# OMD-507
# Oxygen Analyzer

# Document Control

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|---|---|---|
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# 1. Safety and General Information

## 1.1 Intended Use

The OMD-507 is a microprocessor-based oxygen analyzer intended for continuous oxygen measurement in compatible industrial gas streams. Depending on configuration, the analyzer may be used for trace (ppm), percent, or purity oxygen measurement.

## 1.2 General Safety

- Read this manual before installing, wiring, calibrating, operating, or servicing the analyzer.
- Do not apply voltage above the rating shown on the analyzer label.
- Observe electrostatic-discharge precautions when accessing internal electronics.
- For outdoor installations, install the analyzer inside a suitable NEMA 4X or IP66 protective enclosure.
- Properly condition sample pressure, flow, temperature, moisture, particulates, and contaminants before the gas enters the sensor housing.

## 1.3 Trace Oxygen Sensor Handling

Trace oxygen sensors are shipped in nitrogen-purged packaging. Do not open the package until the analyzer is installed and ready to purge with zero or low-oxygen gas. Minimize ambient air exposure; a trace oxygen sensor should be exposed to ambient air for at most a few minutes during installation.

## 1.4 Receiving and Inspection

Carefully unpack the analyzer and accessories. Inspect the electronics module and sensor housing for shipping damage and verify that the ordered oxygen sensor is present. Do not open the sensor package during the initial inspection.

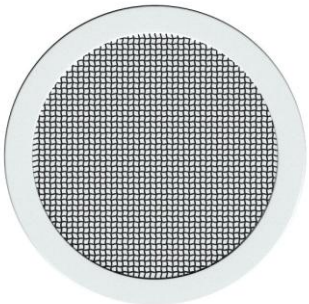
# 2. Product Overview

## 2.1 Product Overview

The OMD-507 combines Southland Sensing electrochemical oxygen sensor technology with microprocessor-based electronics, a local display, field-selectable measurement ranges, calibration functions, and analog/digital output options.


## 2.2 Principle of Operation

The electrochemical oxygen sensor contains an anode, cathode, and electrolyte within a sealed cell body. Oxygen diffuses through the sensing membrane and participates in an electrochemical reaction that generates an electrical current proportional to the partial pressure of oxygen concentration. The analyzer processes this signal and converts it into the displayed and transmitted oxygen measurement.



(Front Sensing Surface)


(Side View of Sensor)

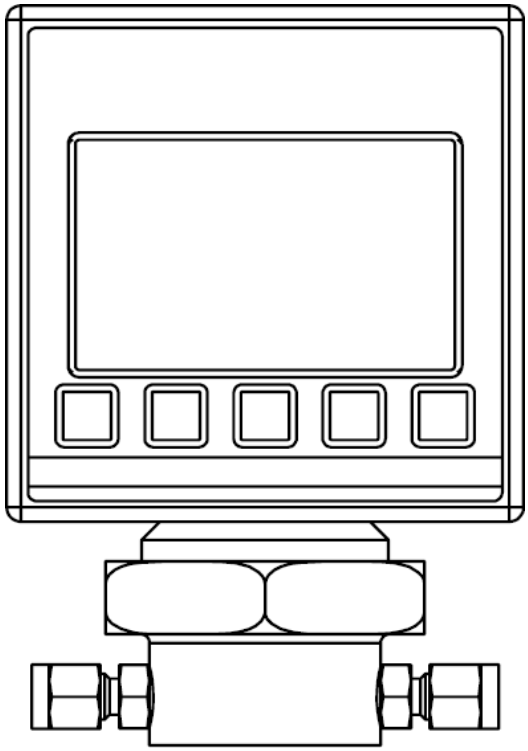
(Rear Circuit Board)

# 3. Installation

## 3.1 Mounting

The OMD-507 should be mounted upright. This keeps the sensing surface facing downward and helps prevent bubbles in the sensor electrolyte from interfering with the sensing membrane.

Horizontal mounting may be acceptable in certain applications such as inert gloveboxes, but never more than a 90-degree angle.



