

Congratulations !

Your new **miniCHEM-DO₂** monitor is the latest in simple, reliable process monitoring instrumentation. With correct operation and maintenance, your **miniCHEM-DO₂** will give you many years of reliable service.

The **miniCHEM-DO₂** is a breeze to operate. This manual has been designed to help you get started, and also contains some handy application tips. If at any stage you require assistance, please contact either your local TPS representative or the TPS factory in Brisbane.

The manual is divided into the following sections:

1. Table of Contents

Each major section of the handbook is clearly listed. Sub-sections have also been included to enable you to find the information you need at a glance.

2. Introduction

The introduction has a diagram and explanation of the display and controls of the **miniCHEM-DO₂**. It also contains a full listing of all of the items that you should have received with the unit. Please take the time to read this section, as it explains some of items that are mentioned in subsequent sections.

3. Main Section

The main section of the handbook provides complete details of the **miniCHEM-DO₂**, including operating modes, calibration, troubleshooting, specifications, and warranty terms.

4. Appendices

Appendices containing background information and application notes are provided at the back of this manual.

miniCHEM-DO₂ Process Monitor

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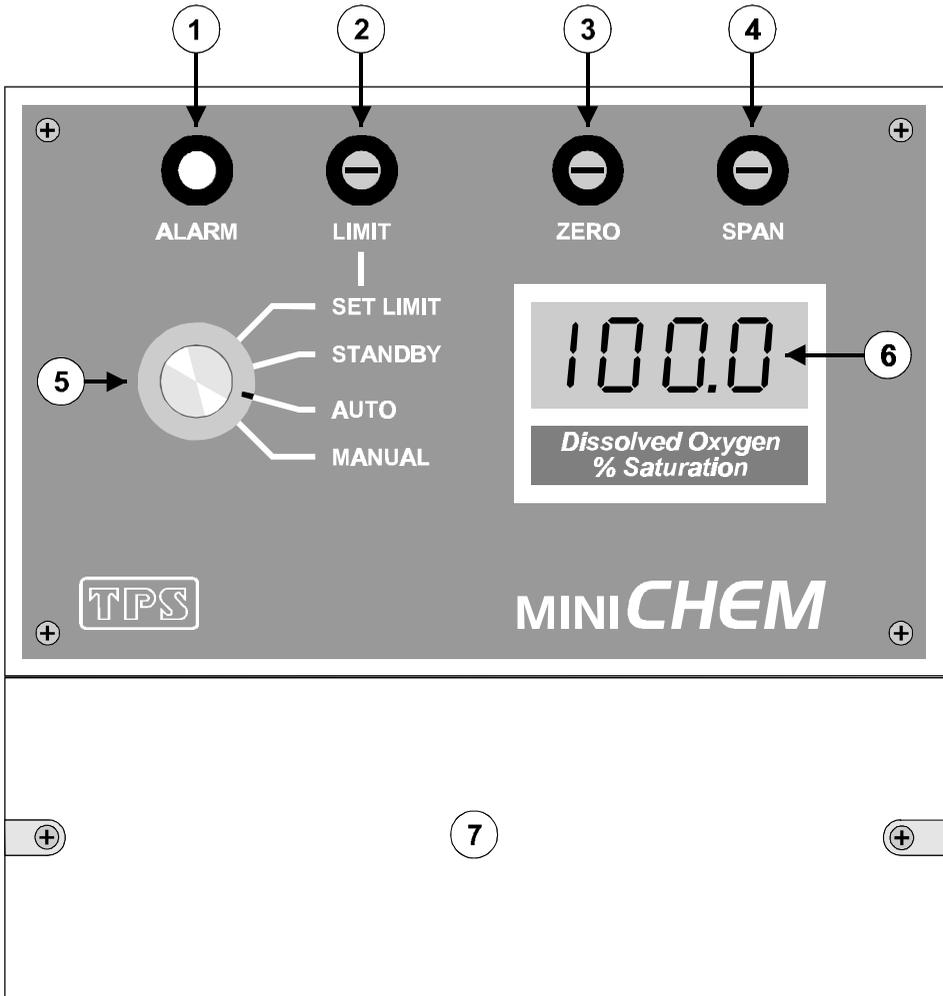
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1. Introduction

1.1 miniCHEM-DO₂ Illustration



① Alarm LED

The Alarm LED provides visual indication of when the control limit has been exceeded. The control limit can be set for a “too high” or a “too low” alarm. See section 0.

② Limit Control

Adjust this control to the Dissolved Oxygen value at which the Alarm LED and (optional) relay output are activated. See section 0.

③ Zero Calibrate Control

Adjust this control to calibrate the **miniCHEM-DO₂** in an Oxygen-free solution. See section 4.1.

④ Span Calibrate Control

Adjust this control to calibrate the **miniCHEM-DO₂** in air, or against a Winkler titration. See section 4.1.

⑤ Function Switch

The Function Switch is used to select the mode of operation. See section 2.

⑥ Display Window

The **miniCHEM-DO₂** has a large, easy to read LCD display. The units of measurement are clearly shown in the window beneath the display.

⑦ Terminal Cover

The terminal cover provides easy access to all of the connections, (optional) relay output fuse, configuration jumpers and user-adjustable trimmers. The cover is water resistant to IP65.

1.2 Unpacking Information

Before using your new **miniCHEM-DO₂**, please check that the following accessories have been included:

	Part No
1. miniCHEM-DO₂ Process Monitor	113140
2. miniCHEM-DO₂ Handbook	130050

Options that may have been ordered with your miniCHEM-DO₂:

TPS Dissolved Oxygen Sensor (submersible to 3 metres max)...

