

# Dissolved Ozone Sensors

## 358-2X0 & 58 041 XXX

# Instruction Manual



Dissolved Ozone Sensors  
58 086 601 Rev M

**METTLER TOLEDO**

## IMPORTANT SAFETY INFORMATION

*This manual includes safety and critical information with the following designations and formats:*

**WARNING: POTENTIAL FOR PERSONAL INJURY.**

**CAUTION: possible product damage or malfunction.**

**NOTE:** important operating information.

The 25mL bottle of O<sub>3</sub>-Electrolyte included with the dissolved ozone probe and maintenance kits has one of the two associated **Material Safety Data Sheets** included at the end of this manual. Maintain a copy of the applicable MSDS in your material safety file.

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## INTRODUCTION

This manual covers installation, operation and maintenance of METTLER TOLEDO Thornton Dissolved Ozone Sensors. For information on the measuring instruments, consult their instruction manuals.

A complete dissolved ozone sensor consists of:

- Dissolved Ozone Probe with electrolyte
- VP cable for M300, AK9 cable for ISM transmitters, or preamplifier for 770MAX
- 17743 (58084012) Polycarbonate or 02385 (58084010) Stainless steel flow housing

Sensor Type	6500 Standard		6510 Fast Response		6510i ISM, Fast Response
	Probe	52201178		52201225	
Transmitter	M300	770MAX	M300	770MAX	ISM
Housing, cable length	Complete sensor part numbers				
Polycarbonate, 1 m	58041231	358-210 (58041001)*	58041236	58041011*	58041436
Polycarbonate, 3 m	58041232	-	58041237	-	58041437
Polycarbonate, 5 m	58041233	-	58041238	-	58041438
Polycarbonate, 10 m	58041234	-	58041239	-	58041439
Stainless steel, 1 m	58041241	358-220 (58041003)*	58041246	58041013*	58041446
Stainless steel, 3 m	58041242	-	58041247	-	58041447
Stainless steel, 5 m	58041243	-	58041248	-	58041448
Stainless steel, 10 m	58041244	-	58041249	-	58041449
none, 1 m	58041251	358-230 (58041004)*	-	-	-
none, 3 m	58041252	-	-	-	-
none, 5 m	58041253	-	-	-	-
none, 10 m	58041254	-	-	-	-

\*includes preamp with 1 m cable; requires separately ordered patch cable for connection to transmitter

For a complete measurement system, a METTLER TOLEDO Thornton transmitter is required. With a 770MAX transmitter, a patch cable is also required. Ozone measurement requires 770MAX firmware version 5.0 or higher.

These sensors are designed for monitoring low concentrations of dissolved ozone in semi-conductor and pharmaceutical pure water samples, bottled water and similar applications. They provide long-term operation with minimal maintenance. Ozone and four-electrode conductivity sensors may be used on the same 770MAX instrument only if they are in separate processes electrically isolated from each other.

**Three probe types are available:** **6510** provides especially fast response and is recommended for most installations. The **6510i** is the fast responding probe with built in digital measuring circuit and Intelligent Sensor Management capabilities. See the M800 ISM<sup>®</sup> transmitter manual and Appendix 1, Service Tips for more details. **6500** is an older design analog probe used in existing installations.

## OVERVIEW OF OPERATION

These dissolved ozone sensors use a gas permeable membrane to separate the sample from the electrochemical cell inside. Ozone diffuses through the membrane in direct proportion to the partial pressure of ozone outside the sensor. The cathode and anode inside the probe are polarized with a voltage to enable the electrochemical reaction of ozone. Ozone is reduced at the cathode while the anode is oxidized, producing a small current in direct proportion to the amount of ozone reacting. A guard electrode is provided around the cathode. The very small current developed by these sensors allows them to have a long life with low maintenance.

Temperature compensation adjusts for the changing permeability of the membrane with temperature. In addition, the instrument uses the temperature value to convert the ozone partial pressure signal to a dissolved ozone concentration value by compensating for the changing solubility of ozone with temperature.

For calibration, the ozone concentration is measured by a separate method to provide a reference value to be entered into the transmitter.

## INSTALLATION

Operation of the measuring instrument, preamp (if used) and cable can be verified using the 52201197 Ozone Sensor Simulator (not for use with ISM versions). This check can be made before the sensor is installed and ozone is introduced to the water system.

The sensor location should be in a protected indoor area with reasonably stable and uniform temperature.

Stainless steel or ozone-compatible polymer sample lines are recommended. Make the sample line as short as possible to minimize the time delay in sampling which could allow decay of the ozone. Locate the sensor where it and its sample will be easily accessible for calibration.

**CAUTION: Before installation, electrolyte must be added to the probe. Also after dry storage of more than 2 days, rinse out the membrane body with deionized water and replace the probe electrolyte solution to achieve full response and stability. Follow the Service Procedure.**

If the probe is not installed in a METTLER TOLEDO Thornton flow housing, insure that sample flow velocity past the surface of the membrane will be within 1 – 3 ft/s (0.3 – 1 m/s) during measurement.

In a flow housing, provide between 200 and 500 mL/min flowrate.

1. Mount the flow housing and preamp if used, with the mounting holes and hardware appropriate for the panel. Orient the preamp box with the probe cable coming out of the top. See Figure 1. Earth ground the preamp box, either by mounting screws fastened to a grounded panel or by a user-supplied earth ground wire connected to the screw terminal adjacent to the patch cord connector. Locate the flow housing under or to the side of the preamp to keep any dripping water away from the preamp. The distance between the probe and preamp must be less than the 3 ft (1 m) cable length between them. Allow room above the probe for convenient removal for calibration.
2. Flush the upstream sample line at high flowrate to remove any debris in the line before connecting the flow housing.

