnings and instructions detailed in this manual.*

**SYMBOLS ON LCD**

| | | | |
|---|---|---|---|
| H | Data Hold | •)) | Audible Continuity |
| ▶\| | Diode | AUTO | Auto Ranging |
| AC | Alternating Current | DC | Direct Current |
| ▭ | Low Battery | ↻ | Auto Power Off |
| MAX | Maximum Value | MIN | Minimum Value |
| °F | Degrees Fahrenheit | °C | Degrees Celsius |
| M | Mega (value x $10^{6}$) | k | kilo (value x $10^{3}$) |
| m | mili (value x $10^{-3}$) | µ | micro (value x $10^{-6}$) |
| n | nano (value x $10^{-9}$) | V | Volts |
| A | Amps | F | Farads |
| Ω | Ohms | Hz | Hertz (Frequency) |
| % | Duty-Cycle | ϟ | Hazardous Voltage |

**FEATURE DETAILS**




**NOTE**: There are no user-serviceable parts inside meter.

1. 4000 count LCD display
2. Function selector switch
3. “10A” jack
4. “COM” jack
5. “VΩ” jack
6. Backlight button
7. “RANGE” button
8. “MAX/MIN” button
9. “HOLD” (Data Hold) button
10. “SEL” (Select) button
11. Lead Alert LEDs

## FUNCTION BUTTONS

### ON/OFF

To Power ON the meter rotate the Function Selector switch 2 from the OFF setting to any measurement setting. To Power OFF the meter rotate the Function Selector switch 2 to the OFF setting. By default, the meter will automatically Power OFF after 15 minutes of inactivity. Reactivate meter by pressing any button. To deactivate the automatic Power OFF feature, power the meter ON with the SEL button 10 depressed. When automatic Power OFF is deactivated, the  symbol will not be visible in the display.

**“SEL” (SELECT) BUTTON (FOR SECONDARY FUNCTIONS)**
The “SEL” button 10 activates the secondary function for each application accessible by the function selector switch 2 . For current and voltage, it toggles between AC and DC. For the other functions, it switches between °F and °C, between Hz and % Duty-cycle, between Continuity and Resistance, and between Capacitance and Diode-test. The default function for each application is printed on the meter in white; the secondary function for each location is printed on the meter in orange.

**“HOLD” (DATA HOLD) BUTTON**
Press the “HOLD” button 9 to hold the measurement on the display. Press again to release the display and return to live measuring.

**“RANGE” BUTTON**
The meter defaults to auto-ranging measurement mode . This automatically determines the most appropriate measurement range for the testing that is being conducted. To manually force the meter to measure in a different range, use the “RANGE” button 7 .

1. Press the “RANGE” button 7 to manually select measurement range ( is deactivated on the LCD). Repeatedly press the “RANGE” button 7 to cycle through the available ranges, stopping once the desired range is reached.
2. To return to auto-ranging mode, press and hold the “RANGE” button 7 for more than one second ( is reactivated).

**“MAX/MIN” BUTTON**
When the “MAX/MIN” button 8 is pressed, the meter keeps track of the minimum and maximum value of the measurement as the meter continues to take samples. The first press of the “MAX/MIN” button 8 displays the Max value, the second press displays the Min value. To return to normal measuring mode, press and hold the “MAX/MIN” button 8 for more than one second.

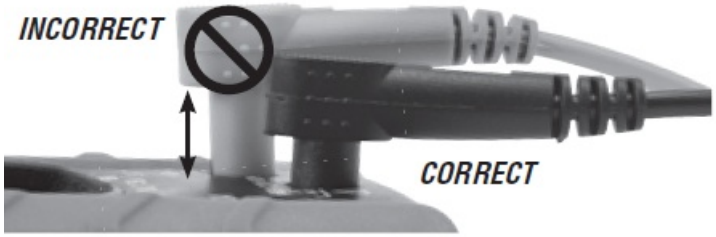
**BACKLIGHT BUTTON**
Press the Backlight button 6 to turn the backlight on or off. Backlight automatically turns off after approximately 3 minutes.

