DE-OX® SUB MULTIGAS COLOR DATA SHEET

General Description

DE-OX® SUB is a fully mobile general purpose measurement instrument able to be connected to a large number of sensors. Its application includes continuous ambient gas monitoring, hyperbaric chambers, safety, medical, air quality etc.
Standard available configurations include:

- Oxygen
- Carbon Dioxide
- Carbon Monoxide
- Humidity
- VOC (Volatile Organic Compound)

It is possible to connect the instrument to many other sensors and to change the sensors and instrument configuration.
The instrument is installed into an extra heavy duty water proof Explorer case on an aluminum oven painted panel. It is easily possible to install the main instrument and the sensors in external panel.
The unit is able to detect air quality following the requirements of EN 12021 Respiratory equipment - Compressed gases for breathing apparatus.
The unit can be equipped with a thermal printer for printing test results on-the-fly on both standard paper and stickers.

GENERAL SPECIFICATIONS

Input voltage requirement:	10-35 Vdc
Internal battery	Lithium ions rechargeable battery. One cell 1400 mAh Li ion 3.7 V
Input:	Up to 6 sensor input
Output:	On board acoustic buzzer alarm
Serial connection:	1 RS232 interface. Baud rate up to 115000 baud, on request RS485 interface
Measure resolution:	24 bit bipolar A/D converter Drift in temperature automatic compensation
Conversion rate:	10 ms
Sampling time:	100 ms (min) for each channel
Signal measurement accuracy:	0.1% Full Scale +/- ½ LSB
Input device:	Rotary knob withy central push
Colour display	TFT 320 x 240 dots resolution, backlight led.
Display light intensity	600 nits (cd/m2)
Memory	micro SD card writer/reader
Microprocessor	Cortex M4

ACOUSTIC ALARM

There is a buzzer on board for acoustic warning (for example activation of audible alarm).

SERIAL INTERFACE

Standard RS232 interface for PC connection. It is possible to remotely read the measures and to program the instrument. It is necessary a proper software available on request.

NON VOLATILE MEMORY

DE-OX SUB is provided with non volatile memory that keeps configuration data and settings for 10 years without power supply.

MECHANICAL Description

Standard case Dimensions: 305x270x144 mm Weight 2 Kg ca
Dimension of the main board: 135 x 74 mm, thickness 24 mm (display included). There are four 3 mm hole for setting up the panel. Available with installation in waterproof hard case.

SOFTWARE Description

It is possible to set:
Start Log
Settings
- Brightness
- References
- Languages
- Units
- Configura alarm
- Date and time
- Select skin
- Factory reset

Calibration
Alarm
Export Data
one minimum alarm and one maximum alarm for oxygen sensor input;
The alarm condition is displayed on the display (one mark marks which input is in alarm) and at the same time it is activated the alarm relay (one relay is associated to all the maximum level, the other relay is associated to all the minimum level for oxygen).
The oxygen input can be calibrated independently of the other input.

Visualisation pages

Rotating the knob, it is possible to scroll the following visualisation pages:
Page 1: start up. Switching on the DE-OX SUB MULTIGAS COLOR there is a 60 seconds warm up time necessary to the sensors and transducers stabilisation. In this page is shown the temperature and the current electrical values of the sensors and transducers. After 60 seconds, DE-OX SUB MULTIGAS COLOR goes to page 2.
Page 2: gas mix value visualization. In this page it is shown the percentage (or ppm or other scale) of the monitored gases. It is shown also the alarm bar with alarm point set for any read value.
Page 3: current and tension values of sensor and transducers. In every moment in this page it is possible to read the values of sensor and transducers output (mA and mV).
Page 4 and following: graphs of the gas reading combined with time. Any gas have its own graph page. Press the know for going to one graph page to the others.