3. Install appropriate fittings to the 1/4" NPT ports of the flow housing, if used, using pipe sealant.

**CAUTION: Tighten fittings only one turn past hand tight. Do not over-tighten or the plastic flow housing tapered pipe threads may be damaged.**

4. Connect the sample line and drain to the fittings.  
**The bottom port is the inlet.**

**CAUTION: If using the plastic housing, use a second wrench when connecting the sample line to a compression fitting to prevent over-tightening the pipe thread into the flow housing and damaging the threads.**

5. If using a sensor with M300 ISM or M800, connect the VP or AK9 cable supplied to the ozone probe. Connect the other end of the cable to the appropriate channel of the measuring instrument.

If using a sensor with preamp, connect the separately ordered patch cord from the instrument to the bottom connector of the preamp box.

When installing the preamp used with the 770MAX, to meet CE requirements, use the 1XXX-70 (5808001X) series patch cord and connect its additional conductor to the adjacent earth ground screw terminal. At the 770MAX, plug in the patch cord and connect the loose conductor to earth ground which may be the power earth ground terminal of the 770MAX if space and local wiring codes permit.

6. **Be sure electrolyte solution has been added to the probe before proceeding.** See service section. For sensors used with 770MAX connect the VP cable from the preamp box to the VP connector of the probe by rotating until the pin and slot are aligned and the parts slide together. Tighten the connector ring.
7. Remove the protective cap and install the probe in the flow housing, if used. Set the sample flowrate at 200 – 500 mL/min. Save the cap for protection when the probe is removed from the flow housing.
8. After at least 4-6 hours of powered operation in a process sample with > 50 ppb of ozone concentration to fully polarize the probe, perform a comparison calibration and a zero calibration as described below.

## CALIBRATION

Calibration of the probe calculates new calibration constants for the sensor—an Adder and a Multiplier in a 770MAX transmitter, or a Zero and a Slope in other transmitters. The Adder/Zero is normally near zero, accounting primarily for zero offset in the electronics since the probe zero is very near theoretical. The Multiplier/Slope is normally in the range given in table on page 4 and is recomputed whenever a comparison slope calibration is performed.

Calibration data for a sensor used with the 770MAX is stored in non-volatile memory and can be viewed under the Measurements / Page Down menu for the appropriate channel.

Calibration data for a sensor used with the M300 or M800 can be viewed under the CAL / Edit menu for the appropriate channel. With the M300 ISM the calibration data can be viewed under Info/calibration data menu.

For most applications, ozone-free air or water provides the most reliable standard for zero calibration.

**NOTE:** To achieve full polarization and proper operation, the probe must be connected to a powered instrument for at least 2 hours. It must also operate at least 4-6 hours in a sample with more than 50 ppb of ozone or 1-2 hours in a sample with 500 ppb of ozone before calibrating or measuring to obtain rated accuracy. For best results a recalibration (slope adjustment) after 12 hours of operation is recommended. **When the sensor is first connected, it is unpolarized and may give a zero ozone signal for up to 45 minutes.**

For strategies on polarization and calibration of sensors where ozone is not normally present, see the Appendix at the end of this manual.

### Zero Calibration Procedure

Zero calibration should be performed at startup and at infrequent intervals thereafter since it does not normally change significantly. A zero calibration changes the Adder/Zero calibration constant from the factory value.

1. Activate the HOLD function in the instrument, if required, to prevent activation of alarm relays and to hold analog outputs at their current value.
2. Shut off the sample flow to the flow housing and, while keeping the probe connected electrically, remove the probe and hang it in open air.

3. Wait for a stable ozone reading, typically for 10 minutes.
4. Step through the instrument CALIBRATION menu performing a one-point zero calibration.
5. When complete, reinstall the probe into the flow housing and tighten the threaded sleeve.
6. Cycle the sample flow on and off to remove any retained bubbles. Restore flow to 200 – 500 mL/min.
7. When the measurement has returned to its normal value and is stable, deactivate the HOLD function in the instrument or allow it to time out.

### Compare/Slope Process Calibration Procedure

Dissolved ozone sensor output will vary slightly over time as the electrolyte, membrane and electrodes age. Periodic calibration to a standard test measurement is needed at installation and at intervals based on experience in the particular application. A slope calibration is performed by comparison while measuring a stable ozonated sample. Use the value of another calibrated ozone instrument or the value of colorimeter readings on the same sample. Colorimeter samples must be taken from the same point and read very quickly to limit errors due to the rapid natural decay of ozone. Compare/Slope calibration will change the Multiplier/Slope value from its previous value. For best accuracy, calibrate at the normal operating sample temperature.

1. Before calibration, be sure that the instrument and probe have been powered for at least 2 hours. They must also operate at least 4-6 hours in a sample with more than 50 ppb of ozone or 1-2 hours in a sample with 500 ppb of ozone.
2. When ozonation is at steady state and a stable reading is observed, obtain the reference value of dissolved ozone from another calibrated instrument or a colorimeter measuring the same sample, taken from the on-line sensor flow housing drain if possible.
3. Step through the instrument CALIBRATION menu to perform a Comparison/Slope calibration.

### Calibration Diagnostics

The Adder/Zero value is recalculated whenever a zero calibration is performed. The displayed value is in

nanoamps and is typically within  $\pm 1$  nA for a functioning probe (and preamp, where used).

The Multiplier/Slope is recalculated whenever a comparison calibration is performed and is typically within the limits shown below for a functioning sensor. The table below summarizes calibration data nomenclature and ranges. On some transmitters Slope values are displayed with negative (-) polarity.

Transmitter	Zero (air) Calibration	Slope/Compare Calibration
770MAX	Adder: $\pm 1$ nA	Multiplier: 0.33 to 2.5
M300	Zero: $\pm 1$ nA	Slope: -0.33 to -2.5
M800	Zero: $\pm 1$ nA	Slope: -0.04 to -0.17 nA/ppb ozone

A continuous trend of Multiplier/Slope values in one direction after several calibrations can indicate that the sensor is drifting and needs electrolyte (and possibly membrane) replacement. Multiplier/Slope values that move up and down may indicate limitations of the repeatability of the reference measurement.

The raw probe current in normal operation should be within the range of 0.04 to 0.17 nA per ppb ozone. In the 770MAX it is displayed by paging down to the bottom of the Measurements menu. In M300 and ISM instruments it is displayed in the Calibrate Verify menu.