## 3.2 Oxygen Sensor Installation

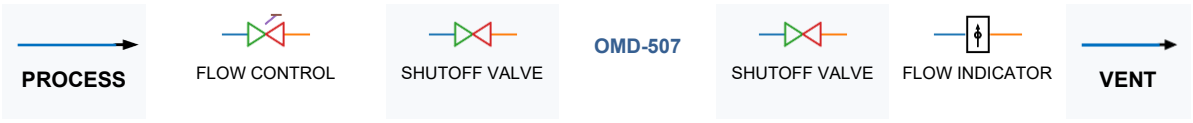
1. Complete gas and electrical connections.
2. Unscrew the stainless-steel collar and separate the upper electronics module from the lower sensor housing.
3. Inspect the O-ring; replace it if damaged, and use an approved lubricant.
4. Open the nitrogen-purged sensor package and inspect the sensor.
5. Remove the shorting strip from the sensor circuit board.
6. Install the sensor with the sensing screen facing downward and circuit-board contacts facing upward.
7. Reinstall the upper housing and hand-tighten the collar to form a leak-tight seal.
8. Immediately begin purging with zero or low-oxygen gas.
9. Perform span calibration before placing the analyzer into service.

# 4. Sample Gas and Sample System Requirements

Sample-system design directly affects measurement accuracy, response time, stability, and sensor life. Condition the sample before it reaches the analyzer and avoid pressure or flow conditions that can damage the oxygen sensor.

## 4.1 Positive-Pressure Sample

Typical arrangement for a positive-pressure process sample. Pressure and flow must be conditioned so the analyzer remains within its specified inlet pressure and flow limits.




## 4.2 Low/No-Pressure Sample

Typical arrangement when the process does not provide sufficient pressure to move the sample through the analyzer.


IMPORTANT: When a sample pump is required, install it upstream of the oxygen sensor. A downstream pump can create vacuum at the sensor and may damage it or affect measurement performance.

## 4.3 Sample-System Guidelines

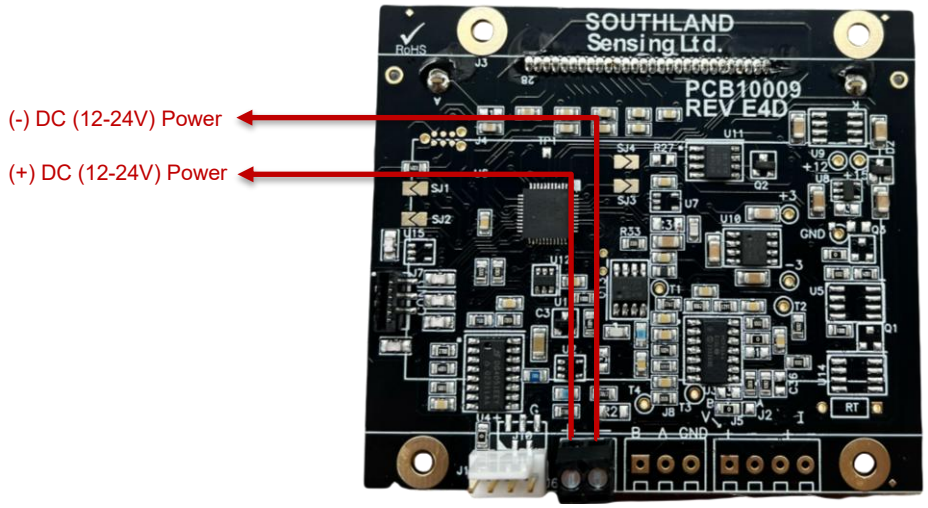
- Use seamless stainless-steel tubing and high-quality compression tube fittings for leak-tight trace oxygen sample paths.
- For ppm or lower-level oxygen measurement, use shutoff/isolation valves when the sample system must be closed or isolated.
- Vent the analyzer outlet to atmosphere or to a location that does not create backpressure.
- Use a flow indicator or rotameter to confirm sample flow. The ideal flow rate is 0.5–5.0 SCFH.
- Inlet pressure should be 0.1–50 PSIG.
- Add suitable filtration or moisture conditioning when particulates or moisture are present.
- Regulate high-pressure samples upstream of the analyzer.

**REFERENCE:** For sample-system component symbols, functions, and additional placement guidance, refer to the Southland Sensing Analyzer Sample System Component Reference Guide.

