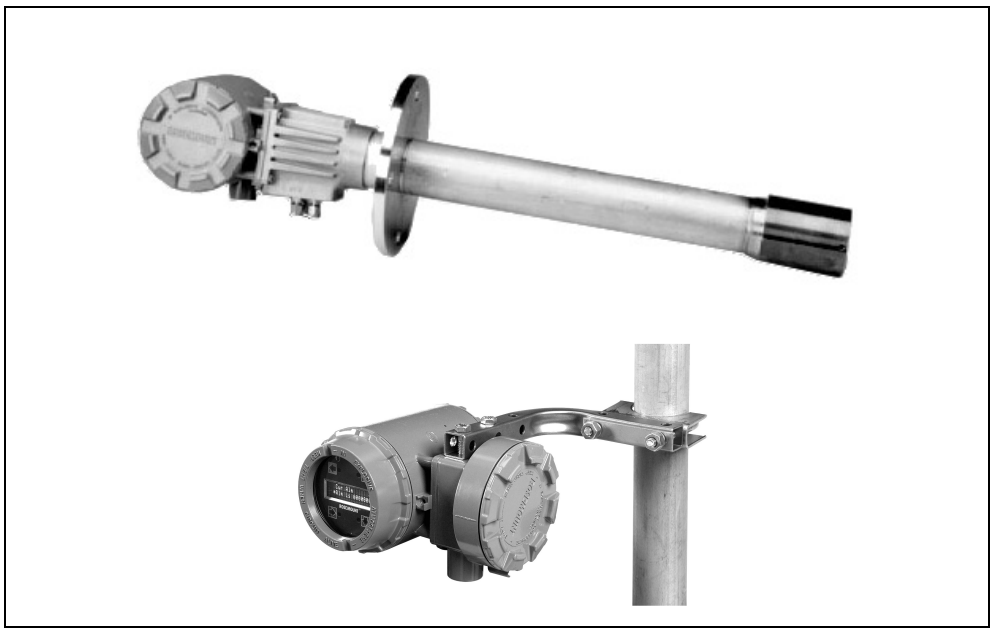
Instruction Manual
IB-106-340C Rev. 4.1
July 2004

OXYMITTER 4000

HAZARDOUS AREA
OXYGEN TRANSMITTER



ROSEMOUNT® Analytical

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ESSENTIAL INSTRUCTIONS
READ THIS PAGE BEFORE PROCEEDING!

Rosemount Analytical designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you **MUST properly install, use, and maintain them** to ensure they continue to operate within their normal specifications. The following instructions **MUST be adhered to** and integrated into your safety program when installing, using, and maintaining Rosemount Analytical products. Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- **Read all instructions** prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, **contact your Rosemount Analytical representative** for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, **use qualified personnel** to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Rosemount. Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, **and VOID YOUR WARRANTY**. Look-alike substitutions may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

The information contained in this document is subject to change without notice.

CAUTION

If a Model 275/375 Universal HART® Communicator is used with this unit, the software within the Model 275/375 may require modification. If a software modification is required, please contact your local Fisher-Rosemount Service Group or National Response Center at 1-800-433-6076 or 1-888-433-6829.

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HIGHLIGHTS OF CHANGES

Effective April, 2004 Rev. 4.0

Page	Summary
Cover	Updated revision number and date. Deleted certification data.
P-3 through P-14	Added foreign language versions of “Safety Instructions for the Wiring and Installation of this Apparatus”.
1-1	Revised Warning. Revised para. 1-2a to include LOI and Model 375 communicator. All IB references to HART Model 275 changed to read “HART Model 275/375”.
1-2	Revised Figure 1-1 to include Oxymitter 4000 remote electronics.
1-3	Revised para. 1-2c to include reference to remote electronics version.
1-4, 1-5	Revised para. 1-2d to include differences between units with LOI versus membrane keypad and to include new Figure 1-3 and Figure 1-4 views.
1-6	Revised NOTE to define LOI operating temperature range data.
1-8	Added Figure 1-7 to show remote electronics versions.
1-12	Revised para. 1-7, Specifications to include LOI data, update electronic noise data, temperature range data. Added pollution degree, over voltage category, and relative humidity data to specifications.
1-13	Added new paragraph 1-8, Hazardous Area Certifications.
1-14, 1-16	Revised Table 1-1, Product Matrix to update Communication Options and Calibration Accessories, and to include Probe-to-Electronics Cables.
2-1	Revised para. 2-1a to reference remote electronics version and LOI. Added temperature note.
2-3	Added new Figure 2-2; installation data for unit with remote electronics.
2-8	Added para. 2-1c and Figure 2-8 to discuss mounting of remote electronics version.
2-8	Revised para. 2-2 to apply to a unit with integral electronics only. Added warning.
2-10	Added new Figure 2-9; wiring for unit with integral electronics.
2-11	Added new para. 2-3 to apply to a unit with remote electronics only.
2-12	Added new Figure 2-10, sheets 1 and 2, to identify different wiring views as applicable to discrete system configurations.
2-15	Revised Figure 2-11 to list SI units first followed by U.S. standards. Added note.
3-1	Revised Section 3 heading to apply to equipment configuration instructions for instruments with a membrane keypad.
3-2	Revised para. 3-1c to correct mA signal level values. Revise para. 3-1e to define new voltage selection parameters.
3-3	Revised Figure 3-2 to update default parameter settings.

HIGHLIGHTS OF CHANGES (Continued)

Effective April, 2004 Rev. 4.0

Page	Summary
3-5	Revised para. 3-3a to correct mA signal level values. Moved power up and remaining procedures to Section 5, Startup and Operation.
4-1 through 4-5	Added new Section 4 to discuss system configuration instructions for instruments with an LOI.
5-1 through 5-4	Added new Section 5 to cover equipment Startup and Operation for instruments with a membrane keypad.
6-1 through 6-6	Added new Section 6 to cover equipment Startup and Operation for instruments with an LOI.
8-1	Added new Figure 8-1 to show mV readings of an O_2 sensor cell at normal operating temperature.
8-2 and 8-3	Revised para. 8-3 and 8-5 to include reference to LOI error indications.
8-4	Corrected mA signal level values in notes for Table 8-1. Added Table 8-2 to identify to LOI fault/alarm messages.
8-5 through 8-19	Revised Figure 8-3 through Figure 8-17 and related text to include LOI fault/alarm messages and corrective actions.
8-20	Added new para. 8-6 to troubleshoot O_2 cell faults that do not show an alarm indication.
9-0	Moved calibration record sheet to front of section for easy access.
9-3	Added new procedural step, para. 9-2b.2(b) for use with LOI. Revised heading of para. 9-2b.3 to Manual Calibration with Membrane Keypad.
9-7 through 9-20	Added new para. 9-4 heading to identify equipment repair procedures. All component replacement procedures revised/reformatted accordingly.
9-8, 9-9	Revised Figure 9-3 to show LOI and glass window cover. Added new Figure 9-4 to show remote electronics components.
9-12	Revised Figure 9-7.
11-1 through 11-4	Updated replacement parts lists.

Effective July, 2004 Rev. 4.1

Page	Summary
Cover	Updated revision number and date.
2-12 and 2-13	Added new Figure 2-10, sheets 1 and 2, to identify corrections to wiring color codes.

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PREFACE

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of the Oxymitter 4000 Hazardous Area Oxygen Transmitter.

Some sections may describe equipment not used in your configuration. The user should become thoroughly familiar with the operation of this module before operating it. Read this instruction manual completely.

DEFINITIONS

The following definitions apply to WARNINGS, CAUTIONS, and NOTES found throughout this publication.

WARNING

Highlights an operation or maintenance procedure, practice, condition, statement, etc. If not strictly observed, could result in injury, death, or long-term health hazards of personnel.

CAUTION

Highlights an operation or maintenance procedure, practice, condition, statement, etc. If not strictly observed, could result in damage to or destruction of equipment, or loss of effectiveness.

NOTE

Highlights an essential operating procedure, condition, or statement.

⏚ : EARTH (GROUND) TERMINAL

⏚ : PROTECTIVE CONDUCTOR TERMINAL

⚠ : RISK OF ELECTRICAL SHOCK

⚠ : WARNING: REFER TO INSTRUCTION BULLETIN

NOTE TO USERS

The number in the lower right corner of each illustration in this publication is a manual illustration number. It is not a part number, and is not related to the illustration in any technical manner.

IMPORTANT

SAFETY INSTRUCTIONS FOR THE WIRING AND INSTALLATION OF THIS APPARATUS

The following safety instructions apply specifically to all EU member states. They should be strictly adhered to in order to assure compliance with the Low Voltage Directive. Non-EU states should also comply with the following unless superseded by local or National Standards.

1. Adequate earth connections should be made to all earthing points, internal and external, where provided.

2. After installation or troubleshooting, all safety covers and safety grounds must be replaced. The integrity of all earth terminals must be maintained at all times.