## PROBE STORAGE

Store the probe at room temperature with the tip immersed in water. For dry storage more than 2 days, remove the electrolyte and rinse internal parts with deionized water. Allow to dry and re-assemble. The electrolyte must then be replaced before reinstalling.

## SERVICE

### Cleaning

Cleaning should not be necessary in the typical pure water applications intended for this sensor. Any accumulation of solids on the membrane surface or in the flow housing should be washed off or cleaned briefly with an agent suitable for removing it. If physical cleaning is needed, use a lint-free cloth or tissue very gently.

**WARNING: USE STANDARD PRE-CAUTIONARY MEASURES IN HANDLING ANY MATERIALS USED FOR CLEANING.**

### Service Indications

For ISM sensors used with M800, also see Appendix 1 Service Tips.

**The electrolyte** must be installed at startup and should be replaced later if response begins to drop off, indicated by increasing Multiplier/Slope values computed over a number of comparison calibrations.

**The membrane body and electrolyte** should be replaced if a visual inspection shows signs of mechanical damage. They should also be replaced if the sensor has a noticeable increasing or decreasing response, indicated by a Multiplier/Slope value trend shown over a number of comparison calibrations or if the sensor cannot be calibrated.

**The interior probe body or complete probe** should be replaced if a visual inspection shows a crack in the glass of the interior body or if the sensor shows leakage current. (With electrolyte and membrane body removed and the internal body carefully dried there should be a zero reading.)

With sensor use, the anode (middle section of the interior body) may develop various shades of green on its surface which is normal and does not detract from sensor performance.

**WARNING: CONTACT OF ELECTROLYTE WITH MUCOUS MEMBRANE OR EYES IS TO BE AVOIDED. THEREFORE WEAR GLOVES FOR DISASSEMBLY. IF SUCH CONTACT OCCURS, RINSE THE AFFECTED AREA WELL WITH WATER. SHOULD ADVERSE SIGNS APPEAR, GET MEDICAL ATTENTION.**

### Electrolyte & Membrane Change

Perform probe disassembly only in a clean work area. Refer to Figure 2 for parts identification.

1. Unscrew the cap sleeve from the probe shaft and carefully pull it off the sensor.
2. If necessary, eject the membrane body from the cap sleeve by pushing it from the end with the flat finger tip. (Before electrolyte is refilled, the membrane body must be removed from the cap sleeve.)
3. Rinse the interior body with demineralized water and carefully dab it dry with a paper tissue.

4. Examine the O-rings visually for mechanical defects, and replace if necessary.
5. Half-fill the new membrane body with electrolyte specifically for the type of membrane used, 6500 or 6510.
6. **IMPORTANT:** Make sure that all air bubbles are removed from the electrolyte in the membrane body. Air bubbles can be removed by sharply tapping on the side of the membrane body.
7. Slip the membrane body over the interior body while holding the sensor in a vertical position. The excess electrolyte will be displaced and must be absorbed with a paper tissue.

**NOTE:** No electrolyte, sample media or contamination may be present between the membrane body and the cap sleeve. Be sure both parts are clean and dry.

8. Carefully slip the cap sleeve over the fitted membrane body, holding the sensor in a vertical position and screw it tight.
9. After changing electrolyte or membrane body, the sensor must be fully repolarized in the presence of ozone and recalibrated.

### Interior Body Change

Perform probe disassembly only in a clean work area. Refer to Figure 2 for parts identification.

1. Unscrew the cap sleeve from the probe shaft and carefully pull it off the sensor.
2. If necessary, eject the membrane body from the cap sleeve by pushing it from the end with the flat finger tip. (Before electrolyte is refilled, the membrane body must be removed from the cap sleeve.)
3. Loosen the retainer nut of the interior body with a 3/8" (9.5 mm) or adjustable wrench and remove it.
4. Remove the interior body by pulling it out of the sensor shaft. If necessary use pliers.

**CAUTION: Do not twist the interior body or the connection pins can be damaged.**

5. Insert the new interior body in the sensor shaft. Turn the interior body in the shaft until the slit of the interior body is aligned with the pin placed in the shaft.
6. Press the body into the shaft and screw the new retainer nut in place.

7. Examine the O-rings visually for mechanical defects, and replace if necessary.
8. Half-fill the new membrane body with O3 electrolyte specifically for the type of membrane used (6500 or 6510) and make sure that all bubbles are removed. Air bubbles can be removed by carefully tapping on the membrane body.
9. Slip the membrane body over the interior body while holding the sensor in a vertical position. The excess electrolyte will be displaced and have to be removed with a tissue.

**Note:** No electrolyte, sample media or contamination may be present between the membrane body and the cap sleeve.

10. Carefully slip the cap sleeve over the fitted membrane body, holding the sensor in a vertical position and screw it tight. The cap sleeve must be clean and dry.