# 5. Electrical Connections

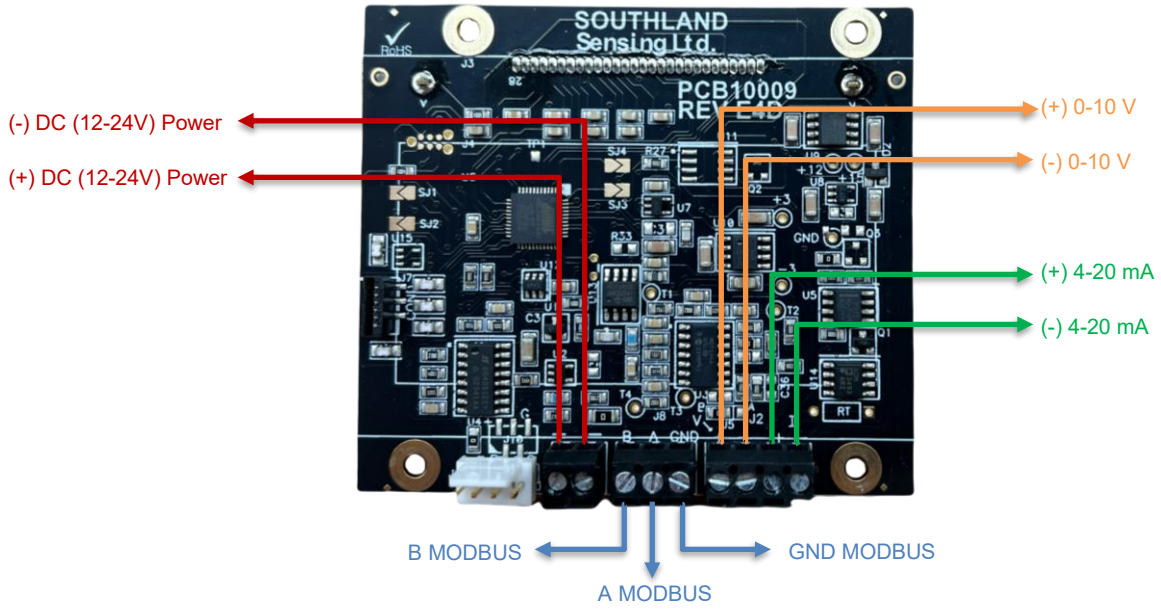
The OMD-507 is available in multiple electrical configurations. Confirm the analyzer configuration and internal label before wiring.