1. ED1M Dissolved Oxygen sensor (no cable)	123440
2. 5m cable for ED1M	123236
3. Extended cable (per metre)	130040

YSI Dissolved Oxygen Sensor and separate cable...

1. EDYSI Dissolved Oxygen sensor (no cable)	123204
2. 5m cable for EDYSI	123210
3. Extended cable (per metre)	130040

Instrument options...

1. Relay control output	130342
2. 4-20mA loop-powered, remote LCD	130080

Spares...

1. Membrane Kit for ED1M	123301
2. Membrane Kit for EDYSI	123300
3. Sodium Sulphite for Zero calibration	123302

1.3 Specifications

Ranges.....	0 to 199.9 % Saturationor 0 to 19.99 ppM (mg/L) (Factory-set)
Resolution	0.1 % Saturationor 0.01 ppM (mg/L)
Accuracy	±0.2 % of full scale
Linearity.....	±0.1 %
Repeatability.....	±0.2 %
Ambient Drift	<0.05 % span per 1°C change
Long term drift	<0.2% per year
Zero Range	±10 %
Span Range	70 to 130 %
Temperature Compensation.....	Dual automatic temperature compensation system, 0 to 50 °C (sensor limit)
Enclosure.....	Polycarbonate, waterproof to IP65
Display.....	12.7 mm LCD (optional remote 4-20mA loop powered display available)
Analogue Outputs	4 to 20mA (500 Ohms max. loop resistance) 0 to 1 V DC (min. load 1000 Ω) 0 to 10 V DC optional (min. load 1000 Ω)
Control Output (optional).....	Clean contact changeover relay, rated to 2A at 240V AC
Isolation.....	Galvanic isolation of sensor input
Power	240V AC, 50/60Hz (120V AC optional)
Dimensions	172 x 160 x 71 mm
Mass	Instrument only : Approx 800g Full Kit : Approx 1.5kg
Operating Environment:	Temperature : 0 to 45 °C Humidity : 0 to 95 % R.H.

2. Operating Modes

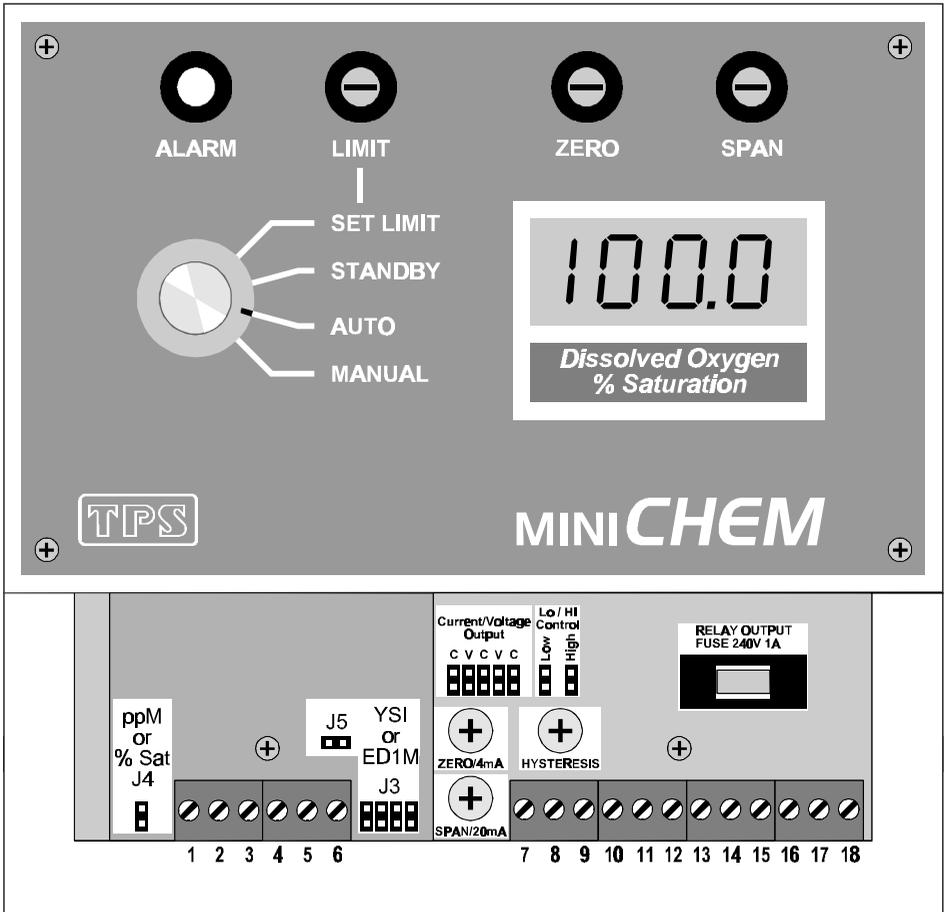
The function switch is used to select the required mode. The four operating modes available are...

1. **SET LIMIT** : Switch to **SET LIMIT** when setting the Dissolved Oxygen value at which the Alarm LED and (optional) relay output are activated. The relay output is not operational in this mode. See section 0.
2. **STANDBY** : Switch to **STANDBY** to inhibit the Alarm LED and (optional) output relay action. Select this mode for calibration, or when automatic dosing is not required.
3. **AUTO** : Switch to **AUTO** to enable the Alarm LED and (optional) relay output. These will be activated when the Dissolved Oxygen is outside the limit value. See section 0.
4. **MANUAL** : Switch to **MANUAL** to manually switch on a control device or alarm when the optional relay output is fitted. The relay output will be activated for as long as the **miniCHEM-DO₂** is in this mode, regardless of the Dissolved Oxygen reading. See section 7.

