

## GMS-10 RVS Series

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### Oxygen Sensors

### Accurate oxygen measurement



#### DESCRIPTION

The GMS-10 is a high-accuracy oxygen sensor suitable for many applications. Originally developed for boiler applications, the product range has been extended to offer versions suitable for oxygen monitoring on board commercial and military aircraft, exhaust gas testing for automotive and medical test equipment. The sensor employs two  $ZrO_2$  discs with a small hermetically sealed chamber in between. One of the discs functions as a reversible oxygen pump, which is used to successively fill and empty the chamber. The second disc measures the ratio of the partial pressure difference and generates a corresponding sense voltage. A heat element

produces the 700 °C required for the  $ZrO_2$  to operate as an  $O_2$  pump. The time taken for the pump to achieve specific minimum and maximum pressures within this chamber is a measure of the partial oxygen pressure of the environment.

The GMS-10 has to be operated by an electronic measuring circuit that controls the sensor operation and signal processing. This circuit can either be incorporated into the customer's own electronics, or be purchased as a separate box of electronics from Honeywell.

#### FEATURES

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- High-accuracy measurement
- Low power consumption
- No reference gas required
- Linear output signal
- No need for temperature stabilization
- Function testing and calibration in ambient air
- Long life

#### TYPICAL APPLICATIONS

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- Heating boiler control
- Industrial process control
- Control of aircraft on board oxygen generation systems
- Automotive exhaust gas diagnostics
- Service instruments
- Monitoring environmental oxygen

#### WARNING

##### MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

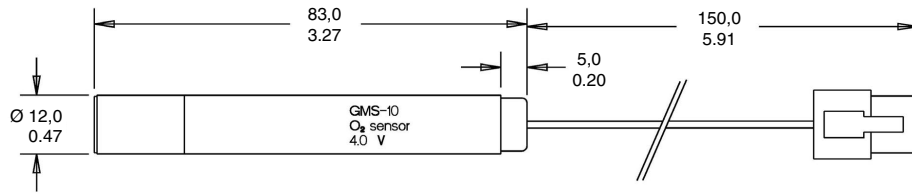
#### WARNING

##### PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

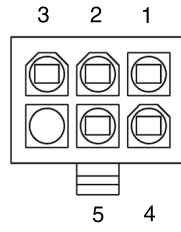
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**MOUNTING DIMENSIONS IN MM/INCHES  
(FOR REFERENCE ONLY)**



**WIRING DIAGRAM**

Heater	(3&5)	Yellow
Pump	(1)	Red
Common	(2)	Black
Sense	(4)	Blue



**TECHNICAL DATA**

<b>Electrical Characteristics</b>	
Sensor voltage levels (recommended ), V	45-64-85 mV
Pump current (recommended), A	40 uA
Heater supply, V/A	4.0 V (1.7A)
Heater supply (stand by)	2.0 V
Pump resistance at 700 °C, Ohm	dc 1 kOhm (typ.) ac 1 kHz 120 Ohm (typ.)
<b>Operational specifications</b>	
Oxygen pressure range	2 mbar – 3 bar
Operational temperature	700 °C
Stand by temperature	500 °C (typ.)
Sensitivity	1.05 ms/mbar
Accuracy	< 5 mbar
Response time	< 15 s
Warm up time	< 100 s
Warm up time (from stand by)	< 20 s
Permissible gas temperature	-100 /+250 °C
Gas flow rate	0-10 m/s
<b>Mechanical characteristics</b>	
Repetitive permissible acceleration	5 g
Incidental permissible acceleration	30 g

**WARRANTY/REMEDY**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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**SALES AND SERVICE**

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**Automation and Control Solutions**

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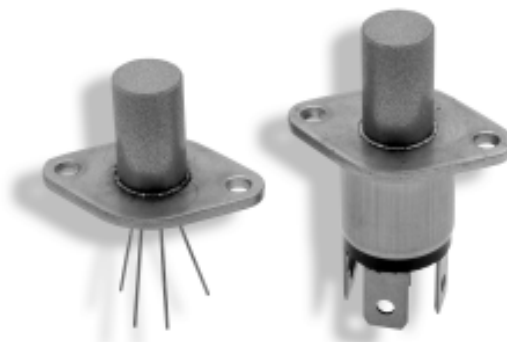
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## KGZ-10 Series