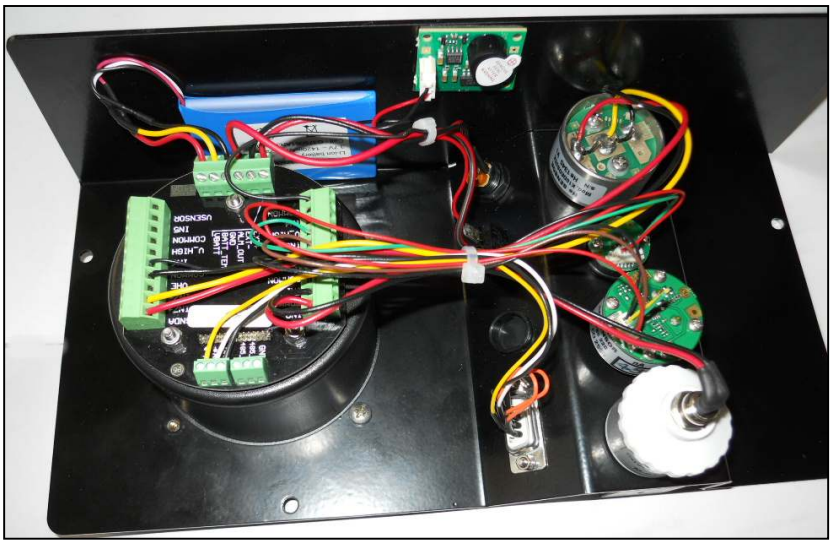
Calibration

It is possible to calibrate sensor transducers and the instrument with certified sample mix gases.

Oxygen sensor

- Medical galvanic cell type
- Measurements range 0÷100% of oxygen

- No effect with gas like CO, CO2, NOx, N2, H2, Ar, He.
- Operating humidity from 0 to 95% non condensing. Prevent condensation on the surface of the sensing surface.
- Operating temperature range from 5°C (41F) to 40°C (104F).
- Storage temperature range from -15°C (5F) to 50°C (122F).
- Do not expose sensor to a biased voltage or to a short circuit.
- Response Time <15 sec for 90% response (or better, up to <5 sec), <25 sec for 97% response.
- Accuracy ±2% over full scale.
- Linearity within ±2% over full scale.
- Stability <1% drift in 8 hours at constant temperature and pressure.
- Output voltage 11±3 milliVolt at 21% oxygen at 23°C (74F) and 60% RH and at 1 ata .
- Do not try to disassemble the sensor.
- Sensor life: up to 48 months under normal operating conditions in air. Sensor must be replaced when unable to calibrate or to analyze mixed gas correctly.



Carbon monoxide sensor

- Operating Principle: 2-electrode electrochemical
- Measurement Ranges: 0-300 ppm or 0-50 ppm
- Expected Operating Life*: >2 years in normal use from date of manufacture
- Temperature Range* Continuous: -10°C to +50°C Intermittent: -20°C to +50°C
- Pressure Range*: 1 atm +10%
- Humidity Range* (non-condensing): Continuous: 15 - 90% Intermittent: 0 - 99%
- Response Time: (T5 90) <50 seconds over complete temperature range
- Baseline Offset (clean air): <-2 to 4 ppm equivalent
- Zero Shift* (-10°C to +50°C): <+10 ppm
- Long Term Output Drift: <5% per annum
- Repeatability: <+5%
- Linearity Linearity: <+5%
- Orientation: Any
- All measurements were taken at 20°C and 505 rH at 1 atmosphere pressure unless otherwise indicated. The performance data detailed in this document refer to new sensors
- With the exception of items marked * the parameters have been verified under the UL component recognition programme

Cross Sensitivity Sensor Table

Gas	Concentration Used (ppm)	Exposure Time (Minutes)	Reading (ppm CO)
Carbon Monoxide	100	5	100
Hydrogen Sulphide	25	5	0
Sulfur Dioxide	50	600	<0.5
Nitrogen Dioxide	50	900	-1.0
Nitric Oxide	50	5	8
Chlorine	2	5	0
Hydrogen	100	5	20
Carbon Dioxide	5000	5	0

Ammonia	100	5	0
Ethanol	2000	30	5
Iso-Propanol	200	120	0
Acetone	1000	5	0
Acetylene	40	5	80

*Note: The figures in this table are typical values and should not be used as a basis for cross calibration. Cross sensitivities may not be linear and should not be scaled. For some cross interferents break through will occur if gas is applied for a longer time period.

Carbon Dioxide sensor

High performance, general purpose CO2 sensor that provides a temperature compensated and linear CO2 measurement over sensing range. The infrared sensors operate by using the NDIR principle to monitor the presence of target gas. The sensor uses proven non-dispersive infra red (NDIR) technology to detect and monitor the presence of carbon dioxide gas. The sensor contains a long life tungsten filament infrared light source, an optical cavity into which gas diffuses, a dual temperature compensated pyroelectric infrared detector, an integral semiconductor temperature sensor and electronics to process the signals from the pyroelectric
detector .