3. Installation and Set-up

3.1 Connection and Configuration Diagram

The diagram below is provided as a reference for the terminal connections, configuration jumpers and user-adjustable trimmers that are discussed throughout this section.



3.2 Mounting the Enclosure

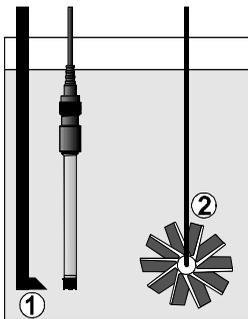
The **miniCHEM-DO₂** can be wall-mounted with 3 screws. Two mounting points are located underneath the terminal cover, and are positioned so that they do not affect the waterproofing of the enclosure. The third mounting point is centrally located near the top of the rear of the enclosure, and has been designed to hook over a screw-head. The dimensions for the mounting screw centres are provided on the rear of the enclosure. The last page of this manual may be photocopied or removed for use as a drilling template.

3.3 Mounting the Sensors

Mounting the sensor is a very important aspect of the installation, and is often done incorrectly. In automatic control situations, the sensor should always be mounted as close as possible to the injection point. This will cause the sensor to detect the added oxygen or chemicals immediately, and shut the addition off until mixing has taken place. For in-line mounting, it is important that oxygen or chemicals are injected upstream. Additionally, the line must be run through a mixing chamber, such as a large drum, to ensure that the injected oxygen or chemical has mixed in properly by the time the solution flows past the sensor. There must always be adequate flow of fresh sample past the sensor, for accurate monitoring. The diagrams below show typical mounting arrangements for “dip” mounting and in-line mounting.

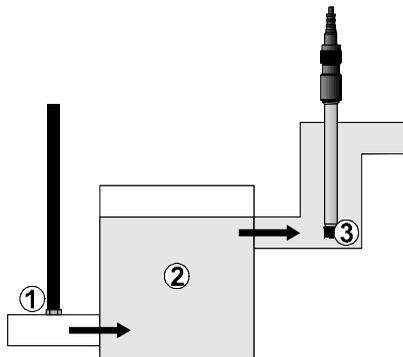
Dip Mounting

1. Injection point close to sensor.
2. Continuous stirring.



In-line Mounting

1. Injection point upstream from and close to sensor.
2. Mixing container after injection and before sensor.
3. DO₂ sensor mounted as close to vertical as practical, through a suitable gland fitting.



3.4 Terminal Connections

Note: The power connections detailed below are for normal mains power. Refer to section 10.7 for power wiring details when the 12V DC power option is fitted.

Terminal No.	Connection	Colour
1	ATC Sensor for ppM operation	Red
2	ATC Sensor for ppM operation	Blue
3	No Connection	
4	Common	Black
5	DO ₂ Sensor Anode	Green
6	DO ₂ Sensor Cathode	Yellow
7	+ve of current or voltage output	Customer-defined
8	-ve of current or voltage output	Customer-defined
9	No Connection	
10	Normally Closed contact of (optional) relay output	Customer-defined
11	Common contact of (optional) relay output	Customer-defined
12	Normally Open contact of (optional) relay output	Customer-defined
13	240V AC Active input	Brown (standard colour)
14	Duplicate 240V AC Active contact. See section 10.7.	Brown (standard colour)
15	240V AC Earth input	Green (standard colour)
16	Duplicate 240V AC Earth contact. See section 10.7.	Green (standard colour)
17	240V AC Neutral input	Blue (standard colour)
18	Duplicate 240V AC Neutral contact. See section 10.7.	Blue (standard colour)

* The ATC connection to terminals 1 & 2 is only for when the unit is reading ppM (mg/L) units. **DO NOT** connect these for % Saturation readout.

3.5 Setting the Control Limit

The control limit can be set over the full scale of the **miniCHEM-DO₂**, as a “too high” or a “too low” trip point. The hysteresis around this set point can be also be adjusted, if necessary. See section 3.5.3 for an explanation of hysteresis.

3.5.1 Setting the limit value

1. Switch the **miniCHEM-DO₂** to **SET LIMIT**.

The control limit value is now displayed. Note that the Alarm LED and (optional) output relay are now disabled. The 4-20mA or 0-1V outputs are still active, and proportional to displayed value.

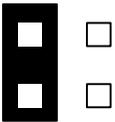
2. Adjust the **LIMIT** control until the display reads the desired trip point value.

3.5.2 Setting the alarm/control direction

The control limit can be set as a “too high” or “too low” trip point using the **Lo/Hi Control** jumpers in the terminal area. The **miniCHEM-DO₂** must be switched OFF before changing jumper settings.

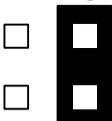
The jumper settings for a “too low” trip point are...

Low High



The jumper settings for a “too high” trip point are...

Low High



3.5.3 *Adjusting the Hysteresis*

The hysteresis is the Dissolved Oxygen range over which the alarm/control output remains switched on, once the trip point has been exceeded.

For example, if the limit is set to 10.00 ppM, as a “too low” trip point, with a hysteresis of ± 0.10 ppM, the alarm/control output is switched ON when the reading goes to 9.90 ppM (i.e. $10.00 - 0.10$). The output is not switched OFF until the reading goes back up to 10.10 ppM (i.e. $10.00 + 0.10$).

The hysteresis stops the relay “chattering” around the set point, by providing a buffer between the points at which the output is switched ON and OFF. This feature can significantly increase the life of aerators, pumps, solenoid valves etc.