### Oxygen Sensors

### Accurate oxygen measurement



#### DESCRIPTION

The KGZ-10 is a high-accuracy oxygen sensor suitable for many applications. Originally developed for boiler applications, the product range has been extended to offer versions suitable for oxygen monitoring on board commercial and military aircraft, exhaust gas testing for automotive and medical test equipment. The sensor employs two  $ZrO_2$  discs with a small hermetically sealed chamber in between. One of the discs functions as a reversible oxygen pump, which is used to successively fill and empty the chamber. The second disc measures the ratio of the partial pressure difference and

#### FEATURES

- High-accuracy measurement
- Low power consumption
- No reference gas required
- Linear output signal
- No need for temperature stabilization
- Function testing and calibration in ambient air
- Long life

generates a corresponding sense voltage. A heat element produces the 700 °C required for the  $ZrO_2$  to operate as an  $O_2$  pump. The time taken for the pump to achieve specific minimum and maximum pressures within this chamber is a measure of the partial oxygen pressure of the environment.

The KGZ-10 has to be operated by an electronic measuring circuit that controls the sensor operation and signal processing. This circuit can either be incorporated into the customer's own electronics, or be purchased as a separate box of electronics from Honeywell.

#### TYPICAL APPLICATIONS

- Heating boiler control
- Industrial process control
- Control of aircraft on board oxygen generation systems
- Automotive exhaust gas diagnostics
- Service instruments
- Monitoring environmental oxygen
- Agriculture, composting, fruit storage

#### ORDER GUIDE

Description	Catalogue Listing
Oxygen Sensor	KGZ-10
Oxygen Sensor	KGZ-10SP

#### **⚠ WARNING** MISUSE OF DOCUMENTATION

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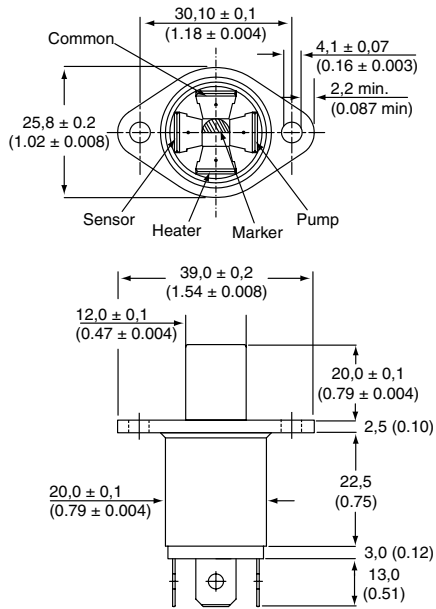
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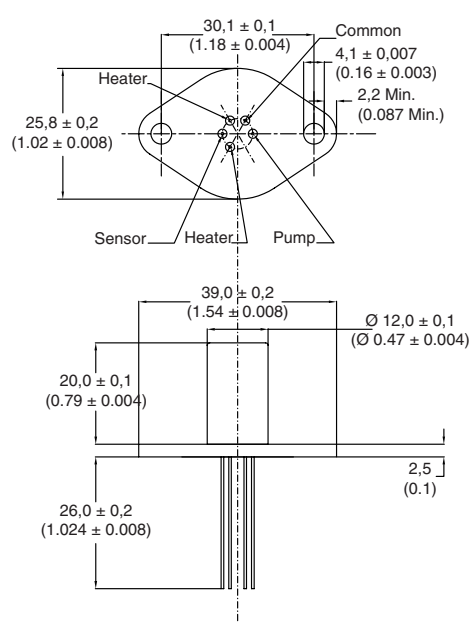
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## MOUNTING DIMENSIONS IN MM (INCHES) FOR REFERENCE ONLY

### KGZ-10



### KGZ-10SP



## TECHNICAL DATA

Electrical Characteristics	
Sensor voltage levels (recommended), V	45-64-85 mV
Pump current (recommended), A	40 uA
Heater supply, V/A	4.35 V (1.85 A)
Heater supply (stand by)	2.0 V
Pump resistance at 700 °C, Ohm	dc 1 kOhm (typ.) ac 1 kHz 120 Ohm (typ.)
Operational specifications	
Oxygen pressure range	2 mbar – 3 bar
Operational temperature	700 °C
Stand by temperature	500 °C (typ.)
Sensitivity	1.05 ms/mbar
Accuracy	< 5 mbar
Response time	< 4 s
Warm up time	< 100 s
Warm up time (from stand by)	< 20 s
Permissable gas temperature	-100 /+250 °C
Gas flow rate	0-10 m/s
Mechanical characteristics	
Repetitive permissable acceleration	5 g
Incidental permissable acceleration	30 g