3. Mains supply cords should comply with the requirements of IEC227 or IEC245.

4. All wiring shall be suitable for use in an ambient temperature of greater than 75°C.

5. All cable glands used should be of such internal dimensions as to provide adequate cable anchorage.

6. To ensure safe operation of this equipment, connection to the mains supply should only be made through a circuit breaker which will disconnect all circuits carrying conductors during a fault situation. The circuit breaker may also include a mechanically operated isolating switch. If not, then another means of disconnecting the equipment from the supply must be provided and clearly marked as such. Circuit breakers or switches must comply with a recognized standard such as IEC947. All wiring must conform with any local standards.

7. Where equipment or covers are marked with the symbol to the right, hazardous voltages are likely to be present beneath. These covers should only be removed when power is removed from the equipment — and then only by trained service personnel.

8. Where equipment or covers are marked with the symbol to the right, there is a danger from hot surfaces beneath. These covers should only be removed by trained service personnel when power is removed from the equipment. Certain surfaces may remain hot to the touch.

9. Where equipment or covers are marked with the symbol to the right, refer to the Operator Manual for instructions.

10. All graphical symbols used in this product are from one or more of the following standards: EN61010-1, IEC417, and ISO3864.

BELANGRIJK

Veiligheidsvoorschriften voor de aansluiting en installatie van dit toestel.

De hierna volgende veiligheidsvoorschriften zijn vooral bedoeld voor de EU lidstaten. Hier moet aan gehouden worden om de onderworpenheid aan de Laag Spannings Richtlijn (Low Voltage Directive) te verzekeren. Niet EU staten zouden deze richtlijnen moeten volgen tenzij zij reeds achterhaald zouden zijn door plaatselijke of nationale voorschriften.

1. Degelijke aardingsaansluitingen moeten gemaakt worden naar alle voorziene aardpunten, intern en extern.

2. Na installatie of controle moeten alle veiligheidsdeksels en -aardingen terug geplaatst worden. Ten alle tijde moet de betrouwbaarheid van de aarding behouden blijven.

3. Voedingskabels moeten onderworpen zijn aan de IEC227 of de IEC245 voorschriften.

4. Alle bekabeling moet geschikt zijn voor het gebruik in omgevingstemperaturen, hoger dan 75°C.

5. Alle wartels moeten zo gedimensioneerd zijn dat een degelijke kabel bevestiging verzekerd is.

6. Om de veilige werking van dit toestel te verzekeren, moet de voeding door een stroomonderbreker gevoerd worden (min 10A) welke alle draden van de voeding moet onderbreken. De stroomonderbreker mag een mechanische schakelaar bevatten. Zoniet moet een andere mogelijkheid bestaan om de voedingsspanning van het toestel te halen en ook duidelijk zo zijn aangegeven. Stroomonderbrekers of schakelaars moeten onderworpen zijn aan een erkende standaard zoals IEC947.

7. Waar toestellen of deksels aangegeven staan met het symbool is er meestal hoogspanning aanwezig. Deze deksels mogen enkel verwijderd worden nadat de voedingsspanning werd afgelegd en enkel door getraind onderhoudspersoneel.

8. Waar toestellen of deksels aangegeven staan met het symbool is er gevaar voor hete oppervlakken. Deze deksels mogen enkel verwijderd worden door getraind onderhoudspersoneel nadat de voedingsspanning verwijderd werd. Sommige oppper-vlakken kunnen 45 minuten later nog steeds heet aanvoelen.

9. Waar toestellen of deksels aangegeven staan met het symbool gelieve het handboek te raadplegen.

10. Alle grafische symbolen gebruikt in dit produkt, zijn afkomstig uit een of meer van devolgende standaards: EN61010-1, IEC417 en ISO3864.

VIGTIGT

Sikkerhedsinstruktion for tilslutning og installering af dette udstyr.

Følgende sikkerhedsinstruktioner gælder specifikt i alle EU-medlemslande. Instruktionerne skal nøje følges for overholdelse af Lavsspændingsdirektivet og bør også følges i ikke EU-lande medmindre andet er specificeret af lokale eller nationale standarder.

1. Passende jordforbindelser skal tilsluttes alle jordklemmer, interne og eksterne, hvor disse forefindes.

2. Efter installation eller fejlfinding skal alle sikkerhedsdæksler og jordforbindelser reetableres.

3. Forsyningskabler skal opfylde krav specificeret i IEC227 eller IEC245.

4. Alle ledningstilslutninger skal være konstrueret til omgivelsestemperatur højere end 75° C.

5. Alle benyttede kabelforskruninger skal have en intern dimension, så passende kabelaflastning kan etableres.

6. For opnåelse af sikker drift og betjening skal der skabes beskyttelse mod indirekte berøring gennem afbryder (min. 10A), som vil afbryde alle kredsløb med elektriske ledere i fejlsitua-tion. Afbryderen skal indholde en mekanisk betjent kontakt. Hvis ikke skal anden form for afbryder mellem forsyning og udstyr benyttes og mærkes som sådan. Afbrydere eller kontakter skal overholde en kendt standard som IEC947.

7. Hvor udstyr eller dæksler er mærket med dette symbol, er farlige spændinger normalt forekom-mende bagved. Disse dæksler bør kun afmonteres, når forsyningsspændingen er frakoblet - og da kun af instrueret servicepersonale.

8. Hvor udstyr eller dæksler er mærket med dette symbol, forefindes meget varme overflader bagved. Disse dæksler bør kun afmonteres af instrueret servicepersonale, når forsyningsspænding er frakoblet. Visse overflader vil stadig være for varme at berøre i op til 45 minutter efter frakobling.

9. Hvor udstyr eller dæksler er mærket med dette symbol, se da i betjeningsmanual for instruktion.

10. Alle benyttede grafiske symboler i dette udstyr findes i én eller flere af følgende standarder:- EN61010-1, IEC417 & ISO3864.

BELANGRIJK

Veiligheidsinstructies voor de bedrading en installatie van dit apparaat.

Voor alle EU lidstaten zijn de volgende veiligheidsinstructies van toepassing. Om aan de geldende richtlijnen voor laagspanning te voldoen dient men zich hieraan strikt te houden. Ook niet EU lidstaten dienen zich aan het volgende te houden, tenzij de lokale wetgeving anders voorschrijft.

1. Alle voorziene interne- en externe aardaansluitingen dienen op adequate wijze aangesloten te worden.

2. Na installatie,onderhouds- of reparatie werkzaamheden dienen alle beschermdeksels /kappen en aardingen om reden van veiligheid weer aangebracht te worden.

3. Voedingskabels dienen te voldoen aan de vereisten van de normen IEC 227 of IEC 245.

4. Alle bedrading dient geschikt te zijn voor gebruik bij een omgevings temperatuur boven 75°C.

5. Alle gebruikte kabelwartels dienen dusdanige inwendige afmetingen te hebben dat een adequate verankering van de kabel wordt verkregen.

6. Om een veilige werking van de apparatuur te waarborgen dient de voeding uitsluitend plaats te vinden via een meerpolige automatische zekering (min.10A) die **alle** spanningvoerende geleiders verbreekt indien een foutconditie optreedt. Deze automatische zekering mag ook voorzien zijn van een mechanisch bediende schakelaar. Bij het ontbreken van deze voorziening dient een andere als zodanig duidelijk aangegeven mogelijkheid aanwezig te zijn om de spanning van de apparatuur af te schakelen. Zekeringen en schakelaars dienen te voldoen aan een erkende standaard zoals IEC 947.

7. Waar de apparatuur of de beschermdeksels/kappen gemarkeerd zijn met het volgende symbool, kunnen zich hieronder spanning voerende delen bevinden die gevaar op kunnen leveren. Deze beschermdeksels/kappen mogen uitsluitend verwijderd worden door getraind personeel als de spanning is afgeschakeld.

8. Waar de apparatuur of de beschermdeksels/kappen gemarkeerd zijn met het volgende symbool, kunnen zich hieronder hete oppervlakken of onderdelen bevinden. Bepaalde delen kunnen mogelijk na 45 min. nog te heet zijn om aan te raken.

9. Waar de apparatuur of de beschermdeksels/kappen gemarkeerd zijn met het volgende symbool, dient men de bedieningshandleiding te raadplegen.

10. Alle grafische symbolen gebruikt bij dit produkt zijn volgens een of meer van de volgende standaarden: EN 61010-1, IEC 417 & ISO 3864.

TÄRKEÄÄ

Turvallisuusohje, jota on noudatettava tämän laitteen asentamisessa ja kaapeloinnissa.

Seuraavat ohjeet pätevät erityisesti EU:n jäsenvaltioissa. Niitä täytyy ehdottomasti noudattaa jotta täytettäisiin EU:n matalajännitedirektiivin (Low Voltage Directive) yhteensopivuus. Myös EU:hun kuulumattomien valtioiden tulee nou-dattaa tätä ohjetta, elleivät kansalliset standardit estä sitä.

1. Riittävät maadoituskytkennät on tehtävä kaikkiin maadoituspisteisiin, sisäisiin ja ulkoisiin.

2. Asennuksen ja vianetsinnän jälkeen on kaikki suojat ja suojamaat asennettava takaisin pai-koilleen. Maadoitusliittimen kunnollinen toiminta täytyy aina ylläpitää.

