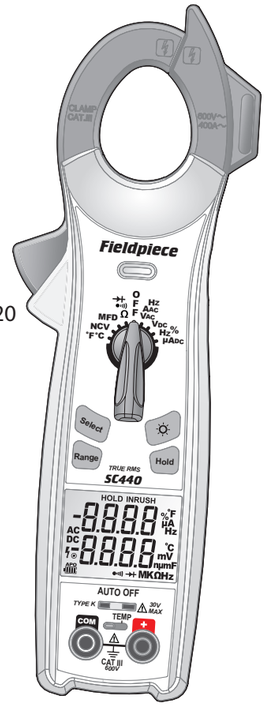
Fieldpiece

Essential Clamp Meters

OPERATOR'S MANUAL

Models SC440 SC420



Quick Start

1. For electrical testing, connect test leads to "COM" and "+" jacks.
2. Rotate the dial to your desired measurement.
3. Connect to test points and read measurement.
4. For temperature testing, remove test leads, slide TEMP switch to the right and connect Type K thermocouple.

Certifications

c UL us LISTED — UL 61010-1, Third Edition

CE — EN61010-1
EN61010-2-032
EN61010-2-033
EMC EN61326-1

N22675 — C-Tick (N22675)

WEEE

CATIII 600V, class II and pollution degree 2 indoor use comply with CE, RoHS compliant.

CATIII is for measurements performed in the building installation.

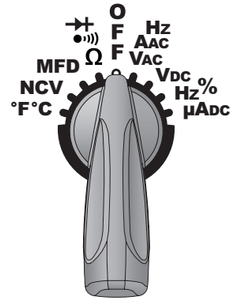
Description

The new SC400 series clamp meters are designed for HVACR service. Hang clamp meter to any metallic surface with the redesigned heavy-duty magnet and keep your hands free to do more (SC440 only). See both voltage and amperage readings at the same time on the dual LCD display, even in low light conditions using the bright blue backlight (backlight SC440 only). Take measurements with one hand using the single test lead holder for added safety. Test leads come with removable gold plated tips to connect with Fieldpiece accessory heads.

Take more accurate VAC and AAC readings on VFDs with True RMS sensing technology (SC440 only). Measure the starting amp draw of a compressor with Inrush current feature (SC440 only). Find the wire you want to test with the automatic clamp jaw light (SC440 only).

The SC400 series clamp meters are built to withstand the rigors of HVACR with high impact plastic and a display you can read in hot or cold environments. Move from a cold freezer to a hot roof top and get accurate temperature measurements that lesser thermometers can not measure properly.

Controls



Rotate dial to the function you want to use.

Select — Cycle through parameters within VAC/AAC/Hz and Ω/•))/⊣ switch positions.

Illuminate backlight (SC440).

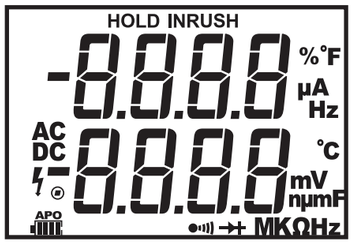
INRUSH — Activate inrush current and scroll through different inrush ranges (SC440).

Range — Manually select a range.

Hold — Freeze the display.

Display

	Battery Life (replace 9V if blinking)
APO	Auto Power Off Enabled
ϟ	High Voltage Warning (>30VAC/VDC)
ⓡ	Manual Range (RNG) Mode
HOLD	Data Hold Mode
INRUSH	Inrush Amps Mode (Model SC440)
•))	Continuity Test
⊣	Diode Test
Hz	Frequency Test (hertz)
Ω	Resistance Test (ohms)
F	Capacitance Test (farads)
%	Duty Cycle Test (percentage)
µ	Micro Unit (10^{-6}, one millionth)
m	Milli Unit (10^{-3}, one thousandth)
K	Kilo Unit (10^{3}, one thousand)
M	Mega Unit (10^{6}, one million)



Safety Information

Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential, while taking measurements. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.

Disconnect the test leads before opening the case. Inspect the test leads for damage to the insulation or exposed wire. Replace if suspect. Keep your fingers behind the finger guards on the probes while taking measurements.

When disconnecting from a circuit, disconnect the "RED" lead first, then the common "BLACK" lead. Use one handed testing when possible. Work with others.

Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit.

Do not measure resistance (ohms) when circuit is powered. Isolate load by disconnecting from circuit.

Disconnect the meter from circuit before turning any inductor off, including motors, transformers, and solenoids. High voltage transients can damage the meter beyond repair.

Do not use during electrical storms.

Do not apply more than rated voltages between input and ground.

Isolate capacitors from system and discharge them safely before testing.

Temperature switch prevents leaving thermocouple plugged in while measuring voltage.

When measuring high frequency AC current, do not exceed the rated 400AAC of the clamp. Failure to adhere may cause the clamp to heat up dangerously.

All voltage tests: All voltage ranges will withstand up to 600V. Do not apply more than 600VDC or AC rms.

Symbols used:

- Caution, risk of electric shock
- ⚠ Caution, refer to manual.
- ⏚ Ground
- ⧈ Double insulation

⚠ WARNINGS

DISCONNECT AND UNPLUG TEST LEADS before opening case.
TEST NCV FUNCTION ON KNOWN LIVE WIRE before using.
DO NOT APPLY VOLTAGE greater than 30VAC or 60VDC to the thermocouple or the jacks when the rotary dial is on °F°C. (Use only Type K thermocouples)
DO NOT APPLY VOLTAGE TO THE JACKS when the rotary dial is on microamps. Even low voltages can cause a current overload and potentially harm the meter.

Specifications

Display: 5000 count dual display
Backlight: 60 second duration with auto-off. Blue color. SC440 only.
Overrange: (OL) or (-OL) is displayed
Measurement rate: 3.3 times per second, nominal
Zero: Automatic
Operating environment: 32°F to 122°F (0°C to 50°C) at <70% relative humidity
Storage temperature: -4°F to 140°F (-20°C to 60°C), 0 to 80% RH (with battery removed)
Accuracy: Stated accuracy @ 73°F±9°F (23°C±5°C), <75%RH
Temperature coefficient: 0.1 x (specified accuracy) per °C [0°C to 19°C (32°F to 66°F), 28°C to 50° C(82°F to 122°F)]
APO (Auto Power Off): Approx. 30 minutes
Power: Single standard 9-volt battery, NEDA 1604, JIS 006P, IEC 6F22
Battery life: 200 hours typical alkaline (SC420); 100 hours typical alkaline (SC440)
Low battery indication: Battery icon blinks and "LO.bt" is displayed when the battery voltage drops below the operating level
Dimensions: 233mm(H) x 79mm(W) x 45mm(D)
Weight: Approx. 315g including battery
Altitude: Up to 6562 ft (2000m)
Overload protection: 600 VDC or 600VAC rms unless otherwise stated
Test leads: Use UL listed test leads that comply to UL61010-031 rated CATIII 600V or above. Included test leads are gold-plated and have removeable safety caps.

Please operate the instrument following all instructions of the operator's manual to avoid impairing the safety of the product.

Functions

Temperature (°F/°C)

Plug any Type K thermocouple directly into the meter to measure temperature. Cold junction is located inside the meter and allows for extremely accurate measurements even in rapidly changing ambient temperatures (going from rooftop to freezer). No adapter is required.

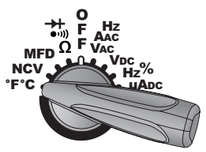
Range: -30°F to 932°F, (-35°C to 500°C) **Resolution:** 0.1°
Accuracy: ±(1°F)* 32°F to 120°F, ±(1°C) 0°C to 49°C
±(1%+2°F) 32°F to 572°F, ±(1%+1°C) 0°C to 300°C
±(2%+6°F) -30°F to 32°F, ±(2%+3°C) -35°C to 0°C
±(2%+6°F) 572°F to 932°F, ±(2%+3°C) 300°C to 500°C
Sensor type: Type K thermocouple *After field calibration
Overload protection: 30 VDC or 30VAC rms

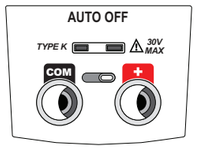
Non Contact Voltage (NCV)