11. Repolarize and recalibrate the sensor.

### Troubleshooting

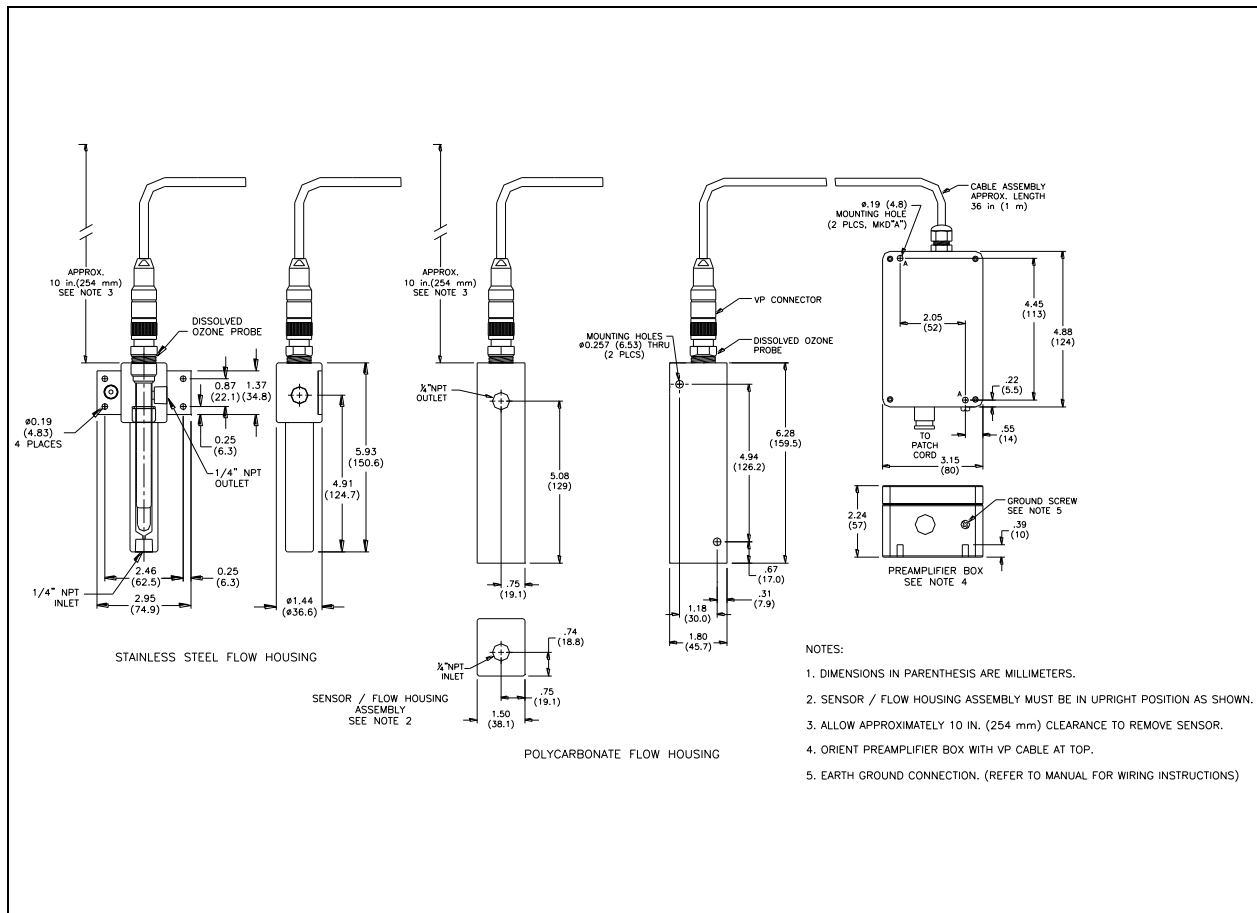
#### Instrument

Operation of the measuring instrument, preamp (if used) and cable can be verified using the accessory 52201197 Ozone Sensor Simulator (not for use with ISM versions). This check can be made before the sensor is installed and ozone is introduced to the water system.

### Sampling

One of the most common problems with Ozone measurement is decay of the concentration between measurement in the process and measurement by an off-line standard. If the process measurement is higher than the off-line method, the off-line testing may have been performed too slowly. If the process measurement is lower than the off-line method, then the off-line method used for the most recent calibration may have been performed too slowly. Repeat the off-line method (and calibration if necessary) more rapidly.

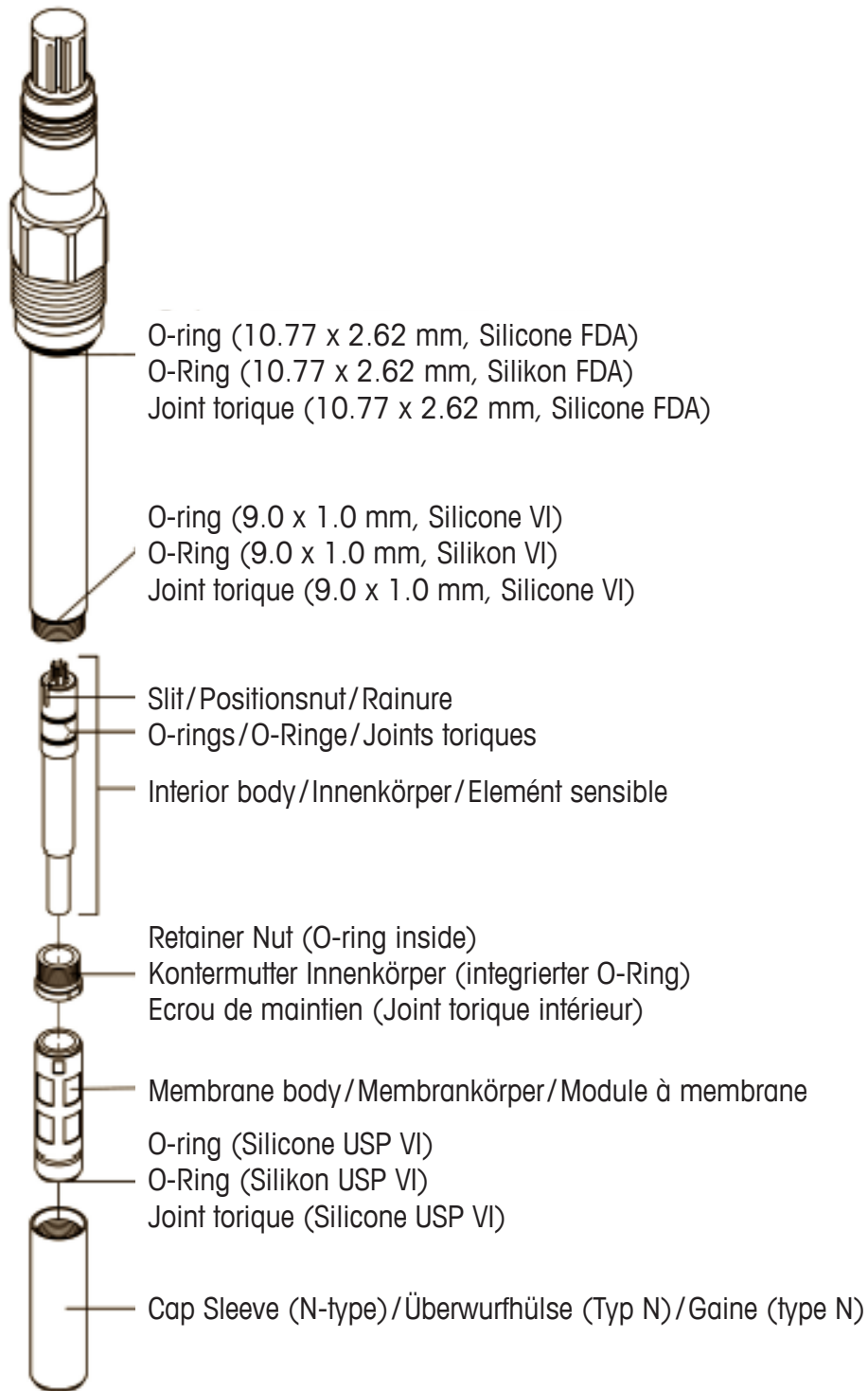
The colorimetric method of ozone measurement has a high level of uncertainty. Duplicate colorimetric measurements should always be made and repeated until consistency is obtained.