3. Jännitesyöttöjohtimien täytyy täyttää IEC227 ja IEC245 vaatimukset.

4. Kaikkien johdotuksien tulee toimia >75°C lämpötiloissa.

5. Kaikkien läpivientiholkkien sisähalkaisijan täytyy olla sellainen että kaapeli lukkiutuu kun-nolla kiinni.

6. Turvallisen toiminnan varmistamiseksi täytyy jännitesyöttö varustaa turvakytkimellä (min 10A), joka kytkee irti kaikki jännitesyöttöjohtimet vikatilanteessa. Suojaan täytyy myös sisältyä mekaaninen erotuskytkin. Jos ei, niin jännitesyöttö on pystyttävä katkaisemaan muilla keinoilla ja merkittävä siten että se tunnistetaan sellaiseksi. Turvakytkimien tai kat-kaisimien täytyy täyttää IEC947 standardin vaatimukset näkyvyydestä.

7. Mikäli laite tai kosketussuoja on merkitty tällä merkillä on merkinnän takana tai alla hengenvaarallisen suuruinen jännite. Suojaa ei saa poistaa jänniteen ollessa kytkettynä laitteeseen ja poistamisen saa suorittaa vain alan asian-tuntija.

8. Mikäli laite tai kosketussuoja on merkitty tällä merkillä on merkinnän takana tai alla kuuma pinta. Suojan saa poistaa vain alan asiantuntija kun jännite-syöttö on katkaistu. Tällainen pinta voi säilyä kosketuskuumana jopa 45 mi-nuuttia.

9. Mikäli laite tai kosketussuoja on merkitty tällä merkillä katso lisäohjeita käyt-töohjekirjasta

10. Kaikki tässä tuotteessa käytetyt graafiset symbolit ovat yhdestä tai useammasta seuraavis-ta standardeista: EN61010-1, IEC417 & ISO3864.

IMPORTANT

Consignes de sécurité concernant le raccordement et l'installation de cet appareil.

Les consignes de sécurité ci-dessous s'adressent particulièrement à tous les états membres de la communauté européenne. Elles doivent être strictement appliquées afin de satisfaire aux directives concernant la basse tension. Les états non membres de la communauté européenne doivent également appliquer ces consignes sauf si elles sont en contradiction avec les standards locaux ou nationaux.

1. Un raccordement adéquat à la terre doit être effectuée à chaque borne de mise à la terre, interne et externe.

2. Après installation ou dépannage, tous les capots de protection et toutes les prises de terre doivent être remis en place, toutes les prises de terre doivent être respectées en permanence.

3. Les câbles d'alimentation électrique doivent être conformes aux normes IEC227 ou IEC245

4. Tous les raccordements doivent pouvoir supporter une température ambiante supérieure à 75°C.

5. Tous les presse-étoupes utilisés doivent avoir un diamètre interne en rapport avec les câbles afin d'assurer un serrage correct sur ces derniers.

6. Afin de garantir la sécurité du fonctionnement de cet appareil, le raccordement à l'alimentation électrique doit être réalisé exclusivement au travers d'un disjoncteur (minimum 10A.) isolant tous les conducteurs en cas d'anomalie. Ce disjoncteur doit également pouvoir être actionné manuellement, de façon mécanique. Dans le cas contraire, un autre système doit être mis en place afin de pouvoir isoler l'appareil et doit être signalisé comme tel. Disjoncteurs et interrupteurs doivent être conformes à une norme reconnue telle IEC947.

7. Lorsque les équipements ou les capots affichent le symbole suivant, cela signifie que des tensions dangereuses sont présentes. Ces capots ne doivent être démontés que lorsque l'alimentation est coupée, et uniquement par un personnel compétent.

8. Lorsque les équipements ou les capots affichent le symbole suivant, cela signifie que des surfaces dangereusement chaudes sont présentes. Ces capots ne doivent être démontés que lorsque l'alimentation est coupée, et uniquement par un personnel compétent. Certaines surfaces peuvent rester chaudes jusqu'à 45 mn.

9. Lorsque les équipements ou les capots affichent le symbole suivant, se reporter au manuel d'instructions.

10. Tous les symboles graphiques utilisés dans ce produit sont conformes à un ou plusieurs des standards suivants: EN61010-1, IEC417 & ISO3864.

Wichtig

Sicherheitshinweise für den Anschluß und die Installation dieser Geräte.

Die folgenden Sicherheitshinweise sind in allen Mitgliederstaaten der europäischen Gemeinschaft gültig. Sie müssen strickt eingehalten werden, um der Niederspannungsrichtlinie zu genügen. Nichtmitgliedsstaaten der europäischen Gemeinschaft sollten die national gültigen Normen und Richtlinien einhalten.

1. Alle intern und extern vorgesehenen Erdungen der Geräte müssen ausgeführt werden.

2. Nach Installation, Reparatur oder sonstigen Eingriffen in das Gerät müssen alle Sicherheitsabdeckungen und Erdungen wieder installiert werden. Die Funktion aller Erdverbindungen darf zu keinem Zeitpunkt gestört sein.

3. Die Netzspannungsversorgung muß den Anforderungen der IEC227 oder IEC245 genügen.

4. Alle Verdrahtungen sollten mindestens bis 75 °C ihre Funktion dauerhaft erfüllen.

5. Alle Kabeldurchführungen und Kabelverschraubungen sollten in Ihrer Dimensionierung so gewählt werden, daß diese eine sichere Verkabelung des Gerätes ermöglichen.

6. Um eine sichere Funktion des Gerätes zu gewährleisten, muß die Spannungsversorgung über mindestens 10 A abgesichert sein. Im Fehlerfall muß dadurch gewährleistet sein, daß die Spannungsversorgung zum Gerät bzw. zu den Geräten unterbrochen wird. Ein mechanischer Schutzschalter kann in dieses System integriert werden. Falls eine derartige Vorrichtung nicht vorhanden ist, muß eine andere Möglichkeit zur Unterbrechung der Spannungszufuhr gewährleistet werden mit Hinweisen deutlich gekennzeichnet werden. Ein solcher Mechanismus zur Spannungsunterbrechung muß mit den Normen und Richtlinien für die allgemeine Installation von Elektrogeräten, wie zum Beispiel der IEC947, übereinstimmen.

7. Mit dem Symbol sind Geräte oder Abdeckungen gekennzeichnet, die eine gefährliche (Netzspannung) Spannung führen. Die Abdeckungen dürfen nur entfernt werden, wenn die Versorgungsspannung unterbrochen wurde. Nur geschultes Personal darf an diesen Geräten Arbeiten ausführen.

8. Mit dem Symbol sind Geräte oder Abdeckungen gekennzeichnet, in bzw. unter denen heiße Teile vorhanden sind. Die Abdeckungen dürfen nur entfernt werden, wenn die Versorgungsspannung unterbrochen wurde. Nur geschultes Personal darf an diesen Geräten Arbeiten ausführen. Bis 45 Minuten nach dem Unterbrechen der Netzzufuhr können derartig Teile noch über eine erhöhte Temperatur verfügen.

9. Mit dem Symbol sind Geräte oder Abdeckungen gekennzeichnet, bei denen vor dem Eingriff die entsprechenden Kapitel im Handbuch sorgfältig durchgelesen werden müssen.

10. Alle in diesem Gerät verwendeten graphischen Symbole entspringen einem oder mehreren der nachfolgend aufgeführten Standards: EN61010-1, IEC417 & ISO3864.

IMPORTANTE

Norme di sicurezza per il cablaggio e l'installazione dello strumento.

Le seguenti norme di sicurezza si applicano specificatamente agli stati membri dell'Unione Europea, la cui stretta osservanza è richiesta per garantire conformità alla Direttiva del Basso Voltaggio. Esse si applicano anche agli stati non appartenenti all'Unione Europea, salvo quanto disposto dalle vigenti normative locali o nazionali.

1. Collegamenti di terra idonei devono essere eseguiti per tutti i punti di messa a terra interni ed esterni, dove previsti.

2. Dopo l'installazione o la localizzazione dei guasti, assicurarsi che tutti i coperchi di protezione siano stati collocati e le messa a terra siano collegate. L'integrità di ciscun morsetto di terra deve essere costantemente garantita.

3. I cavi di alimentazione della rete devono essere secondo disposizioni IEC227 o IEC245.

4. L'intero impianto elettrico deve essere adatto per uso in ambiente con temperature superiore a 75°C.

5. Le dimensioni di tutti i connettori dei cavi utilizzati devono essere tali da consentire un adeguato ancoraggio al cavo.

6. Per garantire un sicuro funzionamento dello strumento il collegamento alla rete di alimentazione principale dovrà essere eseguita tramite interruttore automatico (min.10A), in grado di disattivare tutti i conduttori di circuito in caso di guasto. Tale interruttore dovrà inoltre prevedere un sezionatore manuale o altro dispositivo di interruzione dell'alimentazione, chiaramente identificabile. Gli interruttori dovranno essere conformi agli standard riconosciuti, quali IEC947.