The factory-set hysteresis is approximately ± 0.10 ppM, as in the example above. The hysteresis can be increased to as high as ± 2.00 ppM with the **HYSTERESIS** trimmer in the terminal area. For units set up for % Saturation, the factory-set hysteresis is approximately ± 1.0 % Saturation, which can be adjusted to ± 20.0 % Saturation.

Turning the **HYSTERESIS** clockwise increases the hysteresis and turning it anti-clockwise decreases the hysteresis.

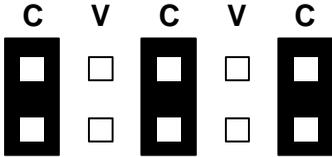
TPS DOES NOT recommend that this setting be altered, unless it is absolutely necessary.

The **HYSTERESIS** trimmer should only be adjusted a little at a time. The process being controlled should then be closely monitored over a time to ensure that the desired control is being achieved.

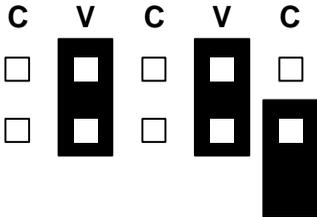
3.6 Selecting Current or Voltage Output

The **Current/Voltage Output** jumpers in terminal section can be user-set for either 4 to 20mA or 0 to 1V DC output. The **miniCHEM-DO₂** must be switched OFF before changing jumper settings.

The jumper settings for 4 to 20 mA output are:



The jumper settings for 0 to 1V DC output are:



Note that the spare jumper has been fitted to a spare **Current/Voltage Output** jumper pin. This is a safe place to keep it, in case the **miniCHEM-DO₂** needs to be reset to current output in the future.

0 to 10V DC output is available as a factory fitted option. The jumper settings are the same as detailed above, but the 0 to 1V DC output will no longer be available.

3.7 Calibrating the 4 to 20mA Output

The 4 to 20mA output of the **miniCHEM-DO₂** is factory calibrated. However, TPS has provided calibration controls for the 4mA and 20mA points in case this requires adjustment in the field. Only a limited amount of adjustment is available, as the **miniCHEM-DO₂** is designed for 4 to 20mA output for the full scale of the instrument.

Calibrating the 4 to 20mA output...

1. Connect a Digital Milliamp Meter between terminals 7 and 8.
2. Switch the **miniCHEM-DO₂** to **SET LIMIT**.
3. Adjust the **LIMIT** control until the display reads 0.00.
4. Adjust the **ZERO/4mA** trimmer in the terminal area until the Digital Milliamp Meter reads 4 mA.
5. Adjust the **LIMIT** control until the display reads 19.99 ppM or 199.9 % Saturation.
6. Adjust the **SPAN/20mA** trimmer in the terminal area until the Digital Milliamp Meter reads 20 mA.

*In the event that the **LIMIT** control does not have sufficient adjustment to reach 0.00 or 19.99/199.9, calculate the expected output level and use this for calibration. Remember that the difference between 0 and 19.99/199.9 is to be made 16mA.*

4. Calibration

4.1 Calibration Procedure

1. Switch the **miniCHEM-DO₂** on.
2. Ensure that the Dissolved Oxygen sensor is correctly connected (see section 3.4).
3. Set the function switch to **STANDBY**, to ensure that the (optional) relay output is not activated by the Dissolved Oxygen sensor's response.
4. Rinse the Dissolved Oxygen sensor in distilled water and blot dry.

Zero Calibration

5. (a) Place the sensor into an oxygen-free solution. This solution may be prepared by dissolving 2g of Sodium Sulphite in 100mL of distilled water. A 50g bottle of Sodium Sulphite powder is supplied with new ED1M and EDYSI sensors for this purpose (part number 123302).
(b) Allow the reading to stabilise at or near zero. This may take 2-3 minutes.
(c) Adjust the **ZERO** control until the display reads 0.00 ppm or 0.0 % Saturation.
6. Rinse the Dissolved Oxygen sensor in distilled water and blot dry.

Span Calibration

7. (a) Hang the Dissolved Oxygen sensor in air. The tip of the sensor should be pointing downwards.
(b) Allow the reading to stabilise. After a zero calibration, this may take up to 5 minutes.
8. (c) For % Saturation readout, adjust the **SPAN** control until the display reads 100.0.

For ppm readout, adjust the **SPAN** control for the ppm (mg/L) Dissolved Oxygen value at the current air temperature, and the expected salinity value of the sample solution. A table is provided in section 10.1 for this purpose.

If the expected salinity value of the sample solution is quite high, there may not be enough adjustment in the **SPAN** control to calibrate the readout. If this is the case, please see section 10.3 for details on how to set the internal jumpers to allow for higher salinities.

9. The **miniCHEM-DO₂** is now calibrated and ready for Dissolved Oxygen measurements.

4.2 Calibration Notes

1. A Span calibration should be performed at least weekly. In applications where the sensor can become dirty or coated, such as sewage effluent, mining slurries etc, a Span calibration may have to be done daily.
2. The Zero calibration is quite stable long term. Monthly Zero calibration is recommended, mainly as a routine check.
3. Both a Zero and a Span calibration need to be performed when the membrane is replaced.

5. Process Monitoring

Once the **miniCHEM-DO₂** has been installed, connected and calibrated, it can be used for continuous monitoring. To monitor the process, WITHOUT any control or alarm functions switch the function switch to **STANDBY**.

6. Automatic Dosing

For Automatic Alarming or Control, switch the function switch to **AUTO** to enable the Alarm LED and the (optional) relay output. These will be switched ON while the Dissolved Oxygen exceeds the limit value, and will switch OFF once the Dissolved Oxygen is back within the limit.