The sensor outputs actual CO2 readings, compensated for temperature in the range -20C and +50C.

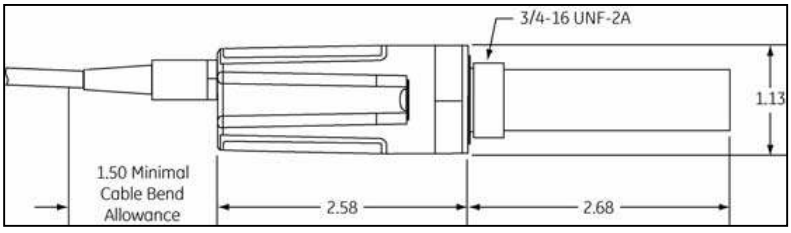
- Resolution 0 – 5000 ppm / 50 ppm resolution from 0 to 2500 ppm, then 100 ppm up to full scale
- Temperature & Humidity working range
  - -20 °C to 50 °C (-4°F to 122°F)
  - Temperature performance:
  - ± 10% of reading up to 50% FSD and ± 15% of reading from 50% to 100% FSD over the range -20°C to +50°C (-4°F to 122°F)
  - Storage temperature range: -20°C to +50°C (-4°F to 122°F)
  - 0 to 95% RH, non-condensing
- Warm-up Time
  - To final zero ± 0.2% of range : 1 minute @ 20°C (68°F) ambient (operational)
  - 10 minutes (for maximum accuracy)
- Accuracy at ambient pressure (tipical 1013 mbar)
  - sensor linearity at ambient temperature is ± 2% FSD or ± 10% of the reading which ever is greater.
  - Response Time T90: <30s @ 20°C (68°F) ambient
  - gas flow rates kept below 600 cc/minute
  - Zero Repeatability: ± 2% of full scale @ 20°C (68°F) ambient
  - Span Repeatability: ± 2% of full scale @ 20°C (68°F) ambient
  - Long term zero drift: ± 1% of full scale / month @ 20°C (68°F) ambient

Dew Point external sensor

If an extra accuracy is required, it is possible to connect an external thin-film aluminum oxide moisture sensor probe with the following features:

Moisture Ranges
• –100°C to 20°C

Note: PPMv ranges based on constant pressure, provided at time of order placement.



Operating Temperature
–40° to 60°C (–40° to 140°F)
Storage Temperature
70°C (158oF) maximum. The probe should be stored with the plastic cover and desiccant packet threaded onto the probe. Store in a cool, dry environment.

Warm-up Time
Meets specified accuracy in 3 minutes
Calibrated Accuracy @ 77°F (25°C)
• ±3.6°F (±2°C) from -85°F to 50°F (-65°C to 10°C) dew/frost point
• ±5.4°F (±3°C) from -112°F to -86°F (-80°C to -66°C) dew/frost point
• from ±4 mg/m3, ±5.6 ppmV at -60°C dew point to ±0.1 mg/m3, ±0.140 ppmV at -100°C dew point at ambient pressure and 70°F (21°) ambient temperature
Repeatability
• ±0.9°F (±0.5°C) from -85°F to 50°F (-65°C to 10°C) dew/frost point
• ±1.8°F (±1.0°C) from -112°F to -86°F (-80°C to -66°C) dew/frost point
Response Time
Less than 5 seconds for 63% of a step change in moisture content in either wet-up or dry-down cycle
Electronics
Power
• Supply voltage: 7 to 28 VDC (loop-powered, customer supplied)
• Output: 4 to 20 mA
• Output Resolution: 0.01 mA
• Max. Loop R = 50 Ω × (PSV–7), where PSV = Power Supply Voltage
Example: Given a 24 VDC Power Supply,Max. Loop R = 50 Ω × (24–7)= 850 Ω
• Cable: 2 m (6 ft.) standard (consult factory for custom lengths)
Mechanical
Sample Connection
• 3/4 in. (16 mm) 16 straight male thread with O-ring
• G 1/2 in with optional adapter
Operating Pressure
5 µHg to 5,000 psig (345 bar)
Enclosure
Type 4X/IP67
European Compliance
Complies with the following:
• EMC Directive 2004/108/EC and PED 97/23/EC for DN<25
• EN 61326:1998
Class A, Annex A, Continuous Unmonitored Operation
(For EN 61000-4-3 transmitter meets performance criteria
A and in a number of frequencies, criteria B per EN 61326)
Dimensions
• Overall: 6.76 × 1.13 in. (17.17 × 2.87 cm)
• Electronics with cable: 4.08 × 1.13 in. diameter (10.36 × 2.87 cm)
• Weight: 5 oz (140 grams)
Moisture Sensor
Calibration
Each sensor is individually computer-calibrated against known moisture concentrations, traceable to NIST
Calibration Interval
Sensor recalibration at TEMC factory is recommended every six to12 months depending on application
Calibration Data
Factory-calibrated, stored in FLASH
Flow Rate
• Gases: Static to 10,000-cm/s linear velocity at a pressure of 1 atm.
• Liquids: Static to 10-cm/s linear velocity at density of 1 g/cc