7. Il simbolo riportato sullo strumento o sui coperchi di protezione indica probabile presenza di elevati voltaggi. Tali coperchi di protezione devono essere rimossi esclusivamente da personale qualificato, dopo aver tolto alimentazione allo strumento.

8. Il simbolo riportato sullo strumento o sui coperchi di protezione indica rischio di contatto con superfici ad alta temperatura. Tali coperchi di protezione devono essere rimossi esclusivamente da personale qualificato, dopo aver tolto alimentazione allo strumento. Alcune superfici possono mantenere temperature elevate per oltre 45 minuti.

9. Se lo strumento o il coperchio di protezione riportano il simbolo, fare riferimento alle istruzioni del manuale Operatore.

10. Tutti i simboli grafici utilizzati in questo prodotto sono previsti da uno o più dei seguenti standard: EN61010-1, IEC417 e ISO3864.

VIKTIG

Sikkerhetsinstruks for tilkobling og installasjon av dette utstyret.

Følgende sikkerhetsinstruksjoner gjelder spesifikt alle EU medlemsland og land med i EØS-avtalen. Instruksjonene skal følges nøye slik at installasjonen blir i henhold til lavspenningsdirektivet. Den bør også følges i andre land, med mindre annet er spesifisert av lokale- eller nasjonale standarder.

1. Passende jordforbindelser må tilkobles alle jordingspunkter, interne og eksterne hvor disse forefinnes.

2. Etter installasjon eller feilsøking skal alle sikkerhetsdeksler og jordforbindelser reetableres. Jordingsforbindelsene må alltid holdes i god stand.

3. Kabler fra spenningsforsyning skal oppfylle kravene spesifisert i IEC227 eller IEC245.

4. Alle ledningsforbindelser skal være konstruert for en omgivelsestemperatur høyere en 750C.

5. Alle kabelforskruvninger som benyttes skal ha en indre dimensjon slik at tilstrekkelig avlastning oppnåes.

6. For å oppnå sikker drift og betjening skal forbindelsen til spenningsforsyningen bare skje gjennom en strømbryter (minimum 10A) som vil bryte spenningsforsyningen til alle elektriske kretser ved en feilsituasjon. Strømbryteren kan også inneholde en mekanisk operert bryter for å isolere instrumentet fra spenningsforsyningen. Dersom det ikke er en mekanisk operert bryter installert, må det være en annen måte å isolere utstyret fra spenningsforsyningen, og denne måten må være tydelig merket. Kretsbrytere eller kontakter skal oppfylle kravene i en annerkjent standard av typen IEC947 eller tilsvarende.

7. Der hvor utstyr eller deksler er merket med symbol for farlig spenning, er det sannsynlig at disse er tilstede bak dekslet. Disse dekslene må bare fjærnes når spenningsforsyning er frakoblet utstyret, og da bare av trenet servicepersonell.

8. Der hvor utstyr eller deksler er merket med symbol for meget varm overflate, er det sannsynlig at disse er tilstede bak dekslet. Disse dekslene må bare fjærnes når spenningsforsyning er frakoblet utstyret, og da bare av trenet servicepersonell. Noen overflater kan være for varme til å berøres i opp til 45 minutter etter spenningsforsyning frakoblet.

9. Der hvor utstyret eller deksler er merket med symbol, vennligst referer til instruksjonsmanualen for instrukser.

10. Alle grafiske symboler brukt i dette produktet er fra en eller flere av følgende standarder: EN61010-1, IEC417 & ISO3864.

IMPORTANTE

Instruções de segurança para ligação e instalação deste aparelho.

As seguintes instruções de segurança aplicam-se especificamente a todos os estados membros da UE. Devem ser observadas rigidamente por forma a garantir o cumprimento da Directiva sobre Baixa Tensão. Relativamente aos estados que não pertençam à UE, deverão cumprir igualmente a referida directiva, exceptuando os casos em que a legislação local a tiver substituído.

1. Devem ser feitas ligações de terra apropriadas a todos os pontos de terra, internos ou externos.

2. Após a instalação ou eventual reparação, devem ser recolocadas todas as tampas de segurança e terras de protecção. Deve manter-se sempre a integridade de todos os terminais de terra.

3. Os cabos de alimentação eléctrica devem obedecer às exigências das normas IEC227 ou IEC245.

4. Os cabos e fios utilizados nas ligações eléctricas devem ser adequados para utilização a uma temperatura ambiente até 75º C.

5. As dimensões internas dos bucins dos cabos devem ser adequadas a uma boa fixação dos cabos.

6. Para assegurar um funcionamento seguro deste equipamento, a ligação ao cabo de alimentação eléctrica deve ser feita através de um disjuntor (min. 10A) que desligará todos os condutores de circuitos durante uma avaria. O disjuntor poderá também conter um interruptor de isolamento accionado manualmente. Caso contrário, deverá ser instalado qualquer outro meio para desligar o equipamento da energia eléctrica, devendo ser assinalado convenientemente. Os disjuntores ou interruptores devem obedecer a uma norma reconhecida, tipo IEC947.

7. Sempre que o equipamento ou as tampas contiverem o símbolo, é provável a existência de tensões perigosas. Estas tampas só devem ser retiradas quando a energia eléctrica tiver sido desligada e por Pessoal da Assistência devidamente treinado.

8. Sempre que o equipamento ou as tampas contiverem o símbolo, há perigo de existência de superfícies quentes. Estas tampas só devem ser retiradas por Pessoal da Assistência devidamente treinado e depois de a energia eléctrica ter sido desligada. Algumas superfícies permanecem quentes até 45 minutos depois.

9. Sempre que o equipamento ou as tampas contiverem o símbolo, o Manual de Funcionamento deve ser consultado para obtenção das necessárias instruções.

10. Todos os símbolos gráficos utilizados neste produto baseiam-se em uma ou mais das seguintes normas: EN61010-1, IEC417 e ISO3864.

IMPORTANTE

Instrucciones de seguridad para el montaje y cableado de este aparato.

Las siguientes instrucciones de seguridad , son de aplicacion especifica a todos los miembros de la UE y se adjuntaran para cumplir la normativa europea de baja tension.

1. Se deben preveer conexiones a tierra del equipo, tanto externa como internamente, en aquellos terminales previstos al efecto.

2. Una vez finalizada las operaciones de mantenimiento del equipo, se deben volver a colocar las cubiertas de seguridad aasi como los terminales de tierra. Se debe comprobar la integridad de cada terminal.

3. Los cables de alimentacion electrica cumpliran con las normas IEC 227 o IEC 245.

4. Todo el cableado sera adecuado para una temperatura ambiental de 75ºC.

5. Todos los prensaestopas seran adecuados para una fijacion adecuada de los cables.

6. Para un manejo seguro del equipo, la alimentacion electrica se realizara a traves de un interruptor magnetotermico (min 10 A), el cual desconectara la alimentacion electrica al equipo en todas sus fases durante un fallo. Los interruptores estaran de acuerdo a la norma IEC 947 u otra de reconocido prestigio.

7. Cuando las tapas o el equipo lleve impreso el simbolo de tension electrica peligrosa, dicho alojamiento solamente se abrira una vez que se haya interrumpido la alimentacion electrica al equipo asimismo la intervencion sera llevada a cabo por personal entrenado para estas labores.

8. Cuando las tapas o el equipo lleve impreso el simbolo, hay superficies con alta temperatura, por tanto se abrira una vez que se haya interrumpido la alimentacion electrica al equipo por personal entrenado para estas labores, y al menos se esperara unos 45 minutos para enfriar las superficies calientes.

9. Cuando el equipo o la tapa lleve impreso el simbolo, se consultara el manual de instrucciones.

10. Todos los simbolos graficos usados en esta hoja, estan de acuerdo a las siguientes normas EN61010-1, IEC417 & ISO 3864.

VIKTIGT

Säkerhetsföreskrifter för kablage och installation av denna apparat.

Följande säkerhetsföreskrifter är tillämpliga för samtliga EU-medlemsländer. De skall följas i varje avseende för att överensstämma med Lågspännings direktivet. Icke EU medlemsländer skall också följa nedanstående punkter, såvida de inte övergrips av lokala eller nationella föreskrifter.

1. Tillämplig jordkontakt skall utföras till alla jordade punkter, såväl internt som externt där så erfordras.
2. Efter installation eller felsökning skall samtliga säkerhetshöljen och säkerhetsjord återplaceras. Samtliga jordterminaler måste hållas obrutna hela tiden.
3. Matningsspänningens kabel måste överensstämma med föreskrifterna i IEC227 eller IEC245.
4. Allt kablage skall vara lämpligt för användning i en omgivningstemperatur högre än 75ºC.
5. Alla kabelförskruvningar som används skall ha inre dimensioner som motsvarar adekvat kabelförankring.
6. För att säkerställa säker drift av denna utrustning skall anslutning till huvudströmmen endast göras genom en säkring (min 10A) som skall frånkoppla alla strömförande kretsar när något fel uppstår. Säkringen kan även ha en mekanisk frånskiljare. Om så inte är fallet, måste ett annat förfarande för att frånskilja utrustningen från strömförsörjning tillhandahållas och klart framgå genom markering. Säkring eller omkopplare måste överensstämma med en gällande standard såsom t ex IEC947.
7. Där utrustning eller hölje är markerad med vidstående symbol föreliggerisk för livsfarlig spänning i närheten. Dessa höljen får endast avlägsnas när strömmen ej är ansluten till utrustningen - och då endast av utbildad servicepersonal.

