

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	0.1 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 H x 380 W x 240 D mm (16 x 15 x 9.5 in.)
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