

Combustible Gas Transmitter 65-2400RK-05

Overview

This detection insert describes the combustible gas transmitter. This insert also describes how to install, start up, maintain, and calibrate the transmitter. A parts list at the end of this insert lists replacement parts and accessories for the combustible gas transmitter.


Specifications

WARNING: *Do not use this product in a manner not specified in this instruction manual.*

Table 1 lists specifications for the combustible gas transmitter.

Table 1: Specifications

Target Gas	Combustible gas
Area Classification	Explosionproof for Class I, Groups B, C, and D
Sampling Method	Diffusion
Signal Output	4 to 20 mA
Detection Range	0 to 100% LEL
Response Time	90% in 45 seconds
Operating Temperature	-40°F to 185°F (-40°C to 85°C)

NOTE: The following symbol on the detector label is a caution to the user to refer to this documentation for installation and operation instructions: 

Description

This section describes the components of the combustible gas transmitter. The transmitter consists of the combustible gas detector, amplifier, and junction box.

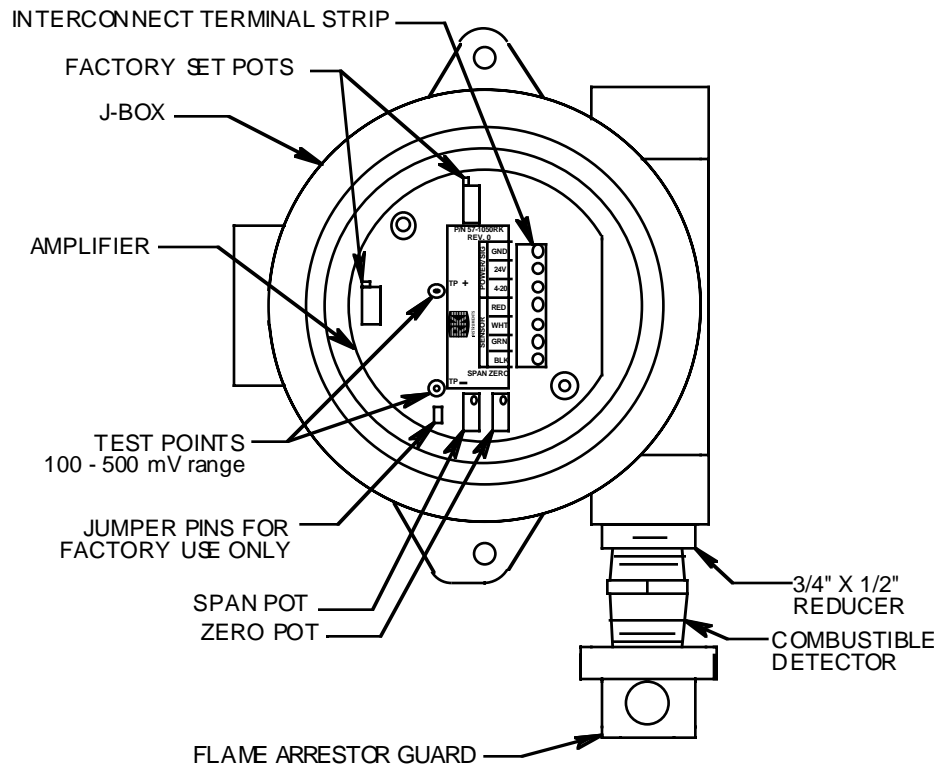


Figure 1: Combustible Gas Transmitter Component Location

Combustible Gas Detector

The combustible gas detector includes the sensing elements, flame arrestor, flame arrestor guard, detector housing, and detector leads.

Sensing elements

Two sensing elements are protected within the detector assembly. Through a series of thermal and electronic reactions, these elements produce an electrical output that is proportional to the detection range of the transmitter.

Flame arrestor

The porous flame arrestor allows the target gas to diffuse into the detector assembly and contact the sensing elements. The flame arrestor also contains sparks within the detector.

Flame arrestor guard

The flame arrestor guard is permanently bonded to the detector housing and protects the flame arrestor from impact damage.

Detector housing

The sensing elements and flame arrestor are installed within the detector housing. Mounting threads (1/2 in. NPT) at the top of the detector allow you to mount the combustible gas detector into the bottom conduit hub of the junction box. A rainshield screws onto the bottom of the detector. The rainshield helps protect the detector from debris in the monitoring environment.