8. När utrustning eller hölje är markerad med vidstående symbol föreligger risk för brännskada vid kontakt med uppvärmd yta. Dessa höljen får endast avlägsnas av utbildad servicepersonal, när strömmen kopplats från utrustningen. Vissa ytor kan vara mycket varma att vidröra även upp till 45 minuter efter avstängning av strömmen.

9. När utrustning eller hölje markerats med vidstående symbol bör instruktionsmanualen studeras för information.

10. Samtliga grafiska symboler som förekommer i denna produkt finns angivna i en eller flera av följande föreskrifter:- EN61010-1, IEC417 & ISO3864.

ΠΡΟΣΟΧΗ

Οδηγίες ασφαλείας για την καλωδίωση και εγκατάσταση της συσκευής.

Οι ακόλουθες οδηγίες ασφαλείας εφαρμόζονται ειδικά σε όλες τις χώρες μέλη της Ευρωπαϊκής Κοινότητας. Θα πρέπει να ακολουθούνται αυστηρά ώστε να εξασφαλιστεί η συμβατότητα με τις οδηγίες για τη Χαμηλή Τάση. Χώρες που δεν είναι μέλη της Ευρωπαϊκής Κοινότητας θα πρέπει επίσης να ακολουθούν τις οδηγίες εκτός εάν αντικαθίστανται από τα Τοπικά ή Εθνικά Πρότυπα.

1. Επαρκείς συνδέσεις γείωσης θα πρέπει να γίνονται σε όλα τα σημεία γείωσης, εσωτερικά και εξωτερικά όπου υπάρχουν.

2. Μετά την εγκατάσταση ή την εκσφαλμάτωση όλα τα καλύματα ασφαλείας και οι γειώσεις ασφαλείας πρέπει να επανεγκαθίστανται. Η καλή κατάσταση όλων των ακροδεκτών γείωσης πρέπει να ελέγχεται και να συντηρείται διαρκώς.

3. Τα καλώδια τροφοδοσίας πρέπει να πληρούν τις απαιτήσεις των IEC227 ή IEC245.

4. Ολες οι καλωδιώσεις θα πρέπει είναι κατάλληλες για χρήση σε ατμοσφαιρική θερμοκρασία χώρου υψηλότερη από 75°C.

5. Ολοι οι στυπιοθλίπτες θα πρέπει να είναι τέτοιων εσωτερικών διαστάσεων ώστε να παρέχουν επαρκή στερέωση των καλωδίων.

6. Για τη διασφάλιση ασφαλούς λειτουργίας της σύνδεσης τροφοδοσίας αυτής της συσκευής θα πρέπει να γίνεται μόνο μέσω ασφαλειοδιακόπτη (ελάχιστο 10A) ο οποίος θα αποσυνδέει όλους του ηλεκτροφόρους αγωγούς στη διάρκεια κατάστασης σφάλματος.
   Ο ασφαλειοδιακόπτης μπορεί επίσης να περιλαμβάνει μηχανικό διακόπτη απομόνωσης. Εάν δεν περιλαμβάνει, τότε άλλα μέσα αποσύνδεσης της συσκευής από την τροφοδοσία πρέπει να παροχηθούν και σαφώς να σημανθούν σαν τέτοια. Οι ασφαλειοδιακόπτες ή διακόπτες πρέπει να συμφωνούν με αναγνωρισμένα πρότυπα όπως το IEC947.

7. Οπου συσκευές ή καλύματα είναι σημασμένα με το σύμβολο επικίνδυνες τάσεις ενυπάρχουν κάτω από αυτά.
   Αυτά τα καλύματα θα πρέπει να αφαιρούνται μόνο όταν έχει αφαιρεθεί η τροφοδοσία από τη συσκευή και τότε μόνο από ειδικευμένο τεχνικό προσωπικό.

8. Οπου συσκευές ή καλύματα είναι σημασμένα με το σύμβολο υπάρχει κίνδυνος από καυτές επιφάνειες κάτω από αυτά.
   Αυτά τα καλύματα θα πρέπει να αφαιρούνται μόνο από ειδικευμένο τεχνικό προσωπικό, όταν η τροφοδοσία έχει αφαιρεθεί από από τη συσκευή. Τέτοιες επιφάνειες μπορούν να παραμείνουν ζεστές στην αφή έως και 45 λεπτά αργότερα.

9. Οπου συσκευές ή καλύματα είναι σημασμένα με το σύμβολο αναφερθείται στις οδηγίες χρήσης της συσκευής.

10. Ολα τα γραφικά σύμβολα που χρησιμοποιούνται σε αυτό το προϊόν είναι από ένα ή περισσότερα από τα έχης πρότυπα: **EN61010-1, IEC417** και **ISO3864.**

CERAMIC FIBER PRODUCTS
MATERIAL SAFETY DATA SHEET
JULY 1, 1996

SECTION I. IDENTIFICATION

PRODUCT NAME

Ceramic Fiber Heaters, Molded Insulation Modules and Ceramic Fiber Radiant Heater Panels.

CHEMICAL FAMILY

Vitreous Aluminosilicate Fibers with Silicon Dioxide.

CHEMICAL NAME

N.A.

CHEMICAL FORMULA

N.A.

MANUFACTURER'S NAME AND ADDRESS

Watlow Columbia
2101 Pennsylvania Drive
Columbia, MO 65202

573-474-9402
573-814-1300, ext. 5170

HEALTH HAZARD SUMMARY
WARNING

- Possible cancer hazard based on tests with laboratory animals.
- May be irritating to skin, eyes and respiratory tract.
- May be harmful if inhaled.
- Cristobalite (crystalline silica) formed at high temperatures (above 1800ºF) can cause severe respiratory disease.

SECTION II. PHYSICAL DATA

APPEARANCE AND ODOR

Cream to white colored fiber shapes. With or without optional white to gray granular surface coating and/or optional black surface coating.

SPECIFIC WEIGHT: 12-25 lb./cubic foot

BOILING POINT: N.A.

VOLATILES (% BY WT.): N.A.

WATER SOLUBILITY: N.A.

SECTION III. HAZARDOUS INGREDIENTS

MATERIAL, QUANTITY, AND THRESHOLD/EXPOSURE LIMIT VALUES

Aluminosilicate (vitreous) 99+ %	1 fiber/cc TWA
CAS. No. 142844-00-06	10 fibers/cc CL
Zirconium Silicate	0-10% 5 mg/cubic meter (TLV)
Black Surface Coating**	0 - 1% 5 mg/cubic meter (TLV)
Armorphous Silica/Silicon Dioxide	0-10% 20 mppcf (6 mg/cubic meter) PEL (OSHA 1978) 3 gm cubic meter (Respirable dust): 10 mg/cubic meter, Intended TLV (ACGIH 1984-85)

**Composition is a trade secret.

SECTION IV. FIRE AND EXPLOSION DATA

FLASH POINT: None

FLAMMABILITY LIMITS: N.A.

EXTINGUISHING MEDIA

Use extinguishing agent suitable for type of surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS / SPECIAL FIRE FIGHTING PROCEDURES

N.A.

SECTION V. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

(See Section III)

EFFECTS OF OVER EXPOSURE

EYE

Avoid contact with eyes. Slightly to moderately irritating. Abrasive action may cause damage to outer surface of eye.

INHALATION

May cause respiratory tract irritation. Repeated or prolonged breathing of particles of respirable size may cause inflammation of the lung leading to chest pain, difficult breathing, coughing and possible fibrotic change in the lung (Pneumoconiosis). Pre-existing medical conditions may be aggravated by exposure: specifically, bronchial hyper-reactivity and chronic bronchial or lung disease.

INGESTION

May cause gastrointestinal disturbances. Symptoms may include irritation and nausea, vomiting and diarrhea.

SKIN

Slightly to moderate irritating. May cause irritation and inflammation due to mechanical reaction to sharp, broken ends of fibers.

EXPOSURE TO USED CERAMIC FIBER PRODUCT

Product which has been in service at elevated temperatures (greater than 1800ºF/982ºC) may undergo partial conversion to cristobalite, a form of crystalline silica which can cause severe respiratory disease (Pneumoconiosis). The amount of cristobalite present will depend on the temperature and length of time in service. (See Section IX for permissible exposure levels).

SPECIAL TOXIC EFFECTS

The existing toxicology and epidemiology data bases for RCF's are still preliminary. Information will be updated as studies are completed and reviewed. The following is a review of the results to date:

EPIDEMIOLOGY

At this time there are no known published reports demonstrating negative health outcomes of workers exposed to refractory ceramic fiber (RCF). Epidemiologic investigations of RCF production workers are ongoing.