**LEAD ALERT LEDs**
When the Function Selector switch 2 is rotated to a measurement setting, the Lead Alert LEDs 11 will illuminate to ensure that the test leads are inserted into the appropriate jacks. The lights will automatically turn off after 2 minutes. To disable the Lead Alert LEDs 11 , hold the Backlight button 6 and turn the Function Selector switch 2 to any setting other than OFF.

**NOTE**: Lead Alert function will reactivate by default when the meter powers OFF or when the Function Selector switch 2 is rotated.

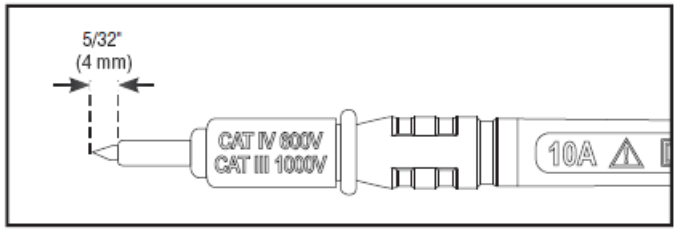
## OPERATING INSTRUCTIONS

**CONNECTING TEST LEADS**
Do not test if leads are improperly seated. Results could cause intermittent display readings. To ensure proper connection, firmly press leads into the input jack completely.



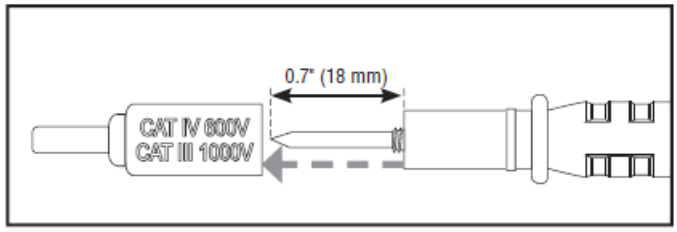

**TESTING IN CAT III / CAT IV MEASUREMENT LOCATIONS**

Ensure the test lead shield is pressed firmly in place. Failure to use the CAT III / CAT IV shield increases arc-flash risk.




**TESTING IN CAT II MEASUREMENT LOCATIONS**

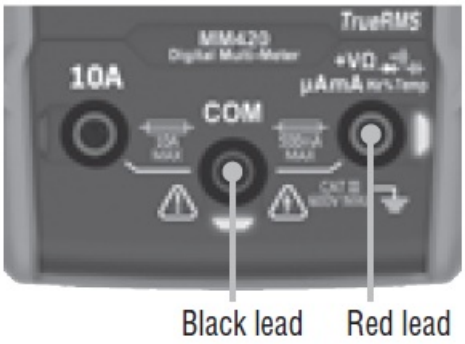
CAT III / CAT IV shields may be removed for CAT II locations. This will allow testing on recessed conductors such as standard wall outlets. Take care not to lose the shields.




**AC/DC VOLTAGE (LESS THAN 600V)**

1. Insert RED test lead into V jack 5 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the V ⎓ setting.

   **NOTE**: The meter defaults to AC measurement. Press the “SEL” button 10 to toggle between AC and DC modes. The AC or DC icon on the LCD indicates which mode is selected.





2. Apply test leads to the circuit to be tested to measure voltage. The meter will auto-range to display the measurement in the most appropriate range.

**NOTE**: The hazardous voltage indicator will appear for voltages >30V.

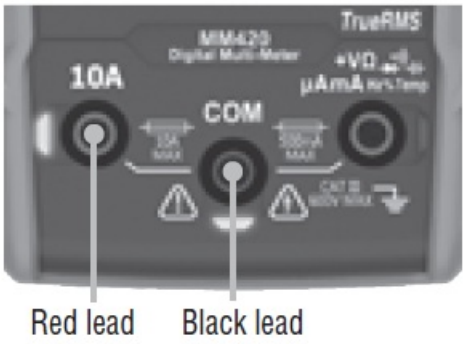
**NOTE**: If "–" appears on the LCD, the test leads are being applied to the circuit in reverse polarity. Swap the position of the leads to correct this.