Detector leads

Four color-coded leads extend from the top of the detector. The leads allow you to connect the combustible gas detector to the amplifier.

Amplifier

The amplifier converts the electrical output from the detector to a 4 to 20 mA signal (that is proportional to the detection range) and transmits the signal to a controller. The amplifier includes the interconnect terminal strip, span potentiometer, zero potentiometer, and test points (see Figure 1.)

Interconnect terminal strip

The interconnect terminal strip is a seven-point terminal strip. Use the interconnect terminal strip to connect the combustible gas detector to the amplifier and the amplifier to a controller.

NOTE: The combustible gas detector is factory-wired to the amplifier. See the Installation section of this insert for all wiring procedures related to the transmitter.

Span potentiometer

The span potentiometer is near the bottom of the amplifier. Of the two potentiometers near the bottom of the amplifier, the span potentiometer is farthest to the left. Use the span potentiometer to adjust the transmitter's response output during the calibration procedure.

Zero potentiometer

The zero potentiometer is to the right of the span potentiometer. Use the zero potentiometer to adjust the transmitter's target gas-free output during the start-up and calibration procedures.

CAUTION: *The amplifier includes two additional potentiometers. They are factory-set. Do not adjust them.*

Test points

The test points (labeled TP+ and TP-) are to the left of the interconnect terminal strip. The test points produce a 100 to 500 mV output that is proportional to the transmitter's 4 to 20 mA output. Use the test points and a voltmeter to measure the transmitter's output during the start-up and calibration procedures.

Junction Box

Use the junction box to install the combustible gas transmitter at a mounting site that is remote from a controller. The junction box also protects the amplifier and wiring connections made to the amplifier. Use the two 3/4 in. conduit hubs to mount the detector to the junction box (bottom hub) and connect wiring from the amplifier to a controller (top hub).

NOTE: The combustible gas detector and amplifier are factory-mounted to the junction box.

Use the junction box's two mounting holes to mount the combustible gas transmitter to a vertical surface at the monitoring site. Use the cover on the front of the junction box to access the interior of the junction box.

Installation

This section describes procedures to mount the combustible gas transmitter in the monitoring environment and wire the transmitter to a controller.

Mounting the Combustible Gas Transmitter

1. Select a mounting site that is representative of the monitoring environment. Consider the following when you select the mounting site.
 - Select a site where the transmitter is not likely to be bumped or disturbed. Make sure there is sufficient room to perform start-up, maintenance, and calibration procedures.
 - Select a site where the target gas is likely to be found first. For lighter gases, mount the detector near the ceiling; for heavier gases, mount the detector near the floor.