## Automation and Control Solutions

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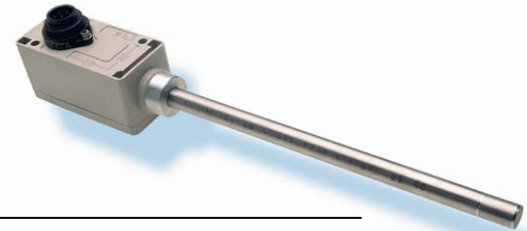
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# Honeywell

## MF010 Series Low Temperature and MF020 Series High Temperature Oxygen Sensors



### DESCRIPTION

The MF010 Series Low Temperature Oxygen Sensors is designed to determine the oxygen concentration in air or inert gas mixtures with temperatures of -100 °C to 250 °C [-148 °F to 482 °F] max. The MF020 Series High Temperature Oxygen Sensors is designed to determine the oxygen concentration in air or inert gas mixtures with temperatures of -100 °C to 400 °C [-148 °F to 752 °F] max.

These products are particularly suitable for measuring oxygen in areas that are not easily accessible, or in closed systems, such as ventilation pipes and containers. The MF010 and MF020 Series may both be supplied with a measuring range of 0.1 vol%O<sub>2</sub> to 25 vol%O<sub>2</sub> and 0.1 vol%O<sub>2</sub> to 100 vol%O<sub>2</sub>. The entire measurement range is linear for both series.

The sensor detects the gas mixture's oxygen partial pressure (absolute oxygen content) by using a dynamic process that occurs on two zirconium dioxide discs which form a hermetically sealed chamber. Because no chemical substances are used, the sensor exhibits significantly longer service life than an electrochemical sensor.

The actual oxygen sensor is mounted in the tip of the bar probe and is protected by a stainless-steel sintered disk which serves as a flame back-flash stop. The water-proof plastic housing accommodates the electronics and is mechanically connected to the bar probe.

### FEATURES

- No moving parts
- Low power consumption
- No need for temperature stabilization
- Functional testing and calibration in ambient air
- Long life

Sensor electronics include:

1. Signal amplifier
2. Control for the ionic pump with an analog component
3. Test component
4. Internal monitoring logic component
5. Power supply for the sensor heating element and the analog and digital components
6. Reset
7. Voltage monitor
8. Analog output
9. Bi-directional digital output
10. Internal potentiometer

The sensor outputs the measured values via an analog channel (4 mA to 20 mA or 0 V to 10 V) and a digital channel (also provides any error signals) which are evaluated and further processed in a user-specified external mounting device such as a fuel controller, display, measuring instrument, programmable logic controller or ventilation system.

Both series may be calibrated manually or self-calibrated using atmospheric air instead of a reference gas. The sensor can also conduct external operational self-tests.

Both series may also operate in a fault-proof mode. The sensor self-monitors during operation and provides error signal output. A second oxygen sensor is not necessary.

### POTENTIAL APPLICATIONS

- Furnace/heating boiler control
- Industrial process control
- Combustion systems
- Compost systems
- Environmental control

# MF010 Series and MF020 Series

**TABLE 1. MF010 SERIES SPECIFICATIONS AND ORDER INFORMATION**

Characteristic	Catalog Listing			
	MF010-0-LC1 MF010-1-LC1 MF010-2-LC1	MF010-0-LC2 MF010-1-LC2 MF010-2-LC2	MF010-0-LC3 MF010-1-LC3 MF010-2-LC3	MF010-0-LC4 MF010-1-LC4 MF010-2-LC4
Temperature range at probe tip	-100 °C to 250 °C [-148 °F to 482 °F]			
Output	0 Vdc to 10 Vdc		4 mA to 20 mA	
O <sub>2</sub> range (O <sub>2</sub> partial pressure) with equivalent O <sub>2</sub> output	1 mbar to 250 mbar 0.1 vol%O <sub>2</sub> to 25 vol%O <sub>2</sub>	1 mbar to 1000 mbar 0.1 vol%O <sub>2</sub> to 100 vol%O <sub>2</sub>	1 mbar to 250 mbar 0.1 vol%O <sub>2</sub> to 25 vol%O <sub>2</sub>	1 mbar to 1000 mbar 0.1 vol%O <sub>2</sub> to 100 vol%O <sub>2</sub>
Probe length:				
-0-LXX	220 mm [8.7 in]			
-1-LXX	400 mm [15.7 in]			
-2-LXX	600 mm [23.6 in]			