**Figure 1 — Mounting and Dimensions of Dissolved Ozone Sensors**

**58 041 XXX Sensors do not include the preamp shown and instead include a longer cable that connects directly to the transmitter. 3X8-230 and 58 041 25X Sensors are used with other, separately specified housings instead of those shown.**





**Figure 2 – Ozone Probe Component Identification for Maintenance Purposes**

## SPECIFICATIONS

Sample Flowrate	200–500 mL/min in housing; 0.5–3 ft/s (0.15–1 m/s) without housing
Sample Temperature:	5 – 50 °C (41 – 122 °F) for compensation; can tolerate 100 °C (212 °F)
Sample Pressure:	0 – 3 bar (0 – 45 psig)
Sample Connections:	1/4" NPTF
Wetted Materials:	polycarbonate or 316 stainless steel flow housing, 316L stainless steel probe, silicone rubber membrane, silicone (FDA, Class VI) o-rings
Cable Lengths:	For 770MAX, probe to preamplifier, 3 ft (1 m); preamp to 770MAX instrument, 1 to 300 ft (0.3 to 91 m); patch cord ordered separately. For M300 and ISM instruments, see the table on page 9.
Sensor Compatibility:	ozone and 4-electrode conductivity sensors on the same instrument must be in processes that are electrically isolated from each other
Weight:	0.5 lb (1 kg)
Relative System Accuracy:	6500 Model: $\pm 2\%$ of reading or 3 ppb, whichever is greater; 6510/i Models: $\pm 4\%$ of reading or 3 ppb, whichever is greater; $\pm 0.5^\circ\text{C}$
Response Time:	6510/i Models: 30 seconds for 90% response, upscale 6500 Model: 3 minutes for 90% response, upscale
Typical Polarization Times:	1-2 hours at 500 ppb; minimum of 4-6 hours at > 50 ppb
Measurement Range:	0 – 5,000 ppb, 0 – 5.00 ppm short term; 0 – 500 ppb, 0 – 0.5 ppm continuous
Instrument Firmware:	770MAX version 5.0 or higher

## SPARE & REPLACEMENT PARTS

	<u>Legacy No.</u>	<u>Part No.</u>
6510 Replacement probe (standard 120 mm length)	-	52 201 225
6510i Replacement ISM probe (standard 120 mm length)	-	30 013 675
6510 & 6510i / V6 Membrane kit including electrolyte, 4 membranes and o-rings	-	52 201 218
6510 & 6510i Electrolyte, 25 mL, included in above kit	-	52 201 224
6500 Replacement probe (standard 120 mm length)	-	52 201 178
6500 / V4 Membrane kit including electrolyte, 4 membranes and o-rings	-	52 201 179
6500 Electrolyte, 25 mL, included in above kit	-	52 201 169
Interior probe body for 6510 & 6500	-	52 201 180
Interior probe body for 6510i	-	30 013 674
Replacement preamp for 770MAX Instrument	358-201	58 041 002
Replacement polycarbonate flow housing	17743	58 084 012
Replacement stainless steel flow housing	02385	58 084 010

## ACCESSORIES

	<u>Legacy No.</u>	<u>Part No.</u>
Analog Ozone Sensor Simulator	-	52 201 197

### 770MAX Patch Cords

Length ft (m)	Standard Cables		Shielded Cables for CE Requirements	
	Legacy No.	Part No.	Legacy No.	Part No.
5 (1.5)	1005-79	58 080 001	1005-70	58 080 011
10 (3)	1010-79	58 080 002	1010-70	58 080 012
15 (4.5)	1015-79	58 080 003	1015-70	58 080 013
25 (7.6)	1025-79	58 080 004	1025-70	58 080 014
50 (15.2)	1050-79	58 080 005	1050-70	58 080 015
100 (30.5)	1100-79	58 080 006	1100-70	58 080 016
150 (45.7)	1115-79	58 080 007	1115-70	58 080 017
200 (61)	1120-79	58 080 008	1120-70	58 080 018
300 (91)	1130-79	58 080 009	1130-70	58 080 019

### Replacement VP Cables for M300 Instruments

	Part No.
1 m	52 300 107
3 m	52 300 108
5 m	52 300 109
10 m	52 300 110
15 m	52 300 144
20 m	52 300 141

### Replacement AK9 Cables for ISM Instruments

	Legacy No.	Part No.
1 m	10 000 0102	59 902 167
3 m	10 000 0302	59 902 193
5 m	10 000 0502	59 902 213
10 m	10 000 1002	59 902 230
20 m	-	59 300 204
30 m	-	52 300 393
50 m	-	52 300 394
80 m	-	52 300 395



### Declaration of Conformity

We,

Mettler-Toledo Thornton, Inc.  
900 Middlesex Turnpike  
Billerica, MA 01821, USA

Declare Under our sole responsibility that the product:

Dissolved ozone sensor, Models 358-210, 358-220, 358-230, 58041011, 58041013

to which this declaration relates, are in conformity with the following European, harmonized and published standards at the date of this declaration:

EMC Emissions:            EN 55022            Class A ITE emissions, requirements.