**NOTE**: When in a voltage setting and the test leads are open, readings of order mV may appear on the display. This is noise and is normal. By touching the test leads together to close the circuit the meter will measure zero volts.

#### AC/DC CURRENT

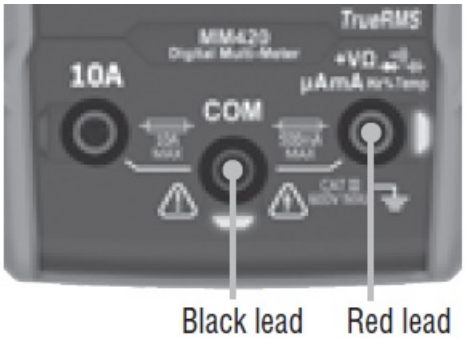
**NOTE**: The meter defaults to AC measurement. Press the "SEL" button 10 to toggle between AC and DC modes. The AC or DC icon on the LCD indicates which mode is selected

1. Attach test leads to the appropriate jacks and rotate function selector switch 2 to the appropriate setting as follows:
    1. **For AC/DC currents >400mA and <10A**: Insert RED test lead into 10A jack 3 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the 10A AC/DC setting



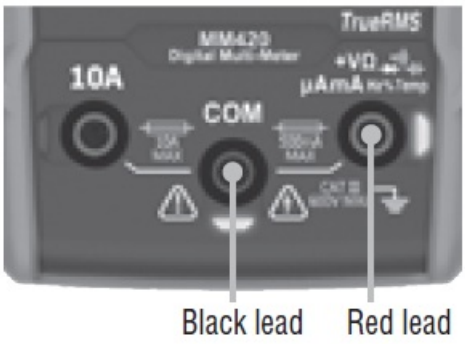


    2. **For mA AC/DC currents <400mA:** Insert RED test lead into V jack 5 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the mA AC/DC setting.





    3. **For µA DC currents <400µA:** Insert RED test lead into V jack 5 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the µA AC/DC setting



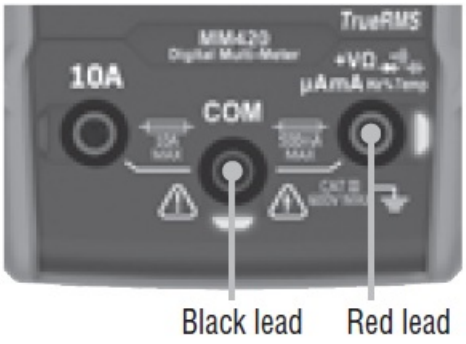


- To measure current: Remove power from circuit, open circuit at measurement point, connect meter in-series in the circuit using the test leads, and apply power to circuit.
- Measure the current. The meter will auto-range to display the measurement in the most appropriate range.

Do not attempt to measure more than 10A. When measuring currents greater than 6A, a measurement time of 30 seconds followed by 10 minutes of recovery time is recommended

**RESISTANCE MEASUREMENTS**

1. Insert RED test lead into V jack 5 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the Continuity/Resistance setting.
   **NOTE**: The meter defaults to Continuity testing in this mode. To enter Resistance testing mode, press the “SEL” button 10 once.
2. Remove power from circuit.
3. Measure resistance by connecting test leads to circuit. The meter will auto-range to display the measurement in the most appropriate range.



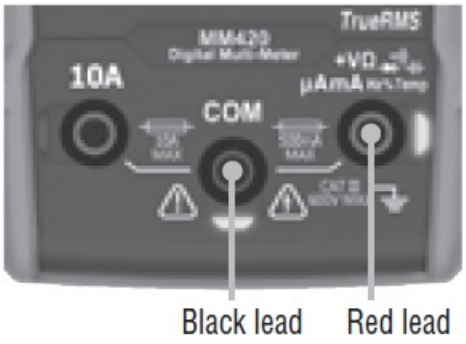


**NOTE**: When in a Resistance setting and the test leads are open (not connected across a resistor), or when a failed resistor is under test, the display will indicate O.L. This is normal DO NOT attempt to measure resistance on a live circuit.