**TABLE 2. MF020 SERIES SPECIFICATIONS AND ORDER INFORMATION**

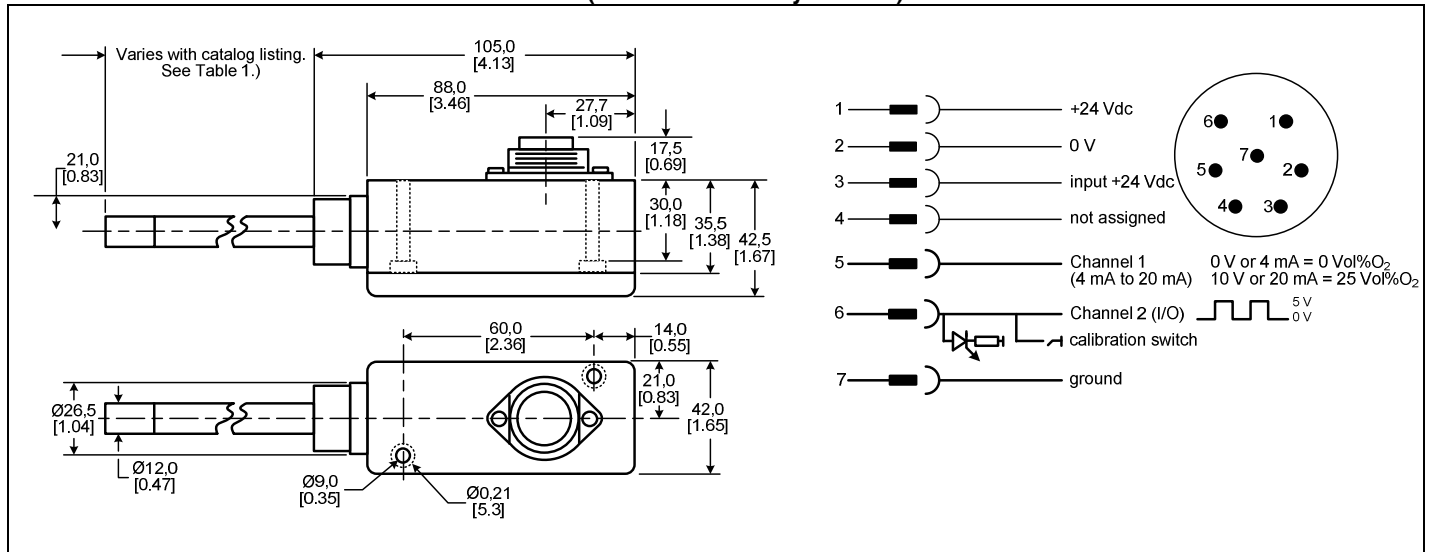
Characteristic	Catalog Listing			
	MF020-0-LC1 MF020-1-LC1 MF020-2-LC1	MF020-0-LC2 MF020-1-LC2 MF020-2-LC2	MF020-0-LC3 MF020-1-LC3 MF020-2-LC3	MF020-0-LC4 MF020-1-LC4 MF020-2-LC4
Temperature range at probe tip	-100 °C to 400 °C [-148 °F to 752 °F]			
Output	0 Vdc to 10 Vdc		4 mA to 20 mA	
O <sub>2</sub> range (O <sub>2</sub> partial pressure) with equivalent O <sub>2</sub> output	1 mbar to 250 mbar 0.1 vol%O <sub>2</sub> to 25 vol%O <sub>2</sub>	1 mbar to 1000 mbar 0.1 vol%O <sub>2</sub> to 100 vol%O <sub>2</sub>	1 mbar to 250 mbar 0.1 vol%O <sub>2</sub> to 25 vol%O <sub>2</sub>	1 mbar to 1000 mbar 0.1 vol%O <sub>2</sub> to 100 vol%O <sub>2</sub>
Probe length:				
-0-LXX	220 mm [8.7 in]			
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-2-LXX	600 mm [23.6 in]			