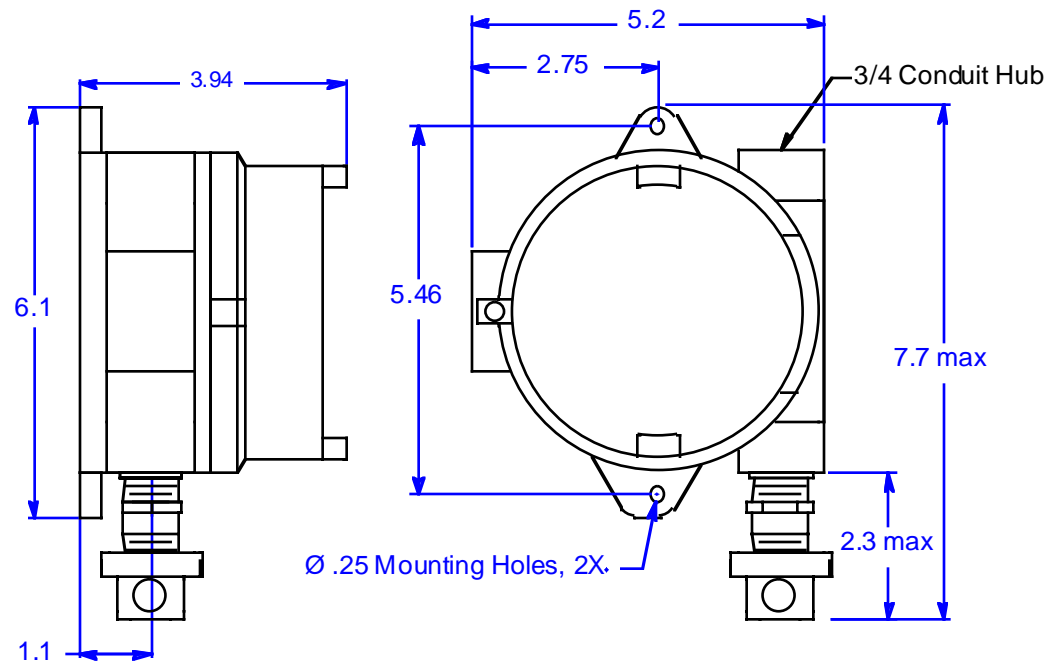


Figure 2: Mounting the Combustible Gas Transmitter

If the combustible gas detector is mounted to the junction box, skip to step 5. If not, continue with step 2.

NOTE: The LEL detector is normally provided with a Killark HKB junction and an HFC lid rated explosion proof for Class I, Groups B, C, and D. This combination is shown in Figure 2 above. Any junction box with an internal volume less than or equal to 69 cubic inches and rated explosion proof for Class I, Groups B, C, and D may be used.

2. Remove the junction box cover.
3. Guide the four wires that extend from the top of the combustible gas detector through

the bottom conduit hub of the junction box.

4. Screw the combustible gas detector into the bottom conduit hub of the junction box.
5. At the monitoring site, use 1/4 in. screws through the junction box's two mounting holes to secure the junction box to a vertical surface.

CAUTION: *Mount the combustible gas transmitter with the detector facing down (see Figure 2.)*

Wiring the Combustible Gas Transmitter to a Controller

WARNING: *Always verify that all power is OFF before you make wiring connections.*

1. Remove the junction box cover.
2. Verify that the detector leads are wired to the amplifier's interconnect terminal strip. If necessary, connect the detector leads to the interconnect terminal strip as shown in Figure 3.
3. Guide a three-conductor, shielded cable in conduit or three wires in conduit through the top conduit hub of the junction box.

WARNING: *To maintain the explosion proof classification of the LEL detector/ junction box combination, a conduit seal must be used at the junction box conduit hub used for wiring to the controller.*

4. Connect the three wires to the interconnect terminal strip as follows (see Figure 3.)
 - Connect the positive wire to the terminal labeled **24V +**.
 - Connect the feedback wire to the terminal labeled **4/20 FB**.
 - Connect the negative wire to the terminal labeled **GND**.

CAUTION: *Leave the drain wire insulated and disconnected at the transmitter. You will connect the opposite end of the cable's drain wire at the controller.*

5. Secure the junction box cover to the junction box.
6. Route the cable or wires leading from the combustible gas transmitter through a conduit hub at the controller.

CAUTION: *Do not route power and transmitter wiring through the same conduit hub. The power cable may disrupt the transmission of the transmitter signal to the controller.*

7. Connect the wires to the appropriate terminals at the controller. Figure 3 shows generic connections. See the controller instruction manual for specific wiring connections.