## 5.1 2-Wire Loop-Powered Configuration



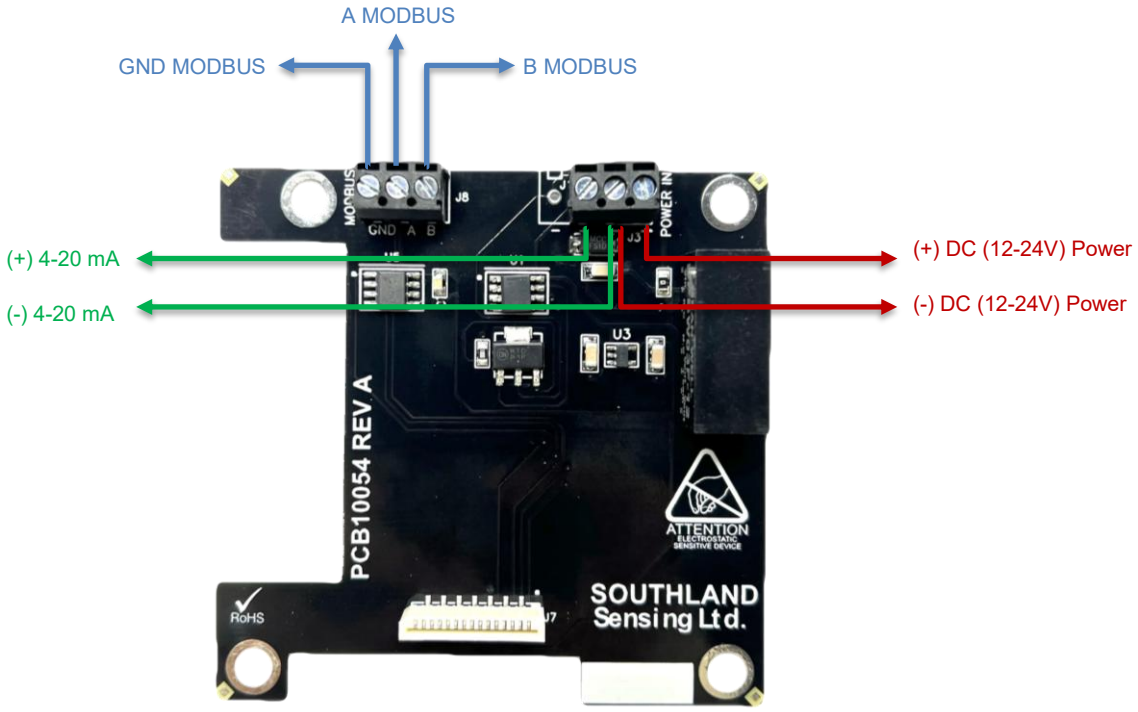

The 2-wire version is a non-isolated loop-powered device intended for PLC/DCS integration. If the receiving system does not provide required isolation, a separate signal isolator may be required.

## 5.2 6-Wire Configuration




CAUTION: Do not apply external power to the analog-output terminals. The 4-20 mA and 0-10 VDC outputs are internally generated.

## 5.3 3-Wire Configuration

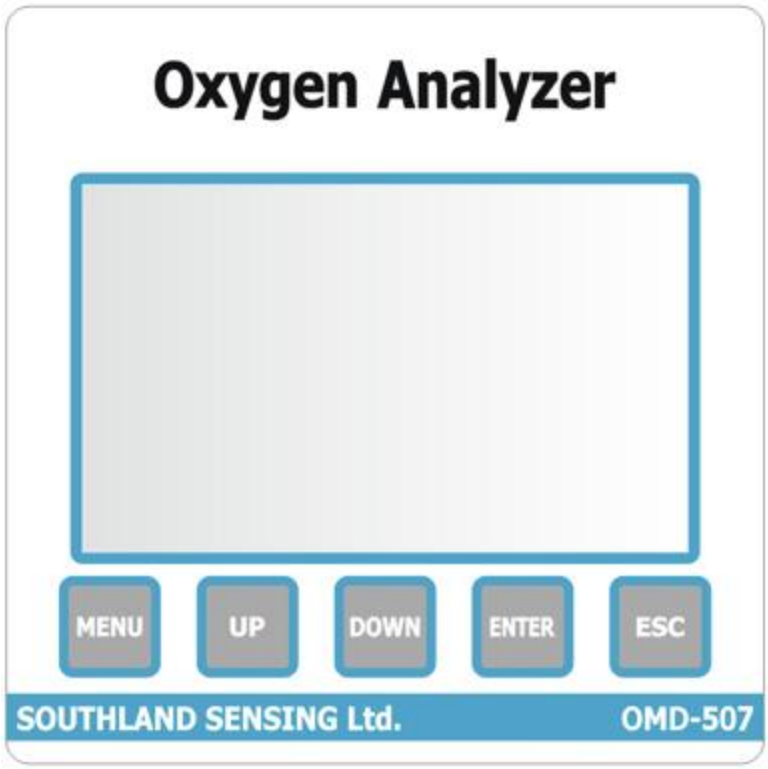



Use shielded cable where appropriate and follow plant grounding practices to minimize EMI/RFI interference.

| Configuration | Power | 4-20 mA | 0-10 VDC | MODBUS RS485 ASCII | Isolation |
|---|---|---|---|---|---|
| 2-Wire | Loop powered | Yes | No | No | Non-isolated |
| 3-Wire | 12 - 24 VDC | Yes | No | Yes | Isolated |
| 6-Wire | 12 - 24 VDC | Yes | Yes | Yes | Non-isolated |

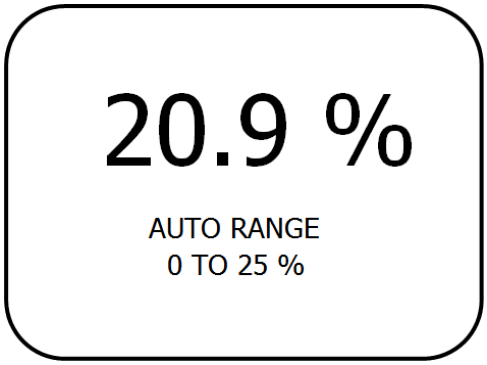
# 6. Startup and Operation

## 6.1 Front-Panel Controls




| Key | Function |
|---|---|
| MENU | Opens the main menu. |
| UP / DOWN | Moves the cursor or changes a setting/value. |
| ENTER | Accepts a selection or performs the displayed action. |
| ESC | Cancels or returns to the previous screen. |

## 6.2 Home Screen




The home screen shows the current oxygen concentration, active operating range, and whether the analyzer is in automatic or manual range mode.