**TABLE 3. MF010 AND MF020 SERIES GENERAL SPECIFICATIONS**

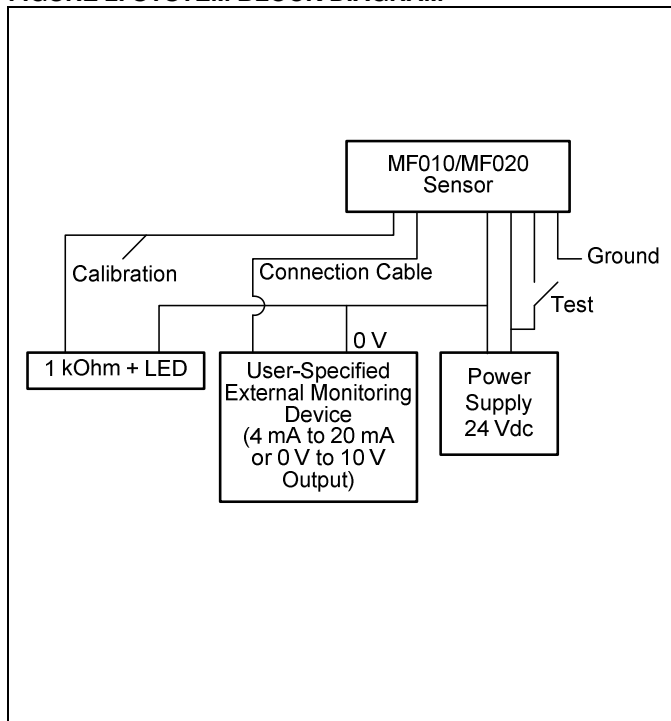
Characteristic	Parameter
Supply voltage	24 Vdc ±5%
Supply current	500 mA
Ambient temperature (includes solar radiation)	-10° C to 50° C [14 °F to 122 °F]
Resolution	12 bit
Heat-up time	approx. 10 min
Accuracy	±2% FS (Full Scale)
Reproducibility	±1% FS (Full Scale)
Gas flow rate	0 m/s to 10 m/s
Reaction time	approx. 3 s
Incidental permissible acceleration	30 g
Repetitive permissible acceleration	5 g
Bar probe material	stainless steel 1.4301
Housing material	Makrolon 8030 (30% GV), UL94 V-1
Housing sealing	IP65
Connector sealing	IP67
Weight (without bar probe)	150 g [5.3 oz]
Termination (female connector)	99-4226-14-07 (Binder 693 series)
Certification	complies with EMC directives EN 50082-2 and EN 50081-1 and directives 89/336/EWG and 92/31/EWG

# Oxygen Sensors

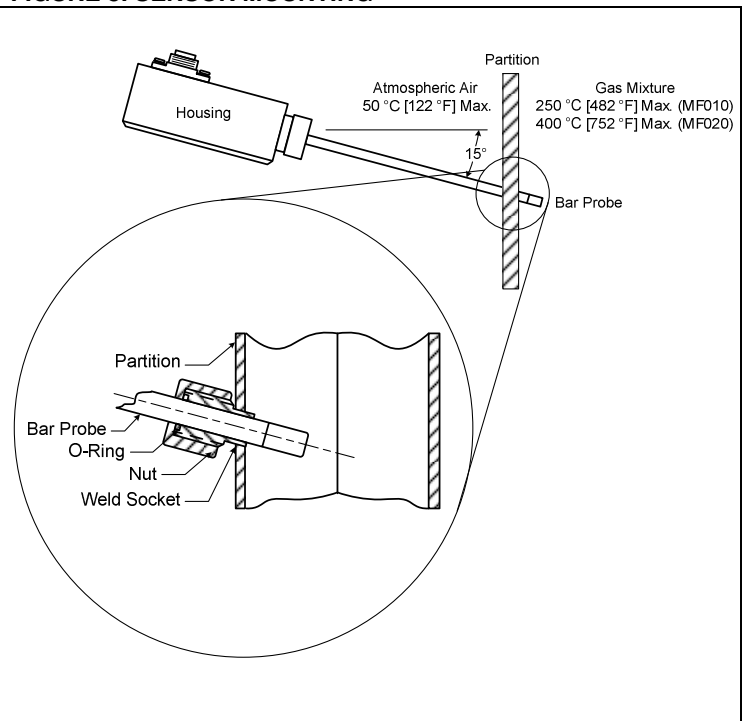
**FIGURE 1. DIMENSIONAL DRAWING AND PINOUT (For reference only: mm/in.)**



**FIGURE 2. SYSTEM BLOCK DIAGRAM**



**FIGURE 3. SENSOR MOUNTING**



**ORDER GUIDE**

Catalog Listing	Description
MF010 Series	Low temperature oxygen sensor (See Table 1 for specifics.)
MF020 Series	High temperature oxygen sensor (See Table 2 for specifics.)