1. Insert RED test lead into V jack 5 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the Continuity/Resistance setting.

**NOTE**: The meter defaults to Continuity testing in this mode. Ensure that the Continuity Testing icon is visible on the display. If not, press the “SEL” button 10 once.

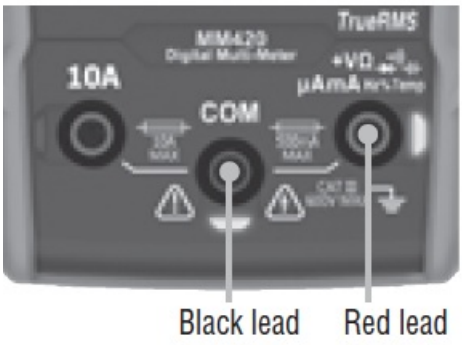
2. Remove power from circuit.
3. Test for continuity by connecting conductor or circuit with test leads. If resistance is measured less than 50, an audible signal will sound and display will show a resistance value indicating continuity. If circuit is open, display will show “OL”.





**CAPACITANCE**

1. Insert RED test lead into V jack 5 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the Capacitance/Diode setting.
   **NOTE**: The meter defaults to Capacitance testing in this mode. Ensure that the display reads “0 nF” with test leads open. If not, press the “SEL” button 10 once.
2. Remove power from circuit.
3. Measure capacitance by connecting test leads across the capacitor. The meter will auto-range to display the measurement in the most appropriate range.

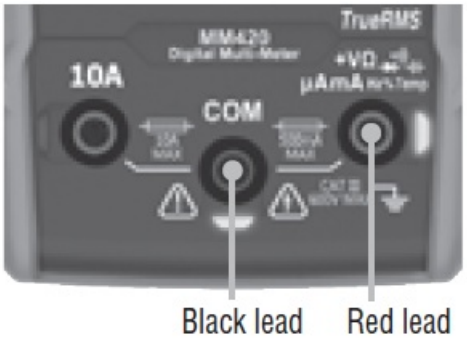




**DIODE TEST**

1. Insert RED test lead into V jack 5 , and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the Capacitance/Diode setting.
   **NOTE**: The meter defaults to Capacitance testing in this mode. To enter Diode testing mode, press the “SEL” button 10 once. The Diode icon will appear on the display.

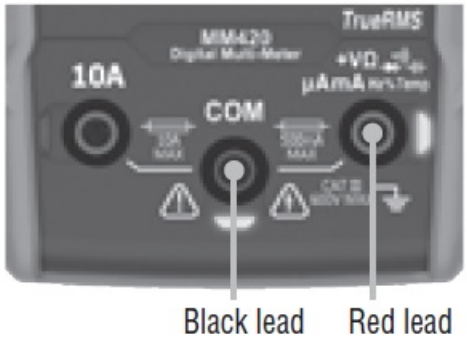
2. Touch test leads to diode. A reading of 200-700mV on display indicates forward bias, “OL” indicates reverse bias. An open device will show “OL” in both polarities. A shorted device will show approximately 0mV.