### 6.3 Initial Startup

10. Verify mounting, wiring, gas connections, sample conditioning, and outlet venting.
11. Install the correct oxygen sensor and establish sample or zero-gas flow.
12. Apply power and allow the analyzer to initialize.
13. Confirm that the oxygen reading responds and trends toward the expected concentration.
14. Perform span calibration before placing the analyzer into service.

## 7. Menu and Configuration

| Menu Item | Function |
|---|---|
| AUTO RANGE | Automatically changes the analog-output range as oxygen concentration changes. |
| MANUAL RANGE | Locks the analog output to one selected full-scale range while the local display continues to show actual oxygen concentration. |
| SPAN CAL | Adjusts the analyzer reading to match a known span-gas concentration. |
| ZERO CAL | Trace/ppm function used only after a verified zero condition has been established. CAUTION: IF ZERO CALIBRATION IS REQUIRED, PURGE ZERO GAS FOR 24 HOURS BEFORE PERFORMING A ZERO CALIBRATION. |
| SYSTEM | Accesses output simulation/calibration, sensor type, custom range, and optional MODBUS ID settings. |

### 7.1 Auto Range and Manual Range

Manual Range is generally preferred when scaling a PLC/DCS analog input because the analog output remains tied to one full-scale range. The local display continues to show actual oxygen concentration even if the concentration exceeds the selected analog-output range.

### 7.2 System Functions

- OUTPUT SIM - Generates simulated analog values for checking a remote PLC/DCS input.
- OUTPUT CAL - Adjusts lower and upper analog-output calibration points.
- SENSOR TYPE - Changes between compatible ppm and percent sensor configurations.
- CUSTOM RANGE - Allows a user-defined manual full-scale range.
- MODBUS ID - Sets the address for optional MODBUS ASCII communication.

# 8. Analog and Digital Outputs

## 8.1 4-20 mA Output

For applicable configurations, the 4-20 mA signal is scaled to the selected full-scale range. Do not apply external voltage to internally powered analog-output terminals.

Signal Output (mA) = [(Reading / Full-Scale Range) x 16] + 4

Example: 500 ppm on a 0-1,000 ppm range produces approximately 12 mA.

NOTE: For 2-wire or 6-wire configurations, the 4 – 20mA is non-isolated.

NOTE: For 3-wire configurations, the 4 – 20mA has isolation.

## 8.2 0-10 VDC Output

The 0-10 VDC output is available in applicable configurations. Refer to the verified wiring diagram for terminal assignments. Do not apply external power to the output.

## 8.3 MODBUS RS485 ASCII

Optional MODBUS RS485 ASCII communication is summarized in Appendix A.

# 9. Calibration

## 9.1 General Guidance

Span calibration matches the sensor/analyzer to a known oxygen concentration. This can be accomplished through ambient-air calibration or certified span-gas calibration. Select the method appropriate for your application.

## 9.2 Ambient-Air Span Calibration

15. Read the complete procedure before exposing a trace sensor to ambient air.
16. Expose the sensor to clean ambient air, nominally 20.9% oxygen, while maintaining electrical contact with the analyzer through the gold pogo pins. The sensor sensing surface should remain pointed toward the ground.
17. Allow the reading to stabilize; this should occur within 45 seconds.
18. Press MENU and select SPAN CAL.
19. Use UP/DOWN until the displayed value matches the span value (20.9%).
20. Press ENTER and confirm PASSED.
21. For a trace sensor, promptly return the sensor to zero or low-oxygen gas.

CAUTION: Minimize ambient-air exposure of a trace oxygen sensor.