Use NCV to check 24VAC from a thermostat or live voltage up to 600VAC. Always test a known live source before using. A segment graph and RED LED will display the presence of voltage. Audible beep increases from intermittent to continuous as intensity of field (EF) increases.
AC Voltage Detection Range: 24VAC to 600VAC (50-60Hz)

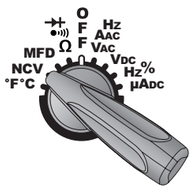
Voltage AC (VAC) (50Hz-500Hz)

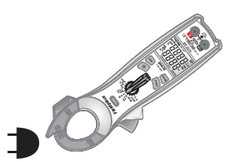
Test power lines (120, 220, 480), test 24V going to controls, and test for transformer failure.
Ranges: 500mV, 5V, 50V, 500V, 600V **Resolution:** 0.1mV
Accuracy: ±(1.2% + 8) 500mV range (50-60Hz)
±(1.2%+8), 5V, 50V, 500V; ±(1.5% + 8) 600V range
True RMS: model SC440 only **Crest factor:** ≤ 3
Audio/Visual Hi-V indicator: >30VAC/VDC
Input impedance: >100MΩ (500mV), 10MΩ (5V), 9.1MΩ (50V-600V)

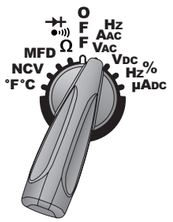


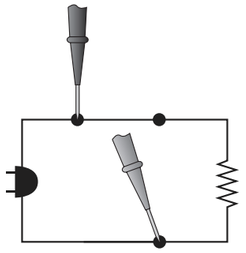


Unplug Leads and Slide TEMP Switch to the Right





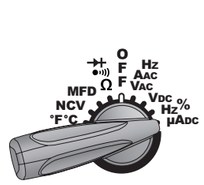


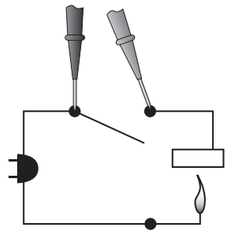


MicroAmps DC (µADC)

Microamps for flame rectifier diode test on a heater control. Connect leads between flame sensor probe and control module and turn heating unit on to read µA measurement. When the flame is on, there should be a measurable µADC signal, typically under 10µADC. Compare measurement to manufacturer's specification to determine if replacement is necessary.

Ranges: 500µA **Resolution:** 0.1µA
Accuracy: ±(1.0% + 2) **Voltage burden:** 1V
Overload Protection: 600VDC or 600VAC rms





Frequency (Hz) Through Leads

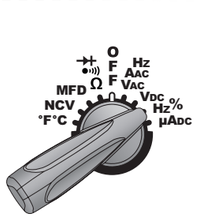
Check incoming voltages to ensure they are cycling at 60Hz. For frequency measurements on VFD equipment, use the amp clamp.

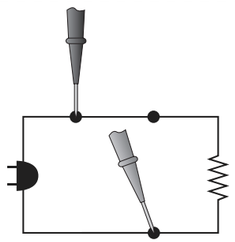
Ranges: 500Hz, 5kHz, 50kHz, 500kHz, 1MHz **Resolution:** 0.1Hz
Accuracy: ±(0.1% + 5) **Sensitivity:** 10Hz to 1MHz: >3.5Vrms
PW: >1µs **Duty Cycle Limits:** >30% and <70%

Duty Cycle (%)

Duty cycle shows the % On Time of a 5V logic signal square wave.

Ranges: 5%-95% (40Hz to 10kHz), 10%-90% (10kHz to 20kHz)
Accuracy (5V logic): ±(2% + 10) **Resolution:** 0.1% **PW:** >10µs
Overload Protection: 600VDC or 600VAC rms

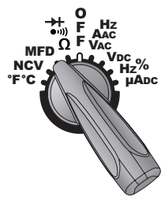


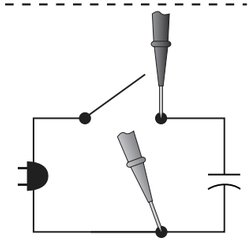


Capacitance (MFD)

Set to MFD to test motor start and run capacitors. Capacitors are one of the most failure prone components in a HVACR system. Disconnect from power and resistors between terminals. Discharge capacitor before testing. If dIS.C is displayed, capacitor is not discharged completely.