7. Manual Dosing

From time to time, the control device (aerator etc.) may be required, even when the Dissolved Oxygen is within the limit value. To do this, simply switch the function switch to **MANUAL**, if the (optional) relay output is fitted.

NOTE: The output will be ON continuously while the function switch is set to **MANUAL**. It will not be switched OFF again until the switch is set back to one of the other modes.

8. Fuse Replacement

If the current drain from any device connected to the output relay exceeds 1 Amp, the output protection fuse will blow.

To replace the fuse...

1. SWITCH THE **miniCHEM-DO₂** OFF.
2. Pull out the black fuse carrier.
3. Replace the blown fuse
4. Push the fuse carrier with the new fuse back into place.

ALWAYS REPLACE THE FUSE WITH A 1 AMP, 240V FUSE. USING A FUSE WITH HIGHER CURRENT RATING MAY DAMAGE YOUR CONTROLLER, VOIDING THE WARRANTY.

Before switching the **miniCHEM-DO₂** back to **AUTO** mode, ensure that the cause of the blown fuse has been eliminated.

If the current drain of the device connected to the relay output is greater than 1 Amp, an external contactor should be used. Please consult an electrical contractor or TPS for details.

9. Troubleshooting

9.1 Instrument Function Troubleshooting

Symptom	Possible Causes	Remedy
No display	<ol style="list-style-type: none"> 1. Mains power input not switched on. 2. Mains power input incorrectly connected. 3. Instrument is faulty. 	<p>Switch power ON.</p> <p>Check connections (see section 3.4).</p> <p>Return to TPS for repair.</p>
Alarm LED or (optional) relay output do not operate when limit is exceeded.	<ol style="list-style-type: none"> 1. Limit not set correctly for “too high” or “too low” alarm/control. 2. Optional relay output not fitted. 3. Hysteresis too large. 4. Fuse has blown. 5. Instrument is faulty. 	<p>Set the Lo/Hi Output jumpers correctly (see section 3.5.2).</p> <p>Return unit to factory to have relay output fitted (part no 130342).</p> <p>Check and adjust the HYSTERESIS trimmer (see section 3.5.3). If in doubt, set this to minimum level.</p> <p>Check and replace fuse if necessary (see section 8).</p> <p>Return to TPS for repair.</p>
Incorrect analogue output signal.	<ol style="list-style-type: none"> 1. Current/Voltage Output jumpers incorrectly set for required output. 2. 4-20mA loop resistance too high. 3. Load on 0-1V DC output is too low. 4. 4-20mA output is not calibrated. 5. Instrument is faulty. 	<p>Check that the Current/Voltage Output jumpers are correctly set for 4-20mA or 0-1V, as per requirements. Adjust if necessary (see section 3.6).</p> <p>Ensure loop resistance does not exceed 500 Ohms.</p> <p>Ensure load is 1000 Ohms minimum.</p> <p>Calibrate 4-20mA output (see section 3.7).</p> <p>Return to TPS for repair.</p>

9.2 Dissolved Oxygen Troubleshooting

Symptom	Possible Causes	Remedy
<ul style="list-style-type: none"> • Zero calibration fails (Zero is greater than 10%) • Air calibration fails (Span is less than 70% or greater than 130%). • Unstable or inaccurate readings. 	<ol style="list-style-type: none"> 1. Membrane is leaking or broken. 2. Gap between membrane and gold cathode is dry. 3. Incorrectly fitted membrane. 4. Sensor is empty. 5. Sensor is faulty. 	<p>Replace membrane and refill sensor.</p> <p>ED1M: Undo the barrel 3 turns, then re-tighten to re-flush the filling solution.</p> <p>EDYSI: Gently pump the pressure compensation diaphragm to re-flush the filling solution.</p> <p>Membrane should be smooth and convex with no wrinkles. Re-fit membrane if necessary.</p> <p>Replace membrane and re-fill electrode.</p> <p>Return sensor to factory for repair or replacement</p>
Blackened Silver anode wire	Electrode has been exposed to sulphides or other chemical poisoning.	See section 10.4 for the sensor cleaning procedure. If no improvement, return to the TPS factory for cleaning and service.
Tarnished or scratched Gold cathode.	Sensor has been chemically poisoned or physically damaged.	Return to the TPS factory for cleaning and service.
Meter reads “1. ” (over-range reading).	<ol style="list-style-type: none"> 1. Sensor has not yet polarised. 2. Electrode is faulty 	<p>Wait for 2-3 minutes for the electrode to polarise after the miniCHEM-DO₂ is switched on.</p> <p>Return electrode to factory for repair or replacement.</p>

10. Appendices

10.1 ppM (mg/L) Calibration Table

Salinity					
g/L Cl ⁻	0	4	8	16	20
ppK NaCl	0	6.6	13.2	26.4	33
Temp °C	Dissolved Oxygen, ppM (mg/L)				
0	14.57	13.91	13.26	11.94	11.29
1	14.17	13.54	12.90	11.63	11.00
2	13.79	13.18	12.56	11.33	10.72
3	13.43	12.83	12.24	11.05	10.45
4	13.08	12.50	11.93	10.78	10.20
5	12.74	12.19	11.63	10.52	9.96
6	12.42	11.88	11.34	10.27	9.73
7	12.11	11.59	11.07	10.03	9.51
8	11.81	11.31	10.81	9.80	9.30
9	11.53	11.04	10.56	9.58	9.09
10	11.26	10.79	10.31	9.37	8.90
11	10.99	10.54	10.08	9.17	8.72
12	10.74	10.30	9.86	8.98	8.54
13	10.50	10.07	9.65	8.79	8.37
14	10.27	9.86	9.44	8.62	8.20
15	10.05	9.65	9.25	8.45	8.04
16	9.83	9.44	9.06	8.28	7.89
17	9.63	9.25	8.87	8.12	7.74
18	9.43	9.06	8.70	7.97	7.60
19	9.24	8.88	8.53	7.82	7.46
20	9.06	8.71	8.36	7.67	7.32
23	8.55	8.22	7.90	7.25	6.93
24	8.39	8.07	7.76	7.12	6.80
25	8.24	7.93	7.61	6.99	6.68
26	8.09	7.78	7.47	6.86	6.55
27	7.95	7.64	7.34	6.73	6.42
28	7.81	7.51	7.21	6.60	6.30
29	7.68	7.38	7.07	6.47	6.17
30	7.55	7.25	6.95	6.34	6.04
31	7.42				
32	7.30				
33	7.18				
34	7.07				
35	6.95				