EMC Emissions and Immunity:    EN 61326            Measurement Control and Laboratory equipment EMC requirements.

These conclusions are based on test reports from Test Site Services, Inc., Milford, MA USA.  
Anthony Bevilacqua, METTLER TOLEDO Thornton, Inc.

## APPENDIX—OZONE SENSOR POLARIZATION, CALIBRATION RECOMMENDATIONS AND SERVICE TIPS

### System Configuration

A pharmaceutical water ozonation system typically uses three ozone measurement points:

1. Following the ozone generator or ozonated water storage tank.
2. Following the UV ozone destruct unit to confirm no ozone is going to distribution.
3. At the end of the distribution loop to verify that adequate levels of ozone have reached the end during sanitization with the UV light off.

A semiconductor ultrapure water system typically does not shut down for sanitization and omits the third measurement point.

### Sensor Requirements

Ozone sensors require a period of polarization at first startup in the presence of ozonated water before they develop a signal. They require additional time to achieve stability. During polarization, readings can remain at zero as long as 45 minutes after ozone is first introduced and then the sensor signal will rise to its steady-state response level where calibration can be performed. If a large volume holding tank is in the recirculation loop, additional time may be needed for its ozone concentration to stabilize.

Once the sensors have been polarized, that condition will be held for long periods even when measuring zero ozone. Re-polarization is necessary only if power is off the sensor for more than a few minutes or if the electrolyte or membrane are replaced.

### System and Measurement Operation

Polarization of sensors at measurement points 2 and 3 above may be difficult because there should be no ozone present there during normal operation. It is recommended to start up and operate the measurements during a system sanitization long enough to achieve full polarization.

Alternatively, if the sensor flow housings are mounted close together, it may be possible to temporarily place the point 2 and point 3 sensors, one at a time, into the flow housing for point 1. This must be done without disconnecting any sensor electrical connections and

allows polarization of those sensors in ozonated water during normal operation.

### Compare/Slope Calibration

Colorimeter measurements are accepted standards for ozone measurement. Colorimeters have limited accuracy but are more accurate as a percentage of reading at higher concentrations. It is therefore recommended to calibrate the slope during sanitization at a relatively high level such as  $> 0.20$  ppm, if possible. (Compare/Slope calibration must not be performed at points where the ozone has been removed by UV.)

Because the sensors have excellent linearity, a similar percent of reading accuracy is provided at lower levels. For example, if a calibration is performed based on a colorimetric ozone measurement of  $0.20$  ppm with an uncertainty of  $\pm 0.05$  ppm or  $\pm 25\%$  of reading, the polarographic system can provide an accuracy near  $\pm 25\%$  of reading at  $0.05$  ppm or  $\pm 0.012$  ppm.

Compare/Slope calibration should be performed near the end of a sanitization cycle when the ozonation rate and measurements are high and stable. Because of the rapid decay of ozone in samples and the limited repeatability of the ozone colorimetric method, it is good practice to take at least two colorimeter measurements to establish consistency and to take a third one if a significant deviation is found between the first two. For calibration, use the average of two measurements that are within reasonable agreement.

Measurement points immediately before and immediately after the UV unit are typically close together and should read the same when the UV unit is off. Therefore one point can be calibrated to match the colorimetric result and then the second point can be calibrated to match the first point. A separate colorimetric measurement must be made for the point 3, end of distribution loop compare/slope calibration because normal ozone decay will cause a significant drop in the concentration.

## Zero Calibration

The zero calibration can be performed at any time by removing the sensor from the flow housing and exposing it to air for at least 10 minutes. The instrument should give a stable reading at zero or at the single digit ppb level before initiating the calibration.

## Service Tips

Sensor maintenance is normally required more frequently on the point 1 sensor which is exposed to ozone continuously.

The need for electrolyte change is usually indicated by a downward drift in ozone reading as described in the services section. However, when automatic PID control is based on the point 1 measurement, the controller will increase the ozonation rate to maintain the reading at the setpoint. In this case the symptoms will be an increasing ozonation rate and colorimetric measurements that are consistently increasing above the on-line instrument reading.

Once experience has been gained with a particular ozonation system, a sensor maintenance schedule can be established to minimize process interruption.

**ISM** Intelligent Sensor Management functions provide the following predictive maintenance information on an M800 transmitter display:

**ACT** Active Calibration Timer indicates the amount of time remaining until a calibration is recommended, based on time and concentration of ozone exposure.

**TTM** Time to Maintenance indicates the amount of time remaining until electrolyte and membrane replacement is recommended, based on time and concentration of ozone exposure.

**DLI** Dynamic Lifetime Indicator shows the amount of time remaining until replacement of the inner body is recommended.

**Mettler-Toledo GmbH**

## Process Analytics

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Account No. 370501-21-90 CHF/IBAN CH71 0483 5037 0501 2109 0

[www.mtpro.com](http://www.mtpro.com)

# Material Safety Data Sheet

## Ozone electrolyte 6500

### 1. Identification of the substance / preparation and the company / undertaking

<b>Use of the substance / preparation</b>	Electrolyte for ozone sensors 6500.
<b>Chemical characterization</b>	Aqueous solution of inorganic salts.
<b>Product code</b>	52 201 169, 52 201 179 (membrane kit)
<b>Supplier</b>	Mettler-Toledo Thornton, Inc. 900 Middlesex Turnpike Billerica, MA 01821, USA Tel: +1-781-301 8600 Fax: +1-781-301 8701
<b>Emergency telephone number</b>	+1-800-535 50 53 (Info Trac, 24 hrs)
<b>Revision date</b>	18.10.2005
<b>Number</b>	1

### 2. Composition / information on ingredients

**Hazardous components** The product contains no substances classified as hazardous to health in concentrations which should be taken into account according to EC directive.