VOC sensor key specifications

- VOC analysis into the gas mix in the range of 0.01 to 20 ppm related to isobutylene
- 0.01 ppm (parts per million) resolution.
- Reading of mg/m3 with the molecular weight [g/mole]
- Setting of any known VOC response factor to isobutylene and molecular weight
- Operating life 5 years (excluding replaceable lamp and electrode stack)
- IS Approval IECEx Ex ia IIC T4; ATEX Ex ia II 1G -40ºC < Ta < +55ºC (< 10VDC supply)
- Onboard filter To remove liquids and particulates

- Lamp User replaceable
- Electrode stack User replaceable
- Error state signal Lamp out: 35 mV
- Weight < 8g
- Position sensitivity None
- Lamp and electrode stack are user replaceable. Max 10.6eV lamp life: 5,000 lit hours

PERFORMANCE

- Target gases VOCs with ionisation potentials < 10.6 eV
- Minimum detection level ppb isobutylene 1
- Linear range ppm isobutylene 3% deviation
- Overrange ppm isobutylene 50
- Sensitivity linear range mV / ppm Isobutylene > 20
- Full stabilisation time minutes to 20 ppb 20
- Warm up time seconds time to full operation 5
- Offset voltage mV variable between detectors 46 to 60
- Response time (t90) seconds diffusion mode < 3

ENVIRONMENTAL

- Temperature range -40ºC to +55ºC (Intrinsically Safe); -40ºC to +65ºC (non-IS)
- Temperature dependence 0°C to 40°C 90% to 100% of signal at 20°C
- -20°C 140% of signal at 20°C
- Relative humidity range Non-condensing 0 to 95%
- Humidity sensitivity During operations: 0% to 75% rh transient near zero

PRINTER SPECIFICATIONS

Print method	thermal direct line printing
Paper loading method	easy paper loading
Paper width	58mm
Print width	48mm
Resolution ration	8dots/mm(384dots/line)
Life of printing head	50km
Printing speed	60mm/sec.; Max.:80MM/sec.(voltage 8
Character size	ANK: 9x17,12×24; GBK: 24×24
Outline dimension（WxHxD mm)	111x65x57
Installation(WxH mm):	103x57
Embedded depth	50 mm
Paper roll specification	width:58mm, Max. diameter:39mm
Interface	RS232C/TTL/parallel/USB
Input power	DC5-9V or 12V
Operating temperature	5°C~50°C
Storage temperature	-20°C~60°C
Operating humidity	10°C~80°C
Storage humidity	10°C~90°C

Electromagnetic compatibility test for CE marking

- CEI EN 61326-1 Electrical equipment for measurement, control and laboratory use - EMC requirements
- CEI EN 55022 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- CEI EN 61000-4-2Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

Warranty

In the interest of product improvement, *TEMC*® reserves the right to alter design features and specifications without notice. Check *TEMC*® for the latest sensor and analyser specifications. Unless otherwise stated, all product specifications are quoted at standard temperature and pressure.
TEMC® warrants that its *DE-OX*® *SUB MULTIGAS* computer will be free from defects on material and workmanship for a period of twelve (12) months from the date of delivery, with the exception of sensors and batteries not manufactured in-house and that is warranted for six (6) months.

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