1) There is no evidence of any fibrotic lung disease (interstitial fibrosis) whatsoever on x-ray.
2) There is no evidence of any lung disease among those employees exposed to RCF that had never smoked.
3) A statistical "trend" was observed in the exposed population between the duration of exposure to RCF and a decrease in some measures of pulmonary function. These observations are clinically insignificant. In other words, if these observations were made on an individual employee, the results would be interpreted as being within the normal range.
4) Pleural plaques (thickening along the chest wall) have been observed in a small number of employees who had a long duration of employment. There are several occupational and non-occupational causes for pleural plaque. It should be noted that plaques are not "pre-cancer" nor are they associated with any measurable effect on lung function.

TOXICOLOGY

A number of studies on the health effects of inhalation exposure of rats and hamsters are available. Rats were exposed to RCF in a series of life-time nose-only inhalation studies. The animals were exposed to 30, 16, 9, and 3 mg/m^3, which corresponds with approximately 200, 150, 75, and 25 fibers/cc.

Animals exposed to 30 and 16 mg/m^3 were observed to have developed a pleural and parenchymal fibroses; animals exposed to 9 mg/m^3 had developed a mild parenchymal fibrosis; animals exposed to the lowest dose were found to have the response typically observed any time a material is inhaled into the deep lung. While a statistically significant increase in lung tumors was observed following exposure to the highest dose, there was no excess lung cancers at the other doses. Two rats exposed to 30 mg/m^3 and one rat exposed to 9 mg/m^3 developed masotheliomas.

The International Agency for Research on Cancer (IARC) reviewed the carcinogenicity data on man-made vitreous fibers (including ceramic fiber, glasswool, rockwool, and slagwool) in 1987. IARC classified ceramic fiber, fibrous glasswool and mineral wool (rockwool and slagwool) as possible human carcinogens (Group 2B).

EMERGENCY FIRST AID PROCEDURES

EYE CONTACT

Flush eyes immediately with large amounts of water for approximately 15 minutes. Eye lids should be held away from the eyeball to insure thorough rinsing. Do not rub eyes. Get medical attention if irritation persists.

INHALATION

Remove person from source of exposure and move to fresh air. Some people may be sensitive to fiber induced irritation of the respiratory tract. If symptoms such as shortness of breath, coughing, wheezing or chest pain develop, seek medical attention. If person experiences continued breathing difficulties, administer oxygen until medical assistance can be rendered.

INGESTION

Do not induce vomiting. Get medical attention if irritation persists.

SKIN CONTACT

Do not rub or scratch exposed skin. Wash area of contact thoroughly with soap and water. Using a skin cream or lotion after washing may be helpful. Get medical attention if irritation persists.

SECTION VI. REACTIVITY DATA

STABILITY/CONDITIONS TO AVOID

Stable under normal conditions of use.

HAZARDOUS POLYMERIZATION/CONDITIONS TO AVOID

N.A.

INCOMPATIBILITY/MATERIALS TO AVOID

Incompatible with hydrofluoric acid and concentrated alkali.

HAZARDOUS DECOMPOSITION PRODUCTS

N.A.

SECTION VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Where possible, use vacuum suction with HEPA filters to clean up spilled material. Use dust suppressant where sweeping if necessary. Avoid clean up procedure which may result in water pollution. (Observe Special Protection Information Section VIII.)

WASTE DISPOSAL METHODS

The transportation, treatment, and disposal of this waste material must be conducted in compliance with all applicable Federal, State, and Local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION

Use NIOSH or MSHA approved equipment when airborne exposure limits may be exceeded. NIOSH/MSHA approved breathing equipment may be required for non-routine and emergency use. (See Section IX for suitable equipment).

Pending the results of long term health effects studies, engineering control of airborne fibers to the lowest levels attainable is advised.

VENTILATION

Ventilation should be used whenever possible to control or reduce airborne concentrations of fiber and dust. Carbon monoxide, carbon dioxide, oxides of nitrogen, reactive hydrocarbons and a small amount of formaldehyde may accompany binder burn-off during first heat. Use adequate ventilation or other precautions to eliminate vapors resulting from binder burn-off. Exposure to burn-off fumes may cause respiratory tract irritation, bronchial hyper-reactivity and asthmatic response.

SKIN PROTECTION

Wear gloves, hats and full body clothing to prevent skin contact. Use separate lockers for work clothes to prevent fiber transfer to street clothes. Wash work clothes separately from other clothing and rinse washing machine thoroughly after use.

EYE PROTECTION

Wear safety glasses or chemical worker’s goggles to prevent eye contact. Do not wear contact lenses when working with this substance. Have eye baths readily available where eye contact can occur.

SECTION IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

General cleanliness should be followed.

The Toxicology data indicate that ceramic fiber should be handled with caution. The handling practices described in this MSDS must be strictly followed. In particular, when handling refractory ceramic fiber in any application, special caution should be taken to avoid unnecessary cutting and tearing of the material to minimize generation of airborne dust.

It is recommended that full body clothing be worn to reduce the potential for skin irritation. Washable or disposable clothing may be used. Do not take unwashed work clothing home. Work clothes should be washed separately from other clothing. Rinse washing machine thoroughly after use. If clothing is to be laundered by someone else, inform launderer of proper procedure. Work clothes and street clothes should be kept separate to prevent contamination.

Product which has been in service at elevated temperatures (greater than 1800ºF/982ºC) may undergo partial conversion to cristobalite, a form of crystalline silica. This reaction occurs at the furnace lining hot face. As a consequence, this material becomes more friable; special caution must be taken to minimize generation of airborne dust. The amount of cristobalite present will depend on the temperature and length in service.

IARC has recently reviewed the animal, human, and other relevant experimental data on silica in order to critically evaluate and classify the cancer causing potential. Based on its review, IARC classified crystalline silica as a group 2A carcinogen (probable human carcinogen).

The OSHA permissible exposure limit (PEL for cristobalite is 0.05 mg/m^3 (respirable dust). The ACGIH threshold limit value (TLV) for cristobalite is 0.05 mg/m^3 (respirable dust) (ACGIH 1991-92). Use NIOSH or MSHA approved equipment when airborne exposure limits may be exceeded. The minimum respiratory protection recommended for given airborne fiber or cristobalite concentrations are:

CONCENTRATION

0-1 fiber/cc or 0-0.05 mg/m^3 cristobalite (the OSHA PEL)	Optional disposable dust respirator (e.g. 3M 9970 or equivalent).
Up to 5 fibers/cc or up to 10 times the OSHA PEL for cristobalite	Half face, air-purifying respirator equipped with high efficiency particulate air (HEPA) filter cartridges (e.g. 3M 6000 series with 2040 filter or equivalent).
Up to 25 fibers/cc or 50 times the OSHA PEL for cristobalite (2.5 mg/m^3)	Full face, air-purifying respirator with high efficiency particulate air (HEPA) filter cartridges (e.g. 3M 7800S with 7255 filters or equivalent) or powered air-purifying respirator (PARR) equipped with HEPA filter cartridges (e.g. 3M W3265S with W3267 filters or equivalent).
Greater than 25 fibers/cc or 50 times the OSHA PEL for cristobalite (2.5 mg/m^3)	Full face, positive pressure supplied air respirator (e.g. 3M 7800S with W9435 hose & W3196 low pressure regulator kit connected to clean air supply or equivalent).

If airborne fiber or cristobalite concentrations are not known, as minimum protection, use NIOSH/MSHA approved half face, air-purifying respirator with HEPA filter cartridges.

Insulation surface should be lightly sprayed with water before removal to suppress airborne dust. As water evaporates during removal, additional water should be sprayed on surfaces as needed. Only enough water should be sprayed to suppress dust so that water does not run onto the floor of the work area. To aid the wetting process, a surfactant can be used.

After RCF removal is completed, dust-suppressing cleaning methods, such as wet sweeping or vacuuming, should be used to clean the work area. If dry vacuuming is used, the vacuum must be equipped with HEPA filter. Air blowing or dry sweeping should not be used. Dust-suppressing components can be used to clean up light dust.

Product packaging may contain product residue. Do not reuse except to reship or return Ceramic Fiber products to the factory.

GENERAL PRECAUTIONS FOR HANDLING AND STORING HIGH PRESSURE GAS CYLINDERS

Edited from selected paragraphs of the Compressed Gas Association's "Handbook of Compressed Gases" published in 1981
Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, Virginia 22202
Used by Permission

1. Never drop cylinders or permit them to strike each other violently.

2. Cylinders may be stored in the open, but in such cases, should be protected against extremes of weather and, to prevent rusting, from the dampness of the ground. Cylinders should be stored in the shade when located in areas where extreme temperatures are prevalent.

3. The valve protection cap should be left on each cylinder until it has been secured against a wall or bench, or placed in a cylinder stand, and is ready to be used.

4. Avoid dragging, rolling, or sliding cylinders, even for short distance; they should be moved by using a suitable hand-truck.

5. Never tamper with safety devices in valves or cylinders.

6. Do not store full and empty cylinders together. Serious suckback can occur when an empty cylinder is attached to a pressurized system.