Contains:  
Potassium bromide (CAS no 7758-02-3): < 15%

### 3. Hazards identification

None.

NFPA Ratings (Scale 0-4):

HEALTH=1 FLAMMABILITY=0 REACTIVITY=0 SPECIAL=0

HMIS Ratings (Scale: 0=Minimal 1=Slight 2=Moderate  
3=Serious 4=Severe):

HEALTH=1 FLAMMABILITY=0 REACTIVITY=0 PROT.  
EQUIPMENT=A (Safety Glasses)

WHMIS:

no Hazard class

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### 4. First aid measures

#### Inhalation

Not hazardous by inhalation.

#### Skin contact

Wash hands with water as a precaution.

#### Eye contact

Flush eyes with water as a precaution.

#### Ingestion

Rinse mouth.

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### 5. Fire-fighting measures

#### Suitable extinguishing media

No special measures required.

#### Specific hazards

The product is not flammable.

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### 6. Accidental release measures

#### Personal precautions

No special measures required.

#### Environmental precautions

Do not flush into surface water.



## 7. Handling and storage

<b>Handling</b>	No special precautions required.
<b>Storage</b>	Keep out of reach of children. Store at room temperature in the original container.

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## 8. Exposure controls / personal protection

<b>Exposure limit(s)</b>	Not available.
<b>Engineering measures to reduce exposure</b>	General industrial hygiene practice.
<b>Personal protection equipment:</b>	
<b>Respiratory protection</b>	No personal respiratory protective equipment normally required.
<b>Eye protection</b>	Avoid contact with eyes.

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## 9. Physical and chemical properties

<b>Form</b>	Liquid.
<b>Colour</b>	Colourless.
<b>Odour</b>	None.
<b>Physical and chemical properties</b>	pH: 4.5. Boiling point/range: > 212°F (~100 °C). Relative density: 1 g/ml. Flash point: does not ignite. Water solubility: completely soluble.

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## 10. Stability and reactivity

<b>Stability</b>	No decomposition if stored and applied as directed.
<b>Hazardous decomposition Products</b>	None reasonably foreseeable.

## 11. Toxicological information

<b>Local effects</b>	No data is available on the product itself.  Potassium bromide: RTECS: TS7650000 LD50/oral/rat 3070 mg/kg. LD50/oral/mouse 3120 mg/kg. LD50/intraperitoneal/mouse 1030 mg/kg.
<b>Long term toxicity</b>	None.
<b>Further information</b>	The product contains no substances classified as hazardous to health in concentrations which should be taken into account according to EC directive

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## 12. Ecological information

<b>Persistence / degradability</b>	Contains no substances known to be hazardous to the environment or not degradable in wastewater treatment plants.
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## 13. Disposal considerations

<b>Waste from residues / unused products</b>	Can be disposed as wastewater, when in compliance with local regulations. European Waste catalogue code (EWC-code): 06 03 99.
<b>Contaminated packaging</b>	Clean container with water. Empty containers should be taken to local recyclers for disposal.

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## 14. Transport information

<b>Further information</b>	Not classified as dangerous in the meaning of transport regulations.
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## 15. Regulatory information

### Regulatory Information

#### Ozone-Electrolyte:

NFPA Ratings (Scale 0-4):

HEALTH=1 FLAMMABILITY=0 REACTIVITY=0 SPECIAL=0

HMIS Ratings (Scale: 0=Minimal 1=Slight 2=Moderate  
3=Serious 4=Severe):

HEALTH=1 FLAMMABILITY=0 REACTIVITY=0 PROT.  
EQUIPMENT=A (Safety Glasses)

WHMIS:

no Hazard class

#### Potassium bromide:

UNITED STATES REGULATORY INFORMATION

SARA LISTED: No

TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

#### Symbol(s)

Xi.

#### R-phrases(s)

36/38/39: Irritating to eyes, respiratory system and skin

#### S-phrases(s)

26-36: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing.

## 16. Other information

### Recommended use

For industrial application only.

### End use

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release.

**Mettler-Toledo GmbH**

Process Analytics

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[www.mtpro.com](http://www.mtpro.com)

# Material Safety Data Sheet

## Ozone electrolyte 6510

### 1. Identification of the substance / preparation and the company / undertaking

<b>Use of the substance / preparation</b>	Electrolyte for ozone sensors 6510.
<b>Chemical characterization</b>	Aqueous solution of inorganic salts.
<b>Product code</b>	52 201 224, 52 201 218 (membrane kit)
<b>Supplier</b>	Mettler-Toledo Thornton, Inc. 900 Middlesex Turnpike Billerica, MA 01821, USA Tel: +1-781-301 8600 Fax: +1-781-301 8701
<b>Emergency telephone number</b>	+1-800-535 50 53 (Info Trac, 24 hrs)
<b>Revision date</b>	31.08.2010
<b>Number</b>	1

### 2. Composition / information on ingredients

<b>Hazardous components</b>	Potassium hydroxide (CAS no 1310-58-3): < 1 % Potassium bromide (CAS no 7758-02-3): < 15%
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**3. Hazards identification**

Irritating to eyes and skin

NFPA Ratings (Scale 0-4):

HEALTH=1 FLAMMABILITY=0 REACTIVITY=0 SPECIAL=0

HMS Ratings (Scale: 0=Minimal 1=Slight 2=Moderate  
3=Serious 4=Severe):

HEALTH=1 FLAMMABILITY=0 REACTIVITY=0 PROT.  
EQUIPMENT= B (Safety Glasses, Gloves)

WHMIS:

Class D, Division 2, Subdivision B:

Materials causing other toxic effects, Toxic material

**4. First aid measures****Inhalation**

No special measures required.

**Skin contact**

Wash hands with water as a precaution.

**Eye contact**

Rinse thoroughly with plenty of water, also under the eyelids.  
If eye irritation persists, consult a specialist. Flush eyes with  
water as a precaution.