10.2 Selecting % Saturation or ppM (mg/L) Readout

Switch the miniCHEM-DO₂ OFF before changing any jumper settings.

10.2.1 % Saturation Configuration

1. Set the **ppM** jumper in the terminal area to be open. Fit the jumper to one of the pins, as shown below, in case this is needed later.

ppM
or
% Sat

J4



2. (a) Remove the function knob and the four screws at each corner of the front panel. Remove the front panel.
(b) The **Decimal Point** jumpers are three pairs of jumpers, located at the top left hand side of the display.

Set the **Decimal Point** jumpers as shown below.



3. Ensure that the Red and Blue of the sensor cable ARE NOT connected to terminals 1 and 2 (see the connection diagram in section 3.1).

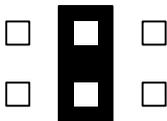
10.2.2 ppM (mg/L) Configuration

1. Set the **ppM** jumper in the terminal area to be closed, as shown below.



2. (a) Remove the function knob and the four screws at each corner of the front panel. Remove the front panel.
(b) The **Decimal Point** jumpers are three pairs of jumpers, located at the top left hand side of the display.

Set the **Decimal Point** jumpers as shown below.



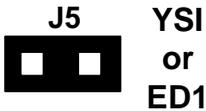
3. Ensure that the Red and Blue of the sensor cable are connected to terminals 1 and 2 (see the connection diagram in section 3.1).

10.3 Selecting YSI or ED1M Dissolved Oxygen Sensor

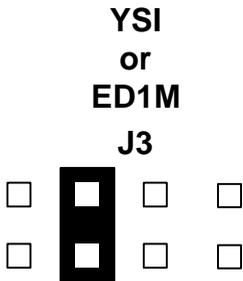
Switch the **miniCHEM-DO₂** OFF before changing any jumper settings.

10.3.1 YSI Dissolved Oxygen Sensor Configuration

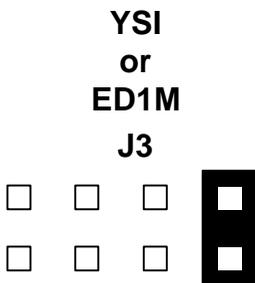
1. Set the **YSI or ED1M (J5)** jumper in the terminal area to be closed.



2. (a) Set the **YSI or ED1M (J3)** jumper in the terminal area across the second jumper (from the left).

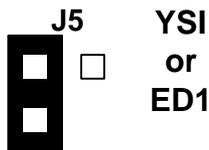


- (b) When the **miniCHEM-DO₂** is set to ppm readout and the samples have a high salinity, there may not be enough adjustment available with the **SPAN** control to calibrate the unit. If this is the case, set the **YSI or ED1M (J3)** jumper to the following setting...

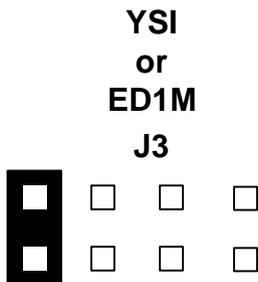


10.3.2 ED1M Dissolved Oxygen Sensor Configuration

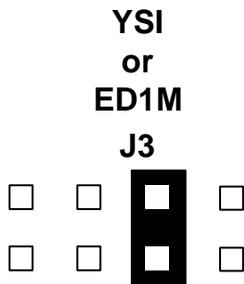
1. Set the **YSI or ED1M (J5)** jumper in the terminal area to be open. Fit the jumper to one of the pins, as shown below, in case this is needed later.



2. (a) Set the **YSI or ED1M (J3)** jumper in the terminal area across the first jumper (from the left).



- (b) When the **miniCHEM-DO₂** is set to ppM readout and the samples have a high salinity, there may not be enough adjustment available with the **SPAN** control to calibrate the unit. If this is the case, set the **YSI or ED1M (J3)** jumper to the following setting...



10.4 Cleaning the Dissolved Oxygen Sensor

If the silver anode of a Dissolved Oxygen sensor becomes contaminated with materials such as sulphide, the electrode will become poisoned. This will cause calibration to become more difficult and eventually impossible. The following procedure can be used for less serious poisoning.

1. Ensure that the electrode is actually the faulty part of the system, by trying a different electrode, cable or meter. If any of these items are not available, check all cable connections, the meter's battery, the temperature readout and the condition of the membrane. If the membrane is loose, has bubbles underneath it or is dirty or greasy, replace it and try the probe again.
2. If you have determined that the probe is the faulty part...
 - (a) For the ED1M, completely unscrew and remove the barrel. The silver anode is the wire wrapped around the sensor stem.
 - (b) For the EDYSI, remove the membrane and the pressure compensation pump assembly (refer to the YSI instruction leaflet). The silver anode is the triangular block inside the tip of the sensor.