**FREQUENCY / DUTY-CYCLE**

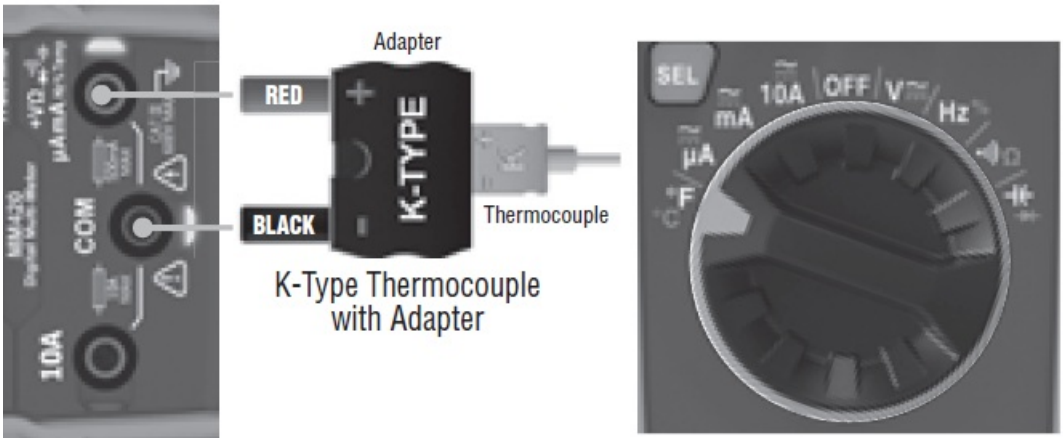
1. Insert RED test lead into V jack 5 and BLACK test lead into COM jack 4 , and rotate function selector switch 2 to the Frequency/Duty-Cycle setting.
   **NOTE**: The meter defaults to Frequency testing in this mode. To enter Duty-Cycle testing mode, press the “SEL” button 10 once. Ensure that the appropriate icon (either Hz or %) appears on the display.
2. Measure by connecting test leads across the circuit





**TEMPERATURE**

1. Insert K-type thermocouple into the V 5 and COM 4 jacks (observe polarity markings on thermocouple and meter) and rotate function selector switch 2 to the Temperature setting.
   **NOTE**: The meter defaults to Fahrenheit scale in this mode. To enter Celsius scale, press the “SEL” button 10 once. Ensure that the appropriate icon (either °F or °C) appears on the display.
2. To measure temperature, make contact between the thermocouple tip and the object being measured. When thermocouple tip and object are in thermal equilibrium, the measurement on the display will stabilize. The meter will auto-range to display the measurement in the most appropriate range




Remove thermocouple before switching meter to other measurement functions. The thermocouple included with the original purchase is suitable for temperatures below 356°F / 180°C only. To measure higher temperatures, a K-type thermocouple with the appropriate measurement range should be used.

## MAINTENANCE

### BATTERY REPLACEMENT

When the indicator is displayed, the batteries must be replaced.

1. Remove screw from battery door.
2. Replace 2 × AAA batteries (note proper polarity).
3. Replace battery door and fasten securely with screw.

To avoid risk of electric shock, disconnect leads from any voltage source before removing battery door. To avoid risk of electric shock, do not operate meter while battery door is removed.