## 9.3 Certified Span-Gas Calibration

For best accuracy, use a certified span concentration near the upper portion of the intended measurement range. For example, approximately 900 ppm is suitable when calibrating for a 0-1,000 ppm range. BEST PRACTICE: Calibrate near the upper portion of the intended measurement range, or on the next higher range, and measure below the calibration concentration for optimal accuracy.

22. Connect certified span gas using a suitable regulator and sample system.
23. Establish the recommended sample flow, ideally the same flow as the process gas.
24. Allow the reading to stabilize; the analyzer often stabilizes within 5 - 10 minutes. If the reading is still trending, allow it to stabilize longer.
25. Press MENU and select SPAN CAL.
26. Adjust the displayed value to match the certified span-gas concentration.
27. Press ENTER and confirm PASSED.
28. Return the analyzer to the process or zero/low-oxygen gas as appropriate.

## 9.4 Zero Calibration

Zero calibration is not required for most applications. If a zero calibration is required for your specific application, allow zero gas to purge for 24 hours to maximize zero accuracy. Premature zeroing can produce erroneously low readings. This feature is only available for trace/ppm configuration.

# 10. Maintenance and Sensor Replacement

## 10.1 Replacing the Oxygen Sensor

Electrochemical oxygen sensors have a finite service life. As an oxygen sensor approaches the end of its service life, its output will gradually decrease. Typically, sensor output will decline by about 10% over the first 85% of sensor life. During the final 10–15% of sensor life, the output will begin to decrease more noticeably. Replace the sensor when it can no longer be successfully span calibrated or when its response no longer meets the requirements of the application.

29. Read the sensor-installation procedure before opening the replacement sensor.
30. Establish zero or low-oxygen purge gas before removing a trace sensor from its package.
31. Unscrew the sensor-housing collar and remove the electronics module.
32. Remove the old sensor and dispose of it in accordance with applicable regulations.
33. Remove the new sensor from its package and remove the shorting strip.
34. Install the new sensor with the sensing surface downward and circuit-board contacts upward.
35. Reassemble the housing and immediately begin purge gas flow.
36. Perform span calibration.

## 10.2 Routine Maintenance

- Periodically inspect tubing, fittings, valves, and the sensor-housing O-ring for leaks or damage.
- Verify sample flow and confirm that the analyzer outlet is not restricted.
- Calibrate at an interval appropriate for the application and quality system.
- Replace the oxygen sensor when it can no longer be calibrated or when response/performance is no longer acceptable.

# 11. Troubleshooting

Detailed troubleshooting procedures are maintained separately in the OMD-507 Troubleshooting Guide. Refer to the current guide for symptom-based checks, corrective actions, and additional troubleshooting information.

For unresolved problems, contact Southland Sensing application or technical support at 1-949-398-2879 or sales@sso2.com.

# 12. Replacement Parts

| Part Number | Description |
|---|---|
| TO2-19 | Hybrid PPM / Percent Oxygen Sensor – Inert Background Gas |
| TO2-1x | Trace Oxygen Sensor – Inert Background Gas |
| TO2-2x | Trace Oxygen Sensor - CO2 Background Gas |
| PO2-160 | Percent Oxygen Sensor – Inert Background Gas |
| PO2-24 | Percent Oxygen Sensor - CO2 Background Gas |
| PO2-1120 | Purity Oxygen Sensor – Inert Background Gas |
| ORING-1001 | H3, H6 and H6L sensor housing o'ring |

# Appendix A. MODBUS RS485 ASCII Communication

| Parameter | Setting |
|---|---|
| Protocol | MODBUS ASCII over RS485 |
| Baud rate | 19200 |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | Even |
| Device ID | User selectable 1-99 |

Function 04 is the primary function used for reading gas concentration. A separate MODBUS ASCII instruction guide is available that covers the register map, command examples, data format, and LRC.

# Appendix B. Additional Documentation

The following product documents are maintained separately so the most current revision can be provided without expanding the printed owner's manual:

- OMD-507 Datasheet
- OMD-507 Menu Guide
- OMD-507 Troubleshooting Guide
- OMD-507 MODBUS RS485 ASCII Communication Guide
- Oxygen Sensor Safety Data Sheet (SDS)
- Southland Sensing Warranty Statement
- Certificate of Conformance / Documentation Request

Current documentation is available from the OMD-507 product/support page at www.sso2.com, or contact us directly at sales@sso2.com.