Ranges: 5µF, 50µF, 500µF, 5mF **Resolution:** 1nF
Accuracy: ±(3% + 15) 5µF, ±(3% + 5) 50µF to 500µF, ±(5% + 20) 5mF
Overload Protection: 600VDC or 600VAC rms



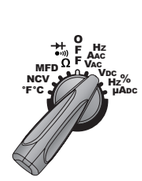


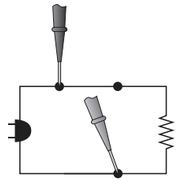
Discharge Cap First!

Voltage DC (VDC)

Select VDC and measure DC voltages on circuit boards on more advanced HVACR systems.

Ranges: 500mV, 5V, 50V, 500V, 600V **Resolution:** 0.1mV
Accuracy: ±(0.5% + 2)
Input impedance: >100MΩ (500mV), 10MΩ (5V), 9.1MΩ (50V-600V)

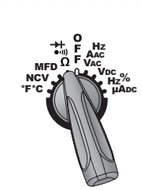


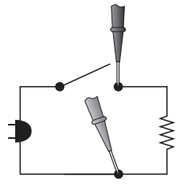


Resistance (Ω)

Used for "ohming out" a compressor. 0.1Ω resolution is necessary to test the resistance between the motor poles because the values are typically very low.

Ranges: 500Ω, 5kΩ, 50kΩ, 500kΩ, 5MΩ, 50MΩ
Resolution: 0.1Ω **Overload Protection:** 600VDC or 600VAC rms
Accuracy: ±(1.0% + 5) 500Ω to 500kΩ, ±(1.5% + 5) 5MΩ, ±(3.0% + 5) 50MΩ

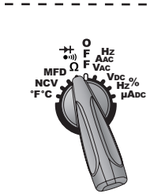


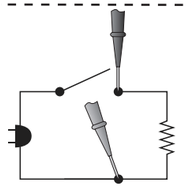


Continuity (•))

Use the continuity feature to test if a circuit is open or closed. Use this feature to check fuses as well. A steady "beep" and green LED indicate you have continuity. Press SELECT once.

Range: 500Ω **Resolution:** 0.1Ω **Response time:** 100ms
Audible beep: <30Ω **Overload Protection:** 600VDC or 600VAC rms

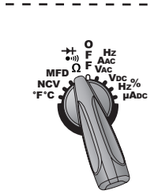


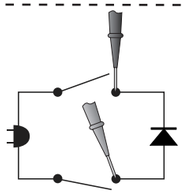


Diode Test (→)

Test diodes for proper forward and reversed-biased functions.

Test current: 0.8mA (Approx.) **Accuracy:** ±(1.5% + 5)
Open circuit volts: 3.2VDC typical **Audible beep**: <0.03V
Visual Indicator: Green LED
Overload Protection: 600VDC or 600VAC rms





Amps AC (AAC) True RMS

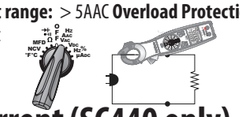
Test any isolated power line. Press SELECT on VAC/AAC/Hz position. Read AAC in upper display. True RMS on SC440 only.

Ranges: 50A, 400A **Resolution:** 0.01A **Crest factor:** ≤ 3
Accuracy: ±(2.0% + 10) 50-60Hz **Jaw Opening:** 1.2in (30 mm)

Frequency (Hz) Through Clamp

Measure Hz on variable frequency drive motors. Turn dial to VAC/AAC/Hz and press SELECT twice. Hz will show in upper display.

Range: 10Hz to 400Hz **Accuracy:** ±(0.1% + 5)
Minimum current range: > 5AAC **Overload Protection:** 400AAC
Resolution: 0.1Hz



Inrush Current (SC440 only)

Inrush feature captures starting current of a compressor motor. Starting current can assist in diagnosing a motor before it fails.

To activate Inrush feature

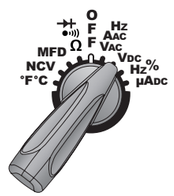
1. Turn selector switch to VAC/AAC/Hz
2. Press SELECT once to show AAC on upper display.
3. Press INRUSH once to select 50AAC range. Press INRUSH twice to select 400AAC range.
4. Clamp meter around compressor start wire. Turn motor on. The starting current will hold on the upper display.
5. Hold INRUSH for 2 seconds to exit Inrush feature or press and release INRUSH to measure starting current again.