**Ingestion**

Immediately give large quantities of water to drink. Consult a  
physician for severe cases.

**5. Fire-fighting measures****Suitable extinguishing media**

No special measures required.

**Specific hazards**

The product is not flammable.

**6. Accidental release measures****Personal precautions**

Clean up to prevent slipping hazard.

**Environmental precautions**

Do not flush into surface water.

**Methods for cleaning up**

Contaminated surfaces will be extremely slippery.

## 7. Handling and storage

<b>Handling</b>	When using, do not eat, drink or smoke. Avoid contact with skin and eyes.
<b>Storage</b>	Keep out of reach of children. Store at room temperature in the original container.

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## 8. Exposure controls / personal protection

<b>Engineering measures to reduce exposure</b>	Avoid contact with skin, eyes and clothing. Wash hands before breaks and at the end of workday.
<b>Personal protection equipment: Respiratory protection</b>	No personal respiratory protective equipment normally
<b>Hand protection</b>	Gloves
<b>Eye protection</b>	Safety glasses.

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## 9. Physical and chemical properties

<b>Form</b>	Liquid.										
<b>Colour</b>	Colourless. Clear										
<b>Odour</b>	None.										
<b>Physical and chemical properties</b>	<table> <tr> <td>pH:</td> <td>12.5.</td> </tr> <tr> <td>Boiling point/range:</td> <td>&gt; 212°F (~100 °C).</td> </tr> <tr> <td>Relative density:</td> <td>1 g/ml.</td> </tr> <tr> <td>Flash point:</td> <td>does not ignite.</td> </tr> <tr> <td>Water solubility:</td> <td>completely miscible.</td> </tr> </table>	pH:	12.5.	Boiling point/range:	> 212°F (~100 °C).	Relative density:	1 g/ml.	Flash point:	does not ignite.	Water solubility:	completely miscible.
pH:	12.5.										
Boiling point/range:	> 212°F (~100 °C).										
Relative density:	1 g/ml.										
Flash point:	does not ignite.										
Water solubility:	completely miscible.										

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## 10. Stability and reactivity

<b>Stability</b>	Stable under recommended storage conditions.
<b>Conditions to avoid</b>	Extremes of temperature and direct sunlight.
<b>Materials to avoid</b>	Incompatible with acids. Corrodes base metals.
<b>Hazardous decomposition Products</b>	None reasonably foreseeable.

## 11. Toxicological information

<b>Acute toxicity</b>	Potassium hydroxide: LD50/oral/rat = 273 mg/kg. LD50/dermal/rabbit = 1 mg (24h): mild irritation  Potassium bromide: LD50/oral/rat 3070 mg/kg. LD50/intraperitoneal/mouse 1030 mg/kg.
<b>Local effects</b>	Irritating to eyes and skin.
<b>Long term toxicity</b>	Chronic intensive skin contact may cause dermatitis.

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## 12. Ecological information

<b>Ecotoxicity</b>	Wastewater from subsequent processing should be given appropriate treatment in line with local regulations. LC50/24h/goldfish = 165 mg/l.
<b>Mobility</b>	No data is available on the product itself.

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## 13. Disposal considerations

<b>Waste from residues / unused products</b>	Taking into account local regulations the product may be disposed of as wastewater after neutralisation. European Waste catalogue code (EWC-code): 06 03 14.
<b>Contaminated packaging</b>	Offer rinsed packaging material to local recycling facilities.

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## 14. Transport information

<b>Further information</b>	Not classified as dangerous as defined by transport regulations.
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## 15. Regulatory information

<b>Regulatory Information</b>	The product is classified and labelled in accordance with EC directives or respective national laws.
<b>Symbol(s)</b>	Xi.
<b>R-phrases(s)</b>	36/37/38: Irritating to eyes, respiratory system and skin
<b>S-phrases(s)</b>	24: Avoid contact with skin. 26/36: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing.

### **Potassium bromide and Potassium hydroxide:**

UNITED STATES REGULATORY INFORMATION

SARA LISTED: No

TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

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## 16. Other information


<b>Recommended use</b>	For industrial application only.
<b>End use</b>	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release.



## **WARRANTY**

METTLER TOLEDO warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and not the result of abuse or misuse within the warranty period, please return by freight pre-paid and amendment will be made without any charge. METTLER TOLEDO's Customer Service Dept. will determine if the product problem is due to deviations or customer abuse. Out-of-warranty products will be repaired on an exchange basis at cost.

The above warranty is the only warranty made by METTLER TOLEDO and is lieu of all other warranties, expressed or implied, including, without limitation, implied warranties of merchantability and fitness for a particular purpose. METTLER TOLEDO shall not be liable for any loss, claim, expense or damage caused by, contributed to or arising out of the acts or omissions of the Buyer or Third Parties, whether negligent or otherwise. In no event shall METTLER TOLEDO's liability for any cause of action whatsoever exceed the cost of the item giving rise to the claim, whether based in contract, warranty, indemnity, or tort (including negligence).

产品中有害物质的名称及含量 Toxic and hazardous substance name and containment in product						
部件名称 Part Name	有毒有害物质或元素 Toxic and hazardous substances					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent chromium (Cr6+)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
插头 Elect. Connector	x	○	○	○	○	○
电路板 PCBA	x	○	○	○	○	○
本表依据SJ/T 11364的规定编制。本产品符合以下标志规范： Table composed in accordance with SJ/T 11364 (CN). This product is bearing the following symbol: 						
○ : 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下 ○ : Indicates that the content of the hazardous substance in all homogeneous materials of the part is below the limit specified in GB / T 26572						
x : 表示该有毒物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。 x : Indicates that the content of the toxic substance in at least one of the homogeneous materials of the part exceeds the limits specified in GB/T 26572.						

**Environmental protection**

Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your Local Authority or retailer for recycling advice.





For addresses of METTLER TOLEDO Market Organizations please go to:  
**[www.mt.com/pro-MOs](http://www.mt.com/pro-MOs)**

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