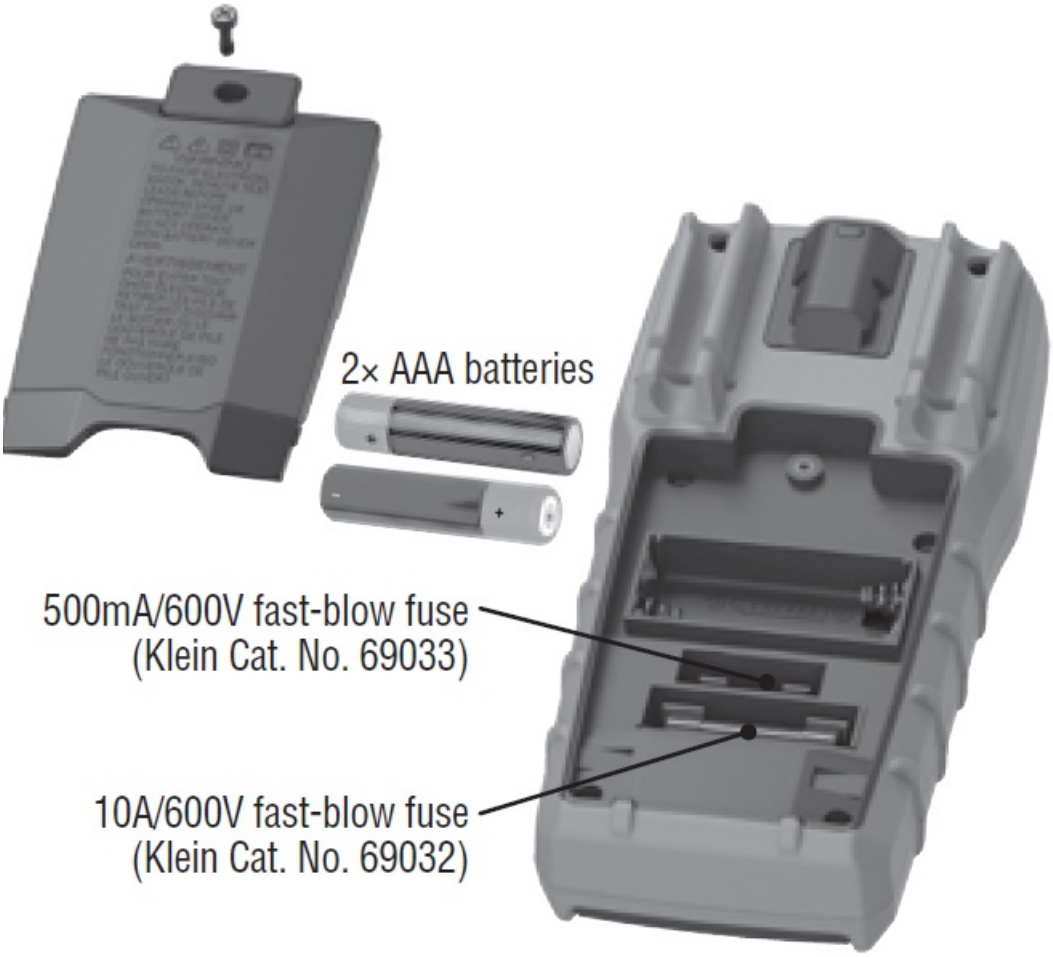
### FUSE REPLACEMENT

A fuse may blow if more than 500mA is applied to the V jack 5 , or more than 10A is applied to the 10A jack 3 .

**To access fuses:**

1. Remove screw from battery door.
2. **Replace blown fuse(s) with**: V (A/mA) jack 5 : 500mA/600V fast-blow (Klein Cat. No. 69033) 10A jack 3 : 10A/600V fast-blow (Klein Cat. No. 69032)
3. Replace battery door and fasten securely with screw.

To avoid risk of electric shock, disconnect leads from any voltage source before accessing fuses. To avoid risk of electric shock, do not operate meter while back housing is removed.




**CLEANING**
Be sure meter is turned off and wipe with a clean, dry lint-free cloth. Do not use abrasive cleaners or solvents.

## STORAGE

Remove the batteries when meter is not in use for a prolonged period of time. Do not expose to high temperatures or humidity. After a period of storage in extreme conditions exceeding the limits mentioned in the General Specifications section, allow the meter to return to normal operating conditions before using.

## FCC & IC COMPLIANCE

See this product's page at www.kleintools.com for FCC compliance information. Canada ICES-003 (B) / NMB-003 (B)

## WARRANTY

**www.kleintools.com/warranty**

**DISPOSAL / RECYCLE**
Do not place equipment and its accessories in the trash. Items must be properly disposed of in accordance with local regulations. Please see **www.epa.gov/recycle** for additional information.

**CUSTOMER SERVICE**
KLEIN TOOLS, INC. 450 Bond Street Lincolnshire, IL 60069

- 1-800-553-4676
- customerservice@kleintools.com
- www.kleintools.com

## Documents / Resources

| | |
|---|---|
|  | KLEIN TOOLS MM420 Digital Multi-Meter [pdf] Instruction Manual<br>MM420 Digital Multi-Meter, MM420, Digital Multi-Meter, Multi-Meter, Meter |

## References

- Reduce, Reuse, Recycle | US EPA
- Klein Tools - For Professionals since 1857 | Klein Tools
- Warranty | Klein Tools