

## H<sub>2</sub> MONITORING TESTS TRANSFORMER CONDITION

### Application Description

Electrical utilities use large electrical transformers to drop the voltage coming from power lines. These transformers can be huge; the size of a car or greater. The transformers are sealed with an oil bath surrounding all of the electrical coils inside. This oil bath acts as both a coolant and an insulator. At the top of the transformer, there is a head space that has no oil and is filled with nitrogen, generally under a slight positive pressure. For a new transformer, this nitrogen blanket will remain "clean" for a long time. As the transformer ages, and the insulation between the wire coils starts to break down, the high voltage can arc between two adjacent coils of the transformer. When this occurs, the high voltage passes through the oil blanket, and causes the oil to break down. This causes small amounts of flammable vapors to form from the oil, and rise to the top of the transformer to mix with the nitrogen blanket. These flammable vapors consist of a variety of gases, but generally hydrogen is predominant. Typical maintenance of transformers includes periodic testing of the nitrogen blanket for flammable vapors to evaluate the health of the transformer. If the testing reveals a buildup of flammable vapors, the transformer can be removed from service in a planned manner instead of a catastrophic manner (such as an explosion).



### RKI's Solution

RKI offers "Transformer Gas Testing" versions of our EAGLE portable sample drawing gas monitor for this application. These instruments have a range of 0-5% hydrogen and use a catalytic sensor.

#### Positive Pressure Transformers

For positive pressure transformers the instrument is provided with a sample bag, a probe, and a dilution fitting. The dilution fitting is needed since the catalytic sensor requires oxygen in order to operate. The dilution fitting is attached to the inlet of the EAGLE gas monitor, and this fitting blends 50% sample with 50% ambient air, which provides sufficient oxygen for the sensor. For testing, the

sample bag is filled from the transformer. (Remember that the transformer is normally under slight positive pressure, and a valve is present on most transformers that can be easily used for this). The sample probe is attached to the dilution fitting on the instrument inlet, and then connected to the filled sample bag to test the sample. Readings are displayed over the range of 0-5% hydrogen.

#### Negative Pressure Transformers

For transformers where the nitrogen blanket is under negative pressure, we offer a version of the EAGLE that has two pumps and an internal dilution fitting. In this version the probe is connected directly to the transformer tap, and the first pump is used to extract a sample from the transformer. The second pump draws sample from a vented chamber that is filled by the first pump. This version can also be used on transformers with positive pressure. Testing frequencies vary for each Utility, but generally are between 3 to 6 months. A sudden rise of flammables over this time period is an indication of transformer trouble.

### Ordering Information

Each version includes alkaline batteries, dilution fitting, and probe. Sample bag is included in versions with 1 pump.

#### Single Gas H<sub>2</sub> EAGLE

72-5101RK-TR1	\$1,750
EAGLE for positive pressure transformers, 0-5% hydrogen.	
72-5101RK-TRB	\$2,000
EAGLE for negative pressure transformers, 0-5% hydrogen, includes 2 pumps and internal dilution fitting.	
81-5101RK-H2	\$ 455
Calibration kit with regulator, 103 liter gas mix.	
81-5101RK-H2LV	\$140
Calibration kit with regulator, 34 liter gas mix.	

#### Dual Gas H<sub>2</sub>/O<sub>2</sub> EAGLE

72-5201RK-TR1	\$1,925
EAGLE for for positive pressure transformer, 0-5% hydrogen and 0-25% Oxygen.	
72-5201RK-TRB	\$2,250
Eagle for negative pressure transformers, 0-5% hydrogen and O <sub>2</sub> , includes 2 pumps includes 2 pumps and internal dilution fitting..	
81-5201RKTR1	\$ 570
Calibration kit with regulator, two 103 ltr gas mix.	
81-5201RKTR1-LV	\$ 180
Calibration kit with dispensing valve, two 34 ltr gas mixes.	