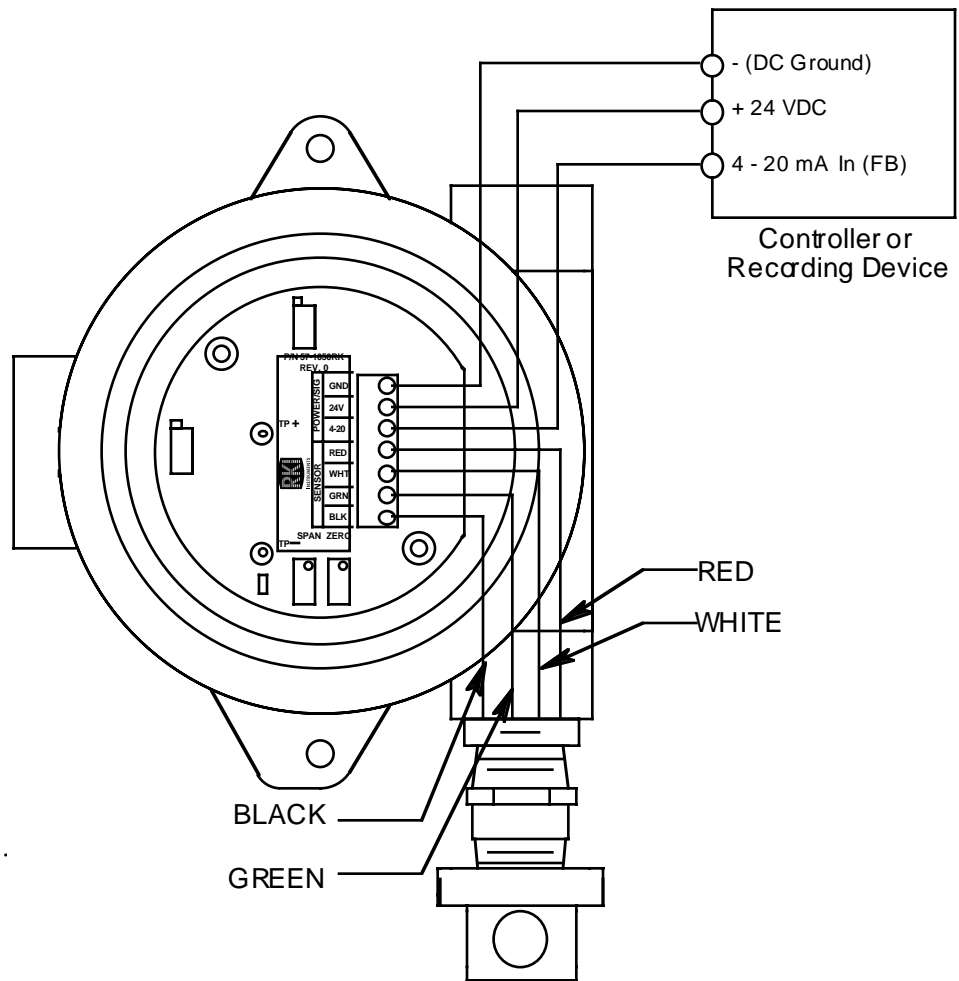


Figure 3: Wiring the Combustible Gas Transmitter to the Pioneer Gas Monitor

8. At the controller, connect the cable's drain wire to an available chassis ground.

Start Up

This section describes procedures to start up the combustible gas transmitter and place the transmitter into normal operation.

Introducing Incoming Power

1. Complete the installation procedures described earlier in this insert.
2. Verify that the power wiring is correct and secure (see Chapter 3, Installation and Start Up.)
3. Turn on or plug in the incoming power at the power source end, then turn on the controller.

CAUTION: *Allow the detector to warm up for 15 minutes before you continue with the next section, "Setting the Zero Signal."*

Setting the Zero Signal

WARNING: *Do not remove the junction box cover while the circuits are energized unless the area is determined to be non-hazardous. Keep the junction box cover tightly closed during operaiton.*

CAUTION: *If you suspect the presence of combustible gas in the monitoring environment, use the calibration kit and the zero air calibration cylinder to introduce "fresh air" to the detector and verify an accurate zero setting.*

1. Verify that the transmitter area is non-hazardous and thta it is a fresh air environment (environment known to be free of combustible gas).
2. Unscrew and remove the junction box cover from the junction box.
3. Set a voltmeter to measure in the millivolt (mV) range.
4. Plug the voltmeter leads into the test points on the amplifier. Plug the positive lead into the test point labeled TP+; plug the negative lead into the test point labeled TP-.
5. Verify a voltmeter reading of 100 mV (± 2 mV).
6. If necessary, use a flat-blade screwdriver to adjust the zero potentiometer until the voltmeter reading is 100 mV (± 2 mV).
7. Secure the junction box cover to the junction box.

WARNING: *Do not remove the sensor cap or junction box cover while the circuits are energized. Keep the sensor cap and junction box cover tightly closed during operaiton.*

Maintenance

This section describes maintenance procedures. It includes preventive maintenance, troubleshooting, and component replacement procedures.

Preventive Maintenance

This section describes a preventive maintenance schedule to ensure the optimum performance of the combustible gas transmitter. It includes daily, monthly, and quarterly procedures.

Daily

1. Verify a display reading of 0 %LEL at the controller. Investigate significant changes in the display reading.

Monthly

This procedure describes a test to verify that the combustible gas transmitter responds properly to the target gas.

NOTE: Verifying the response of the transmitter may cause alarms. Be sure to put the controller into calibration mode or disable external alarms before verification.

Preparing for the response test

1. Verify that the display reading is 0.
If the display reading is not zero, set the zero reading as described in the Start Up section of this insert, then continue this procedure.
2. Assemble the calibration kit as described in the Calibration section of this insert.