## **WARNING**

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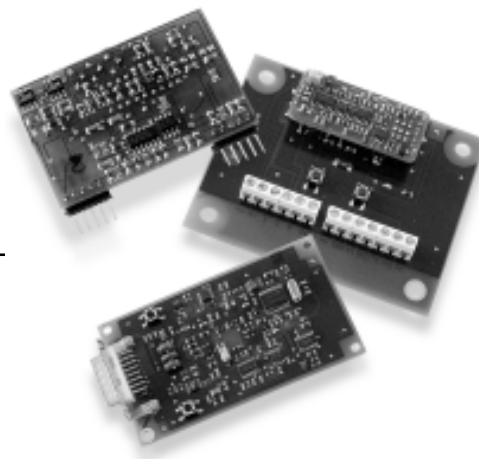
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# Honeywell



# Oxymac50, DE800 and Elecdit



## Oxygen Sensor Interface Boards Accurate oxygen measurement

### DESCRIPTION

The Oxymac 50, Elecdit and DE800 sensor interface boards are control and measurement devices for Honeywell's range of dynamic highly accurate oxygen sensors. The ability of these sensors to operate without any reference gas makes them ideal for many applications including combustion and environmental control.

Honeywell oxygen sensors using zirconia based sensing elements require external connection to an electronic measuring circuit to control sensor operation and signal processing. A heating element on the sensor produces the 700 °C required for the ZrO<sub>2</sub> to achieve its operational temperature. These interface boards supply the sensor with the necessary circuits to provide this control and processing, while also providing sensor calibration. The DE800 interface also includes the heater supply, Oxymac50 and Elecdit require an external heater power supply .

### FEATURES

- Provides the necessary circuits to control Honeywell oxygen sensors
- Functional testing and calibration in ambient air
- PCB board format
- Linear output of measured oxygen content in voltage or current format
- Low power consumption

### TYPICAL APPLICATIONS

- Heating boiler control
- Industrial process control
- Combustion systems
- Compost systems
- Environmental control
- Medical
- Aerospace

Oxymac50 is a recently upgraded interface that offers similar performance to the Elecdit board but operates from a 24 Vdc power supply.

The DE800 interface offers the features of the Oxymac50 but also contains the heating element power source.

The Elecdit interface was developed for Industrial applications and offers a level of noise protection. It operates from a ±15 V supply.

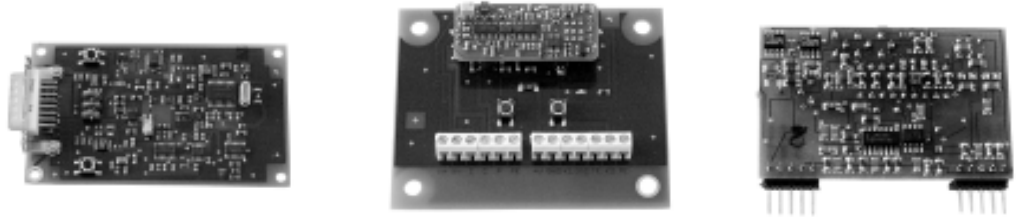
Oxymac50 and DE800 are the recommended interfaces for new applications.

The interfaces are supplied ready for mounting into customers' enclosures. Oxymac50 a 15-pin D type connector, DE800 has screw connector block and Elecdit has 2,5 mm x 2,5 mm (0.1 in x 0.1 in) pin connector.