The usual indication of poisoning of the silver anode is blackening.

3. Rinse the sensor to remove any loose particles.
4. Soak the electrode for 10 minutes in 5% Ammonia solution.
5. Rinse well under a tap.
6. If an ultra-sonic cleaning bath is available, add a few drops of detergent (eg: dishwashing liquid) to the water so that it covers the silver anode. Turn on the cleaner for approximately 5 minutes.
7. Rinse well under a tap.
8. Re-assemble the sensor, re-fill the electrode and fit a new membrane, as per the instructions supplied with the sensor.
9. If the electrode still fails to calibrate or read correctly, TPS can attempt further cleaning by electrolysis. This procedure removes the outmost layer of the anode and actually reduces its size. Whilst the procedure is hard on the sensor, it does often restore the probe's performance.
10. If poisoning is a problem for the EDYSI, then please refer to the YSI instruction leaflet and TPS appendix to the leaflet regarding correct fitting of the membrane.

10.5 Maintenance of the Membrane

The membrane does not require replacement as long as it remains intact. If punctured or suspected of leaking around the edges, it must be replaced.

To replace the membrane of the EDYSI sensor, see the separate leaflet with which it is supplied.

To replace the ED1M membrane...

1. Unscrew the lower barrel and carefully remove it from the probe. Ensure that the internal lexan barrel is not touched with the fingers, as the metallic surfaces are easily contaminated.
2. Remove the plastic cap and membrane from the end of the barrel.
3. Cut a 30 mm square (approx.) piece of membrane material from your probe maintenance kit. Hold this over the end of the barrel, and push the plastic retaining cap back into place evenly. A little moisture on the outside of the membrane will let the cap slip on easily. The excess membrane may be trimmed off with a razor blade.
4. Pour enough 0.1 Molar KCl solution into the barrel to fill only 1/3.
5. Push the barrel carefully onto the lexan internal rod. As this is done, check for leaks on the membrane. The internal rod can be used to gently "pump" the membrane to check for leaks.
6. If no leaks can be seen, screw the outer barrel into place, so that the membrane is evenly and smoothly stretched over the gold internal cathode (gold bead at end). DO NOT OVER-TIGHTEN.

If the probe is washed off and put in fresh water, then, by viewing obliquely in a strong light, it is possible to see electrolyte "streaming" from the tip if it is leaking (even slowly). The effect is one of differential refractive index and is quite sensitive.

If the response is low, or zero impossible, or reading over-ranged, fit a new membrane.

10.6 Dissolved Oxygen Sensor Storage

The Oxygen probe should be kept moist when not in use to prevent the thin film of electrolyte behind the membrane from drying out. To achieve this, the probe can be stored with the tip in water.

For long term storage of several weeks or more, remove and empty the barrel. Replace the barrel with the membrane intact. When the electrode is stored in this way, the membrane should be replaced and the electrode refilled before use.

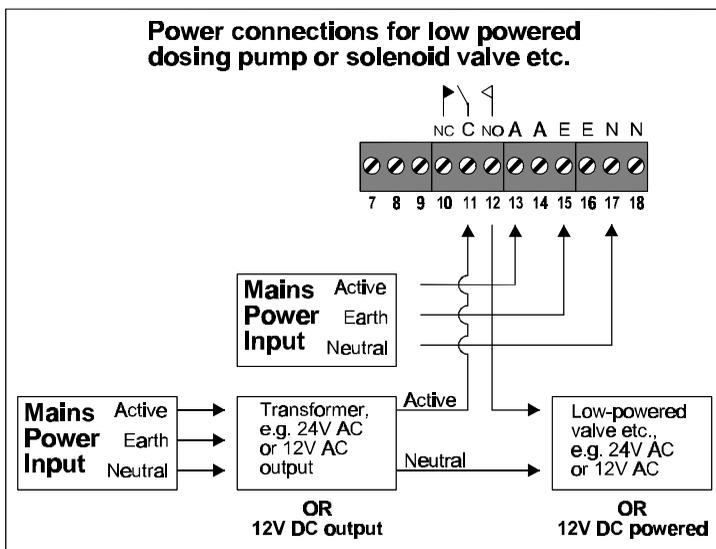
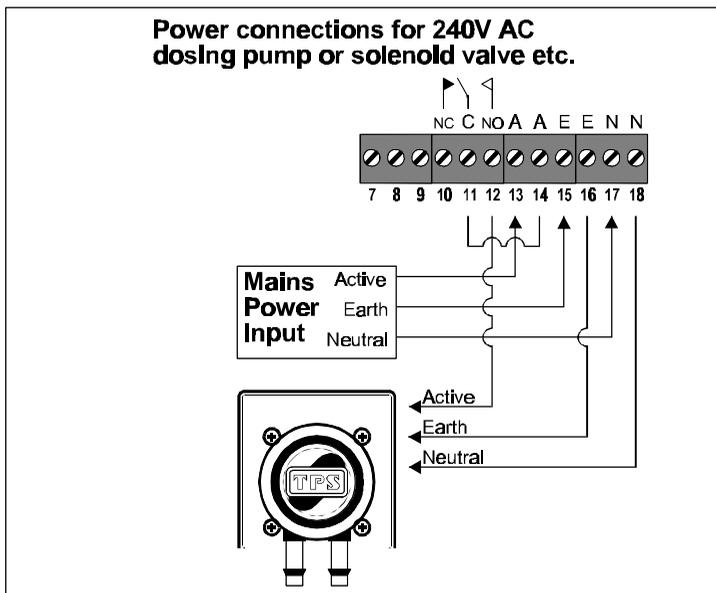
10.7 Terminal connections when 12V DC option is fitted

