

Model 921A Combustible Gas Meter



The Arbiter Systems[®], Inc. Model 921A Combustible Gas Meter is a rugged, portable instrument that measures total combustible gases (TCG) in oil-filled transformer nitrogen gas blankets. TCG measurements have been shown to be good indicators of transformer health. See, for example, IEEE C57.104, "Guide for the Detection and Determination of Generated Gases in Oil-Immersed Transformers and their Relation to the Serviceability of Equipment," IEEE Insulating Fluids Subcommittee, Transformers Committee, Power Engineering Society, 1988.

Method

The Model 921A Combustible Gas Meter passes a sample of the unknown gas over a heated catalytic sensor along with instrument air to provide oxygen. The heat of oxidation of any combustible gases present is measured, and the meter automatically converts and displays the result directly in percent TCG.

Operation

Operation of the 921A is simple. Prior to making a series of measurements, a field calibration is performed using the supplied cylinders of Zero Nitrogen and 1% Methane calibration gases. This compensates for normal sensitivity variations due to sensor aging, gas impurities, environmental conditions, or other causes.

After initial field calibration is completed, TCG measurements are virtually automatic. The instrument air cylinder is left connected to the Model 921A and the TCG input port is connected to the gas sampling port of the transformer using the supplied sampling hose and oil filter assembly. The measurement cycle begins when the **TCG** key is pressed.

The Model 921A automatically performs the following measurement cycle. First, the sensor power is turned on and the sensor is allowed to stabilize. Then 100% air is passed over the sensor to cancel drifts. Then 50% blanket gas is added to measure TCG. These steps are repeated, finishing with a final 100% air measurement to complete the drift cancellation. The sensor power is then turned off, and the measured TCG result is displayed. The entire process takes less than 45 seconds.

Other Features

The Model 921A also has a built-in gas pressure sensor. By connecting the gas sampling hose to the PSI port and pressing **PSI**, the blanket fill gas pressure can be accurately measured.

The Model 921A is provided with a hard-sided transit case, along with instrument air, nitrogen, and 1% calibration gas cylinders and all necessary regulators and accessories.

Model 921A Specifications

Input

TCG

| | |
|----------------|----------------------|
| Inlet Pressure | 1 to 5 PSIG, nominal |
| Damage Limit | Vacuum to 30 PSIG |
| Gas Inlet | Female Luer Fitting |

Pressure

| | |
|--------------|---------------------|
| Damage Limit | Vacuum to 30 PSIG |
| Gas Inlet | Female Luer Fitting |

Air

| | |
|----------------|--|
| Purity | Zero-Grade Instrument Air, 21.00% Oxygen |
| Inlet Pressure | 20 to 25 PSIG or use supplied regulator |
| Air Inlet | Female Luer Fitting |

Measurements

TCG

| | |
|-------------|----------------------------|
| Range | 0 to 10.0% |
| Accuracy | ±(5% of reading + 1 count) |
| Resolution | 0.01% TCG |
| Calibration | 1% Methane = 1% TCG |

Sensitivity to Various Gases

(reading for 1% gas in nitrogen, typical)

| | |
|-----------------|-------------------------|
| Methane | 1.00 |
| Carbon Monoxide | 0.48 |
| Hydrogen | 0.86 |
| Acetylene | 1.9 to 2.0 ¹ |
| Ethylene | 1.92 |
| Ethane | 1.64 |
| Air (100%) | -0.07 ² |

Pressure

| | |
|----------|--------------|
| Range | 0 to 15 PSIG |
| Accuracy | 0.5 PSI |

¹ Interactions between the catalyst and acetylene cause the sensitivity to gradually increase during a sequence of acetylene measurements. This does not affect the sensitivity to other gases, and the effect is reversed on standing.

² The thermal conductivity of air, being slightly higher than that of nitrogen, will cause a negative reading by virtue of differences in thermal conductivity. While not optimized as a thermal-conductivity detector, this is an indication that transformer gas is not reaching the Model 921A.

Power Requirements

Internal Battery

| | |
|---------------|--|
| Type | Gelled-electrolyte lead-acid, 6 V / 4 AH |
| Operation | 400 measurements on full charge |
| Charging Time | 8 hours typical |

General

Physical

| | |
|--------------|--|
| Instrument | 130 x 230 x 65 mm (5.125 x 9.125 x 2.625 in.) |
| Transit Case | 400 x 380 x 240 mm (16 x 15 x 9.5 in.) |
| Shipping | 533 x 533 x 533 mm (21 x 21 x 21 in.) 9.5 kg (21 lbs) Ships Federal Express with Dangerous Goods classification |
| Weight | 3 kg (7 lbs), net (instrument) 10 kg (22 lbs), with accessories |

Environmental

| | |
|-------------|--|
| Temperature | Operating: 0° to 50° C Nonoperating: -40° to +75° C |
| Display | 16 character alphanumeric supertwist LCD |

Accessories

Included

| Description | Order No. |
|--------------------------------------|-----------|
| Transit Case | HD0031800 |
| Plug-in charger, 120 Vac UL/CSA | AP0001800 |
| Automobile lighter adapter | AP0002500 |
| Transformer gas hose assembly | AS0019300 |
| Calibration gas regulators (2 each) | AS0019100 |
| Calibration gas hose assembly (red) | AS0019402 |
| Calibration gas hose assembly (blue) | AS0019406 |
| Transformer Hose In-Line Filter Kit | AS0026900 |
| Particulate filter (2 each provided) | AS0020800 |
| Calibration Gas | |
| Instrument Air | AS0019500 |
| Zero Nitrogen | AS0019600 |
| 1% Methane in Nitrogen | AS0019700 |
| Operation Manual | PD0010700 |

Available

| Description | Order No. |
|---------------------------------|-----------|
| Syringe Adapter (Kit of 5 each) | AS0020500 |
| Annual Filter Maintenance Kit | AS0035100 |