### BENEFITS

- Removes the need to implement sensor control circuits within customers' equipment
- Removes effects of barometric or application pressure changes and sensor drift for best accuracy
- Ease of mounting and access for calibration
- Flexible interconnection
- Lower running costs

# Oxymac50, DE800 and Elecdit



## TECHNICAL DATA

	Oxymac50	DE800	Elecdit
Measuring range		0 % to 25 % oxygen (standard) 0 % to 100 % oxygen (option)	
Power source	+24 Vdc $\pm$ 20 %	+24 Vdc $\pm$ 20 %	$\pm$ 15 Vdc $\pm$ 10 %
Other inputs	Ext Calibration, Sensor Pump, Sense and Common, Test	Ext Calibration, Sensor Pump, Sense, Common, Heater, Test	Ext Calibration, Sensor Pump, Sense and Common
Power consumption (interface)	<250 mW	<500 mW	<250 mW
Outputs	0 V to 10 V, 4 mA to 20 mA <sup>(1)</sup>	4 mA to 20 mA, 0 V to 10 V <sup>(1)</sup> , Pulse	0 V to 10 V, LED drive
Accuracy	2 % full scale		
Resolution	0.04 V		
Operating temperature	-10 °C to 60 °C		
Storage temperature	-10 °C to 50 °C		
Dimensions	63 mm x 108 mm, 4 mm $\varnothing$ mounting holes	80 mm x 100 mm, 6,5 mm $\varnothing$ mounting holes	60 mm x 42 mm x 17 mm
Connector	15 pin male D connector	Screw connector block	2 x 5 pin 2,5 mm x 2,5mm
Mates with type	GMS-10, KGZ-10, KGZ-12		

Notes: For warm up time and other sensor characteristics refer to datasheet 100470-EN

<sup>(1)</sup> Factory set to voltage or current output

## OPERATING AND CALIBRATION NOTES

### Oxymac50

1. Reset of the Oxymac50 is possible by putting the power off/on.
2. The output signal can be 0 V to 10 V or 4 mA to 20 mA. The output signal is factory set by the solder bridge JP1.
3. A proper operation of a connected sensor and electronic circuit can be tested with the test switch or with an external signal. After switching the test function the output signal should indicate a 20 % lower value.
4. LED indication - proper sensor operation is indicated by blinking of LED D3.
5. Calibration - sensor and Oxymac circuit can be calibrated in normal air. After a loss of power the Oxymac50 circuit stores the calibration value.

### DE800

1. Heater adjustment - the heater voltage of the sensor can be adjusted with pot meter PC419.
2. Test function - after pressing the test button, the output has to go to a 20% lower output signal. Testing with an external (24 V) signal is possible via terminal TE.
3. Calibration - the sensor can be calibrated in normal air with the calibration button. Calibration is lost after power loss.
4. LED - if the sensor is functioning properly, the LED D4 is blinking.
5. Signal out - if the sensor is functioning properly a pulse signal can be measured at terminal K2.

### Elecdit

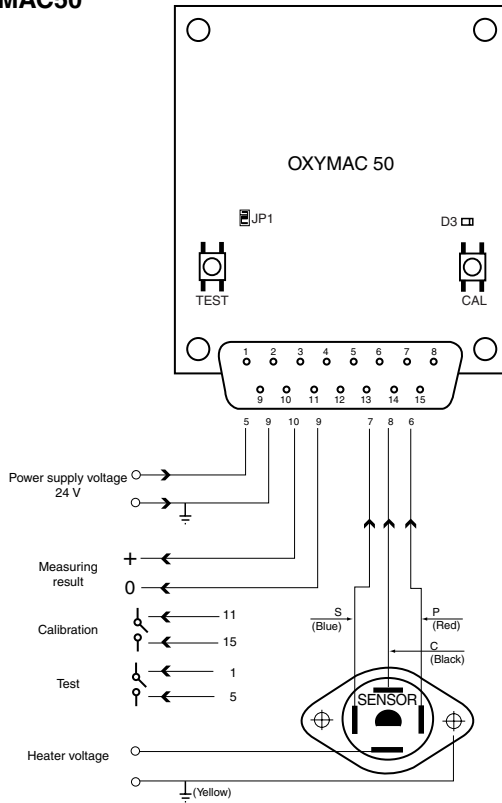
Adjustment/calibration procedure. *The interface is factory set, for sensor replacement follow these instructions.*

1. Adjust with Pot1 12 V (internal  $\pm$ 6 V) at Pin 2.
2. Adjust with Pot2 reference at Pin 1 to 10 V  $\pm$ 0.2 V.
3. After approx 60 s an impulse (blinking) signal should be present at Pin 1. Apply at the sensor 95 mbar air, adjust with Pot5 at Pin 9 to 0.8 V. Then apply at the sensor 1013 mbar air and adjust with Pot3 at Pin 9 Uout to 8.3 V.
4. Adjust with Pot4 0 mV at Pin 10.
5. Adjust with Pot5 Uout to 0 V at Pin 9.