7. No part of cylinder should be subjected to a temperature higher than 52°C (125°F). A flame should never be permitted to come in contact with any part of a compressed gas cylinder.

8. Do not place cylinders where they may become part of an electric circuit. When electric arc welding, precautions must be taken to prevent striking an arc against the cylinder.

SECTION 1
DESCRIPTION AND SPECIFICATIONS

1-1 COMPONENT CHECKLIST OF TYPICAL SYSTEM (PACKAGE CONTENTS)

A typical Rosemount Hazardous Area Oxymitter 4000 Oxygen Transmitter should contain the items shown in Figure 1-1. Record the part number, serial number, and order number for each component of your system in the table located on the first page of this manual.

WARNING

The Oxymitter 4000 is offered in both hazardous area and general purpose configurations. The hazardous area version has special markings on the approval label. The general purpose version does not. If you received the general purpose version, ensure you do not install it in a potentially explosive atmosphere.

Also, use the product matrix in Table 1-1 at the end of this section to compare your order number against your unit. The first part of the matrix defines the model. The last part defines the various options and features of the Hazardous Area Oxymitter 4000. Ensure the features and options specified by your order number are on or included with the unit.

1-2 SYSTEM OVERVIEW

a. Scope

This Instruction Bulletin provides the information needed to install, start up, operate, and maintain the Hazardous Area Oxymitter 4000. Signal conditioning electronics outputs a 4-20 mA signal representing an O_2 value and provides a membrane keypad or full function Local Operator Interface (LOI) for setup, calibration, and diagnostics. This same information, plus additional details, can be accessed with the HART Model 275/375 handheld communicator or Asset Management Solutions (AMS) software.

b. System Description

The Hazardous Area Oxymitter 4000 is designed to measure the net concentration of oxygen in an industrial process; i.e., the oxygen remaining after all fuels have been oxidized. The probe is permanently positioned within an exhaust duct or stack and performs its task without the use of a sampling system.

The equipment measures oxygen percentage by reading the voltage developed across a heated electrochemical cell, which consists of a small yttria-stabilized, zirconia disc. Both sides of the disc are coated with porous metal electrodes. When operated at the proper temperature, the millivolt output voltage of the cell is given by the following Nernst equation:

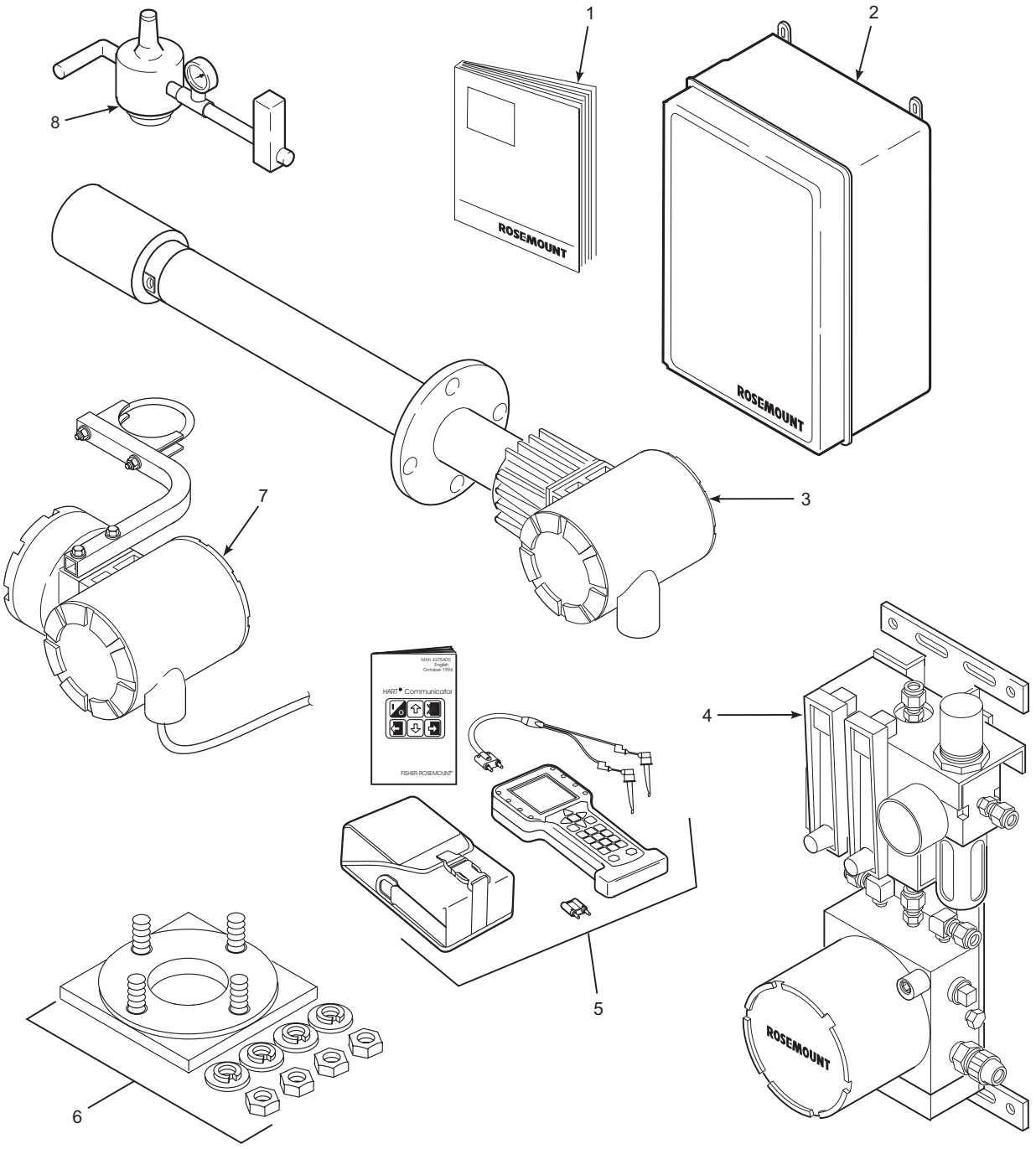
$$EMF = KT \log10(P1/P2) + C$$

Where:

1. P2 is the partial pressure of the oxygen in the measured gas on one side of the cell.
2. P1 is the partial pressure of the oxygen in the reference air on the opposite side of the cell.
3. T is the absolute temperature.
4. C is the cell constant.
5. K is an arithmetic constant.

NOTE

For best results, use clean, dry, instrument air (20.95% oxygen) as the reference air.



1. Instruction Bulletin
2. IMPS 4000 Intelligent Multiprobe Test Gas Sequencer (Optional)
3. Hazardous Area Oxymitter 4000 with Integral Electronics
4. SPS 4000 Single Probe Autocalibration Sequencer (Optional) - (Shown with reference air option) (Safe area only)
5. HART® Communicator Package, Model 375 (Optional)
6. Mounting Plate with Mounting Hardware and Gasket
7. Hazardous Area Oxymitter 4000 with Remote Electronics (Optional)
8. Reference Air Set (used if SPS 4000 without reference air option or IMPS 4000 not supplied)

Figure 1-1. Typical System Package

When the cell is at operating temperature and there are unequal oxygen concentrations across the cell, oxygen ions will travel from the high oxygen partial pressure side to the low oxygen partial pressure side of the cell. The resulting logarithmic output voltage is approximately 50 mV per decade. The output is proportional to the inverse logarithm of the oxygen concentration. Therefore, the output signal increases as the oxygen concentration of the sample gas decreases. This characteristic enables the Hazardous Area Oxymitter 4000 to provide exceptional sensitivity at low oxygen concentrations.

The Hazardous Area Oxymitter 4000 measures net oxygen concentration in the presence of all the products of combustion, including water vapor. Therefore, it may be considered an analysis on a “wet” basis. In comparison with older methods, such as the portable apparatus, which provides an analysis on a “dry” gas basis, the “wet” analysis will, in general, indicate a lower percentage of oxygen. The difference will be proportional to the water content of the sampled gas stream.

c. System Configuration

Hazardous Area Oxymitter 4000 units are available in three length options, giving the user the flexibility to use an in situ penetration appropriate to the size of the stack or duct. The options on length are 457 mm (18 in.), 0.91 m (3 ft), and 1.83 m (6 ft).

The electronics control probe temperatures and provide an isolated output, 4-20 mA, that is proportional to the measured oxygen concentration. The power supply can accept voltages of 90-250 VAC and 48/62 Hz; no setup procedures are required. The oxygen sensing cell is maintained at a constant temperature by modulating the duty cycle of the probe heater portion of the electronics. The electronics accepts millivolt signals generated by the sensing cell and produces the outputs to be used by remotely connected devices. The output is an isolated 4-20 mA linearized current.