NOTE: Do not screw the regulator into the calibration cylinder at this time.

3. Set a voltmeter to measure in the millivolt (mV) range.
4. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.
Plug the positive lead into the test point labeled TP+; plug the negative lead into the test point labeled TP-.
5. Use the following formula to determine the correct test points output for the test sample.

$$\text{Output (mV)} = (\text{calibrating sample/fullscale}) \times 400 + 100$$

For example, with a test sample of 50% LEL and a fullscale setting of 100% LEL, the correct output is 300 mV.

$$300 \text{ (mV)} = (50/100) \times 400 + 100$$

Performing the response test

1. Screw the regulator into the calibration cylinder.
2. When the reading on the voltmeter stabilizes after approximately 2 minutes, verify that the reading is within $\pm 10\%$ of the response reading you determined earlier.

NOTE: If the reading is not within $\pm 10\%$ of the correct response reading, calibrate the transmitter as described in the Calibration section of this insert.

3. Unscrew the regulator from the calibration cylinder, then disassemble the calibration kit as described in the Calibration section of this insert.

Quarterly

Calibrate the combustible gas transmitter as described in the Calibration section of this insert.

Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the combustible gas transmitter.

NOTE: This troubleshooting guide describes transmitter problems only. See the controller instruction manual if it exhibits any problems.

Fail Condition

Symptoms

- The controller is indicating a reading well below zero.
- The controller is indicating a fail condition.

Probable causes

- The transmitter wiring is disconnected or misconnected.
- The transmitter is malfunctioning.

Recommended action

1. Verify that the transmitter wiring is correct and secure. The Installation section of this insert describes transmitter wiring connections.
2. Calibrate the transmitter as described in the Calibration section of this insert.
3. If the fail condition continues, replace the detector as described later in this section.
4. If the fail condition continues, contact RKI Instruments, Inc., for further instruction.

Slow or No Response/Difficult or Unable to Calibrate

Symptoms

- The transmitter responds slowly or does not respond during the monthly response test.
- Unable to accurately set the zero or response reading during the calibration procedure.
- The transmitter requires frequent calibration.

NOTE: Under “normal” circumstances, the transmitter requires calibration once every three months. Some applications may require a more frequent calibration schedule.

Probable causes

- The calibration cylinder is low, out-dated, or defective.
- The transmitter is malfunctioning.

Recommended action

1. Verify that the calibration cylinder contains an adequate supply of a fresh test sample.
2. If the calibration/response difficulties continue, replace the detector as described later in this section.
3. If the calibration/response difficulties continue, contact RKI Instruments, Inc., for further instruction.

Replacing Components of the Combustible Gas Transmitter

This section includes procedure to replace the combustible gas detector and amplifier.

Replacing the combustible gas detector

1. Turn off incoming power.
2. Remove the junction box cover.
3. Disconnect the detector leads from the interconnect terminal strip. Note the position of the color-coded leads as you remove them.
4. Unscrew the detector from the junction box.
5. Guide the detector leads of the replacement detector through the bottom conduit hub of the junction box, then screw the mounting threads of the detector into the conduit hub.
6. Connect the detector leads to the interconnect terminal strip as shown in Table 2 and Figure 3.

Table 2: Reconnecting the Combustible Gas Detector to the Amplifier

Detector Lead	Amplifier Interconnect Terminal Strip
Red	SENSOR RED
White	SENSOR WHT
Green	SENSOR GRN
Black	SENSOR BLK

7. Turn on incoming power.

CAUTION: Allow the replacement detector to warm up for 15 minutes before you continue with the next step.

8. Calibrate the replacement detector as described in the Calibration section of this insert.

- Secure the junction box cover to the junction box.

Replacing the amplifier

- Turn off incoming power.
- Remove the junction box cover.
- Disconnect the detector leads from the interconnect terminal strip and the controller wires from the interconnect terminal strip.
- Unscrew and remove the two screws that secure the amplifier to the junction box. The screws are at the top left and bottom right of the amplifier.
- Remove the amplifier.
- Place the new amplifier in the same position as the amplifier you removed in the previous step.
- Use the two screws you removed in step 4 to secure the amplifier to the junction box.
- Reconnect the wiring from the controller to the interconnect terminal strip as shown in Table 3 and Figure 3.