Terminal No.	Connection	Colour
1	ATC Sensor for ppM operation	Red
2	ATC Sensor for ppM operation	Blue
3	No Connection	
4	Common	Black
5	DO ₂ Sensor Anode	Green
6	DO ₂ Sensor Cathode	Yellow
7	+ve of current or voltage output	Customer-defined
8	-ve of current or voltage output	Customer-defined
9	No Connection	
10	Normally Closed contact of (optional) relay output	Customer-defined
11	Common contact of (optional) relay output	Customer-defined
12	Normally Open contact of (optional) relay output	Customer-defined
13	No connection for 12V DC version.	
14	Negative of 12V DC Input	Customer-defined
15	No connection for 12V DC version.	
16	No connection for 12V DC version.	
17	No connection for 12V DC version.	
18	Positive of 12V DC Input	Customer-defined

* The ATC connection to terminals 1 & 2 is only for when the unit is reading ppM (mg/L) units. **DO NOT** connect these for % Saturation readout.

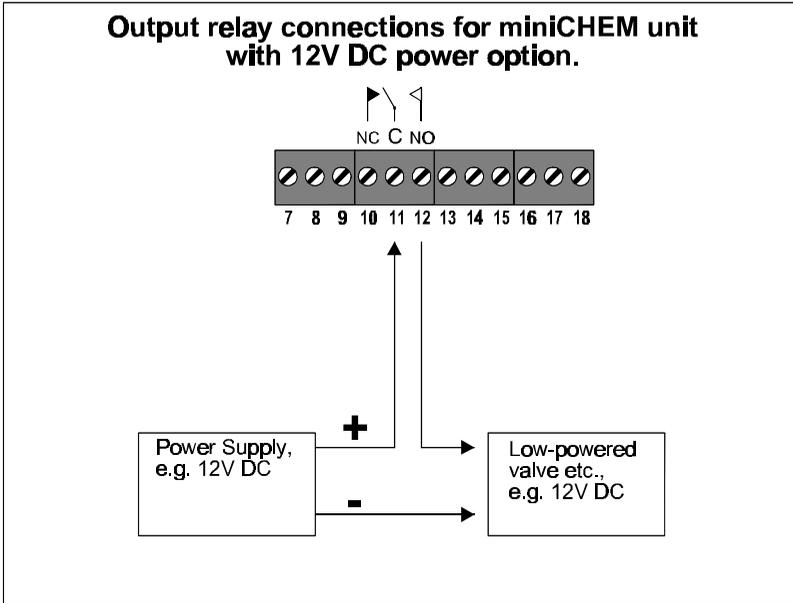
10.8 Relay Output Wiring Examples for mains powered units

The diagrams below provide some examples of wiring the (optional) relay output for standard mains powered **miniCHEM-DO₂** units.



10.9 Relay Output Wiring Examples for 12V DC powered units

The diagrams below provide some examples of wiring the (optional) relay output for **miniCHEM-DO₂** units with the 12V DC power option.



11. Warranty

TPS Pty. Ltd. guarantees all instruments and electrodes to be free from defects in material and workmanship when subjected to normal use and service. This guarantee is expressly limited to the servicing and/or adjustment of an instrument returned to the Factory, or Authorised Service Station, freight prepaid, within twelve (12) months from the date of delivery, and to the repairing, replacing, or adjusting of parts which upon inspection are found to be defective. Warranty period on electrodes is three (3) months.

There are no express or implied warranties which extend beyond the face hereof, and TPS Pty. Ltd. is not liable for any incidental or consequential damages arising from the use or misuse of this equipment, or from interpretation of information derived from the equipment.

Shipping damage is not covered by this warranty.

PLEASE NOTE:

A guarantee card is packed with the instrument or electrode. This card must be completed at the time of purchase and the registration section returned to TPS Pty. Ltd. within 7 days. No claims will be recognised without the original guarantee card or other proof of purchase. This warranty becomes invalid if modifications or repairs are attempted by unauthorised persons, or the serial number is missing.

PROCEDURE FOR SERVICE

If you feel that this equipment is in need of repair, please re-read the manual. Sometimes, instruments are received for "repair" in perfect working order. This can occur where batteries simply require replacement or re-charging, or where the electrode simply requires cleaning or replacement.

TPS Pty. Ltd. has a fine reputation for prompt and efficient service. In just a few days, our factory service engineers and technicians will examine and repair your equipment to your full satisfaction.

TO OBTAIN THIS SERVICE, PLEASE FOLLOW THIS PROCEDURE:

Return the instrument AND ALL SENSORS to TPS freight pre-paid and insured in its original packing or suitable equivalent. INSIST on a proof of delivery receipt from the carrier for your protection in the case of shipping claims for transit loss or damage. It is your responsibility as the sender to ensure that TPS receives the unit.

Please check that the following is enclosed with your equipment:

- **Your Name and daytime phone number.**
- **Your company name, ORDER number, and return street address.**
- **A description of the fault. (Please be SPECIFIC.)**

(Note: "Please Repair" does NOT describe a fault.)

Your equipment will be repaired and returned to you by air express where possible.

For out-of-warranty units, a repair cost will be calculated from parts and labor costs. If payment is not received for the additional charges within 30 days, or if you decline to have the equipment repaired, the complete unit will be returned to you freight paid, not repaired. For full-account customers, the repair charges will be debited to your account.

- **Always describe the fault in writing.**
- **Always return the sensors with the meter.**

12. Drilling Template

The template below is for the three mounting positions for the **miniCHEM** enclosure. This template is actual size, and can be photocopied or removed as required.