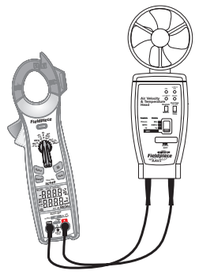
Inrush measurement period: 100-milliseconds
Minimum input: >2A on 50A range; >20A on 400A range
⚠ Note: AAC through the clamp and voltage through the test leads can be measured simultaneously. However, if only AAC, Frequency (Hz), or Inrush is measured through the clamp, test leads and thermcouple must be unplugged from the meter.

Modular Expandability

Your new Swivel Clamp Meter is compatible with all Fieldpiece Accessory Heads. With Fieldpiece Accessory Heads, you can measure any available parameter, and read the measurement on your new meter's display in real-time.

Just set the range to VDC and press the RANGE button until mV is displayed. Remove the probe tips of your test leads, and connect your accessory head (model AAV3 shown).





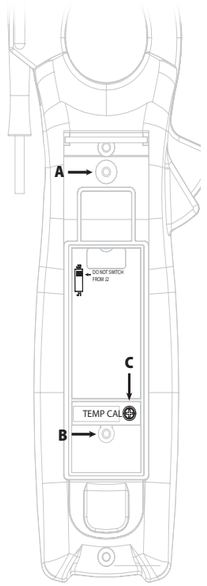
Visit www.fieldpiece.com to see all of the different accessory heads that Fieldpiece offers.

Temp. Calibration

For accuracies of ±1°F, calibrate to a known temperature. A glass of stabilized ice water is very close to 32°F (0°C) and is usually very convenient but any known temperature can be used.

1. Select the °F °C range.
2. Plug thermocouple to be calibrated into the Type K jack.
3. Unscrew A and B and remove the battery cover.
4. Stabilize a large cup of ice water. Stir the ice with the water until temperature stays at a stable value.
5. Immerse the thermocouple probe and let it stabilize. Keep stirring water to prevent micro-environments.
6. Do not let the thermocouple come in direct contact with ice.
7. Use a small screwdriver to adjust calibration pot C below the battery as close to 32°F (0°C) as you would like.

Note: J1-J2 switch is for auto-calibration purposes only. Do not switch from J2.



Auto Power Off

Auto power off or APO will automatcially turn off your meter after 30 minutes of inactivty. By default it is activated and APO will show on the display. To disable, turn meter off. Hold Range and power on the meter by turning the selector dial to any range. Release Range after the beep. APO will no longer display over the battery icon.

Auto Hold

Press and hold Hold for two seconds. Meter will beep and HOLD will blink on LCD. After 6 seconds the measurement on screen will freeze automatically. Press Hold to exit this mode.

Battery Replacement

When your meter's battery is low, the battery icon will appear empty and blink for 30 seconds. "LO.bt" will display and meter will power off.

Turn dial to OFF position, disconnect test leads and remove the battery cover with magnet strap (SC440 only) on the back of your meter. Remove old battery and replace with a standard 9V battery only. Be sure to re-insert the magnet strip before re-installing the battery cover.

Maintenance

Clean the exterior with a dry cloth. Do not use liquid.

Limited Warranty

This meter is warranted against defects in material or workmanship for one year from date of purchase. Fieldpiece will replace or repair the defective unit, at its option, subject to verification of the defect.

This warranty does not apply to defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use of the instrument.

Any implied warranties arising from the sale of a Fieldpiece product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. Fieldpiece shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim of such damage, expenses, or economic loss.

State laws vary. The above limitations or exclusions may not apply to you.

Obtaining Service

Call Fieldpiece Instruments for one-price-fix-all out-of-warranty service pricing. Send check or money order for the amount quoted. Send the meter freight prepaid to Fieldpiece Instruments. Send proof of date and location of purchase for in-warranty service. The meter will be repaired or replaced, at the option of Fieldpiece, and returned via least cost transportation.

For international customers, warranty for products purchased outside of the U.S. should be handled through local distributors.

Fieldpiece
Designed in USA
MADE IN TAIWAN

www.fieldpiece.com

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