Table 3: Reconnecting the Combustible Gas Amplifier to a Controller

Amplifier Interconnect Terminal Strip	Controller Terminals
GND	24 V -
4-20	4-20 mA (Feedback)
24V	24 V +

- Reconnect the detector leads to the interconnect terminal strip as shown in Table 4 and Figure 3.

Table 4: Reconnecting the Combustible Gas Detector to the Amplifier

Detector Lead	Amplifier Interconnect Terminal Strip
Red	SENSOR RED
White	SENSOR WHT
Green	SENSOR GRN
Black	SENSOR BLK

- Turn on incoming power.

CAUTION: Allow the detector to warm up for 15 minutes before you continue with the next step.

- Calibrate the combustible gas transmitter as described in the Calibration section of this insert.

Calibration

This section describes how to calibrate the combustible gas transmitter. It includes procedures to prepare for calibration, enter the Calibrate program, set the zero reading, set the response reading, and return to normal operation.

NOTE: Calibrating the transmitter may cause alarms. Be sure to put the controller into calibration mode or disable external alarms before calibration.

Preparing for Calibration

1. Slide the calibration cup over the bottom of the combustible gas detector, then secure the calibration cup to the detector with the thumb screw.
2. Use the sample tubing to connect the regulator to the calibration cup.

NOTE: Do not screw the regulator into the zero air calibration cylinder at this time. If you can verify a fresh air environment, you will not need to apply gas from the zero air cylinder when setting the zero.

3. Set a voltmeter to measure in the millivolt (mV) range.

WARNING: *Do not remove the junction box cover while the circuits are energized unless the area is determined to be non-hazardous. Keep the junction box cover tightly closed during operation.*

4. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.
Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP-**.
5. Use the following formula to determine the correct test points output for the calibrating sample.

$$\text{Output (mV)} = (\text{calibrating sample}/\text{fullscale}) \times 400 + 100$$

For example, with a calibrating sample of 50% LEL and a fullscale setting of 100% LEL, the correct output is 300 mV.

$$300 \text{ (mV)} = (50/100) \times 400 + 100$$

Setting the Zero Reading

1. Screw the regulator into the zero air calibration cylinder.
2. When the reading on the voltmeter stabilizes, verify a reading of 100 mV (± 2 mV). If necessary, use the zero potentiometer on the amplifier to adjust the reading to 100 mV (± 2 mV).
3. Unscrew the regulator from the zero air calibration cylinder.
Leave the sample tubing connected to the regulator and the calibration cup.

Setting the Response Reading

1. Screw the regulator into the calibration cylinder.
2. When the reading on the voltmeter stabilizes, verify that the reading matches the

response reading (± 2 mV) you determined earlier. If necessary, use the span potentiometer on the amplifier to adjust the reading to match the correct response reading.

3. Unscrew the regulator from the calibration cylinder.
4. Remove the voltmeter leads from the amplifier test points.
5. Loosen the two screws that secure the calibration cup to the detector, then remove the cup from the bottom of the detector.

NOTE: For convenience, leave the components of the calibration kit connected by the sample tubing.

6. Secure the junction box cover to the junction box.
7. Wait one to two minutes for the reading to decrease and stabilize.
8. Verify that the display reading at the controller decreases and stabilizes at 0 %LEL.
9. Store the components of the calibration kit in a safe and convenient place.

Parts List

Table 5 lists replacement parts and accessories for the combustible gas transmitter.

Table 5: Parts List

Part Number	Description
06-1248RK	Sample tubing (3/16 in. x 5/16 in.; specify length when ordering)
18-0003RK	Conduit plug (3/4 in. NPT)
18-0405RK-01	Junction box (without cover, pre-drilled for amplifier)
18-0406RK	Junction box cover (cover only)
57-1050RK	Amplifier (specify target gas when ordering)
61-0140RK-05	Combustible gas detector (specify target gas when ordering)
65-2400RK-05	Combustible gas transmitter (includes detector and amplifier; specify target gas when ordering)
71-0052RK	<i>Combustible Gas Transmitter Manual Insert</i> (this document)
81-0007RK-01	Calibration cylinder (50% LEL Hexane; 34 liter)
81-0012RK-01	Calibration cylinder (50% LEL Methane; 34 liter)
81-0076RK-01	Zero air calibration cylinder (34 liter)
81-1003RK	Regulator, 0.5 liter/minute; continuous flow (for 17 and 34 liter calibration cylinders)
81-1117RK	Calibration cup