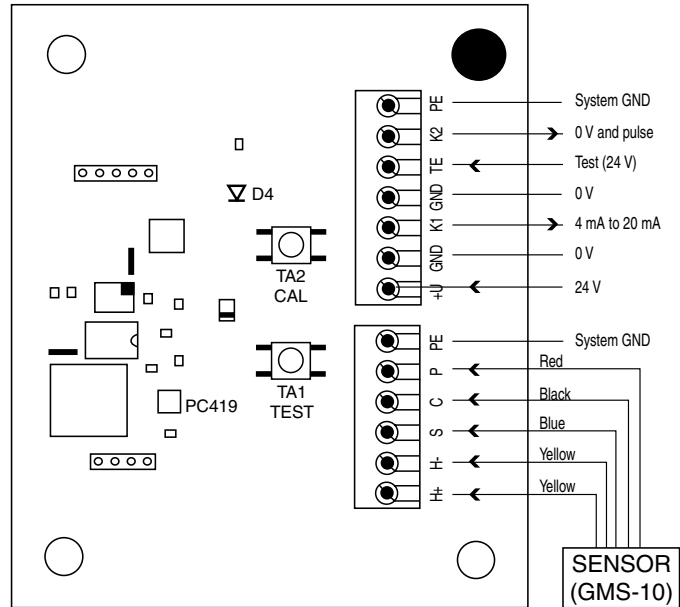
# Oxygen Sensor Interface Boards

## MOUNTING DRAWINGS, FOR REFERENCE ONLY

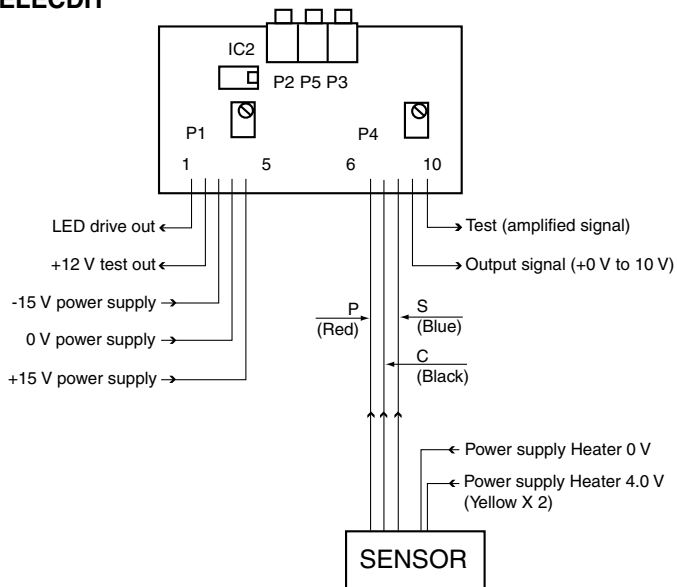
### OXYMAC50



### DE800



### ELECDIT



### ORDER GUIDE

Oxymac 50.V.1	Oxymac50 circuit, output 0 V to 10V, measuring range 0 % to 25 %
Oxymac 50.V.2	Oxymac50 circuit, output 0 V to 10V, measuring range 0 % to 100 %
Oxymac 50.A.1	Oxymac50 circuit, output 4 mA to 20mA, measuring range 0 % to 25 %
Oxymac 50.A.2	Oxymac50 circuit, output 4 mA to 20mA, measuring range 0 % to 100 %
DE800.V.1	DE800 circuit, output 0 V to 10V, measuring range 0 % to 25 %
DE800.V.2	DE800 circuit, output 0 V to 10V, measuring range 0 % to 100 %
DE800.A.1	DE800 circuit, output 4 mA to 20mA, measuring range 0 % to 25 %
DE800.A.2	DE800 circuit, output 4 mA to 20mA, measuring range 0 % to 100 %
Elecdit.V.1	Elecdit circuit, output 0 V to 10V, measuring range 0 % to 25 %
Elecdit.V.2	Elecdit circuit, output 0 V to 10V, measuring range 0 % to 100 %

**⚠ WARNING**  
**MISUSE OF DOCUMENTATION**

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

**⚠ WARNING**  
**PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

**WARRANTY/REMEDY**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

**SALES AND SERVICE**

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

**E-mail:** [info.sc@honeywell.com](mailto:info.sc@honeywell.com)

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