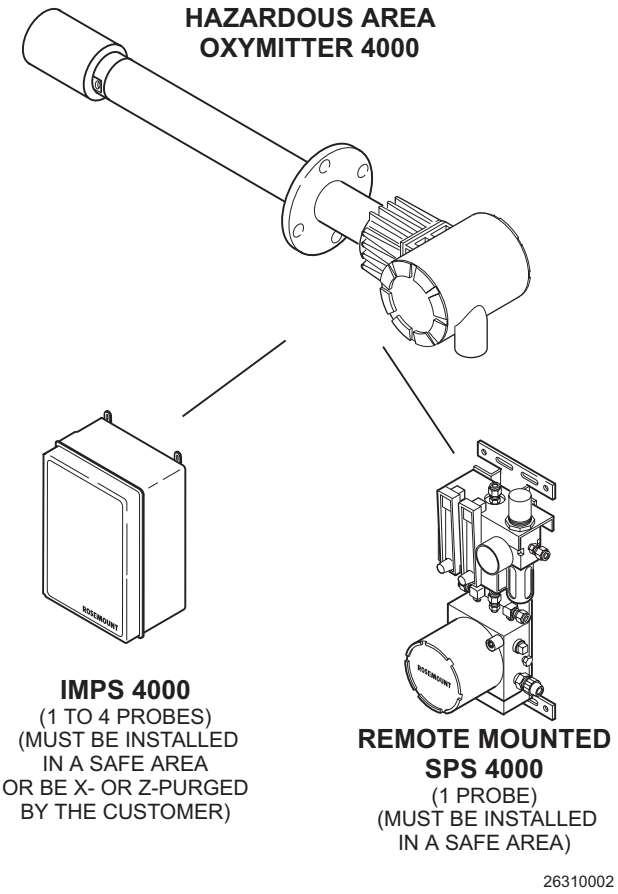


Figure 1-2. Hazardous Area Oxymitter 4000 Autocalibration System Options

The Oxymitter 4000 transmitter is available with an integral or remote electronics package. Two calibration gas sequencers are available to the Hazardous Area Oxymitter 4000, but they must be installed in a non-hazardous, explosive-free environment: the IMPS 4000 and the SPS 4000 (Figure 1-2).

Systems with multiprobe applications may employ an optional IMPS 4000 Intelligent Multiprobe Test Gas Sequencer. The IMPS 4000 provides automatic calibration gas sequencing for up to four Hazardous Area Oxymitter 4000 units and accommodates autocalibrations based on the CALIBRATION RECOMMENDED signal from the Hazardous Area Oxymitter 4000, a timed interval set up in HART or the IMPS 4000, or whenever a calibration request is initiated.

For systems with one or two Hazardous Area Oxymitter 4000 units per combustion process, an optional remote mounted SPS 4000 Single Probe Autocalibration Sequencer can be used with each Hazardous Area Oxymitter 4000 to provide automatic calibration gas sequencing. The sequencer performs autocalibrations based on the CALIBRATION RECOMMENDED signal from the Hazardous Area Oxymitter 4000, a timed interval set up in HART, or whenever a calibration request is initiated.

d. System Features

1. The CALIBRATION RECOMMENDED feature detects when the sensing cell is likely out of limits. This may eliminate the need to calibrate on a “time since last cal” basis.

2. The cell output voltage and sensitivity increase as the oxygen concentration decreases.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

3. Membrane keypad Figure 1-3 and HART communication are standard. To use the HART capability, you must have either:

   (a) HART Model 275/375 Communicator.

   (b) Asset Management Solutions (AMS) software for the PC.

4. An optional Local Operator Interface Figure 1-4 allows continual O_2 display and full interface capability.

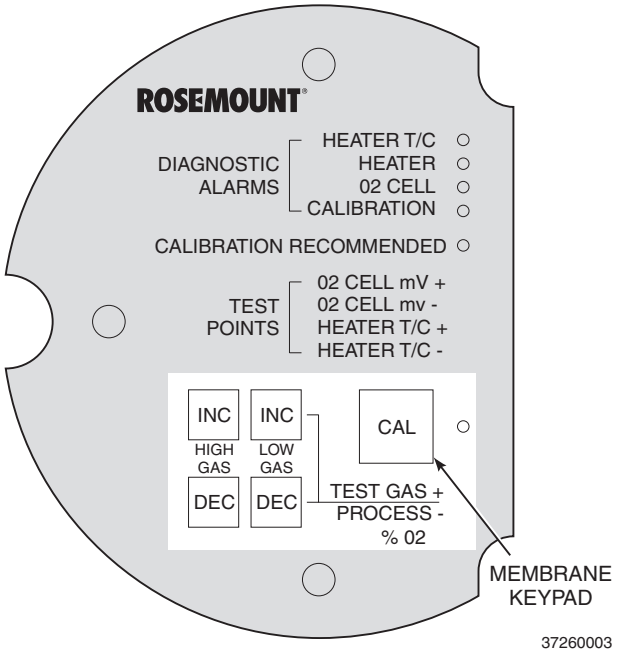


Figure 1-3. Membrane Keypad

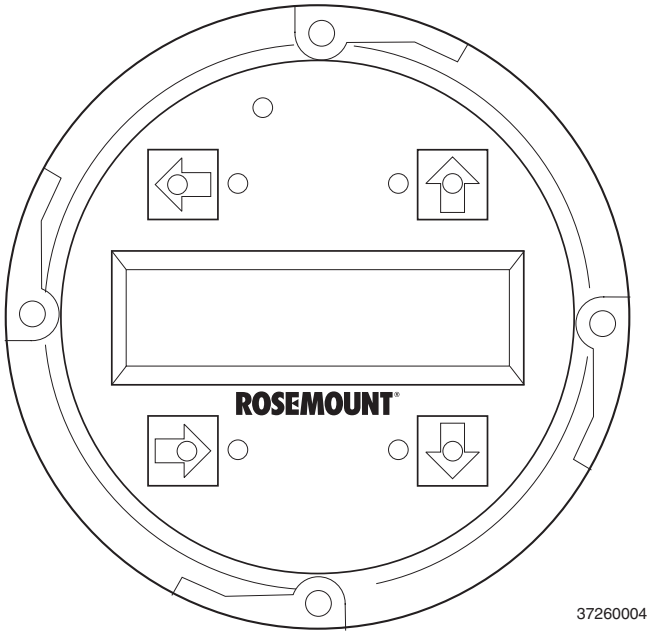


Figure 1-4. Local Operator Interface (LOI)

5. Field replaceable cell, heater, thermocouple, diffuser, and PC boards.
6. The Hazardous Area Oxymitter 4000 is constructed of rugged 316L stainless steel for all wetted parts.
7. The electronics is adaptable for line voltages from 90-250 VAC; therefore, no configuration is necessary.
8. The Hazardous Area Oxymitter 4000 membrane keypad is available in five languages: English, French, German, Italian, and Spanish.
9. An operator can calibrate and communicate with the Hazardous Area Oxymitter 4000 in one of three ways:

CAUTION

Accessing the probe keypad requires opening the electronics housing. Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in hazardous areas may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

(a) Membrane Keypad. The membrane keypad, housed within the right side of the electronics housing, provides fault indication by way of flashing LEDs. Calibration can be performed from the membrane keypad.

(b) LOI. The optional LOI takes the place of the membrane keypad and allows local communication with the electronics. Refer to Section 4 for more information.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

(c) Optional HART Interface. The Hazardous Area Oxymitter 4000's 4-20 mA output line transmits an analog signal proportional to the oxygen level. The HART output is superimposed on the 4-20 mA output signal. This information can be accessed through the following:

1 Rosemount Model 275/375 Handheld Communicator - The handheld communicator requires Device Description (DD) software specific to the Hazardous Area Oxymitter 4000. The DD software will be supplied with many Model 275/375 units but can also be programmed into existing units at most Fisher-Rosemount service offices. See Section 7, HART/AMS, for additional information.

2 Personal Computer (PC) - The use of a personal computer requires AMS software available from Fisher Rosemount.

3 Selected Distributed Control Systems - The use of distributed control systems requires input/output (I/O) hardware and AMS software which permit HART communications.

(d) Optional IMPS 4000. The Programmable Logic Controller (PLC) in the IMPS 4000 provides fault indications using flashing LEDs and LCD display messages. Refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer manual for more information.

10. The optional Rosemount 751 remote mounted LCD display panel is loop-driven by the 4-20 mA output signal representing the O_2 percentage.

e. Handling the Hazardous Area Oxymitter 4000

CAUTION

It is important that printed circuit boards and integrated circuits are handled only when adequate antistatic precautions have been taken to prevent possible equipment damage.

The Hazardous Area Oxymitter 4000 is designed for industrial applications. Treat each component of the system with care to avoid physical damage. Some probe components are made from ceramics, which are susceptible to shock when mishandled.

f. System Considerations

Prior to installing your Hazardous Area Oxymitter 4000, make sure you have all the components necessary to make the system installation. Ensure all the components are properly integrated to make the system functional.

After verifying that you have all the components, select mounting locations and determine how each component will be placed in terms of available line voltage, ambient temperatures, environmental considerations, convenience, and serviceability. Figure 1-5 shows a typical system wiring.

A typical system installation with integral electronics is illustrated in Figure 1-6. A typical system installation with remote electronics is illustrated in Figure 1-7.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

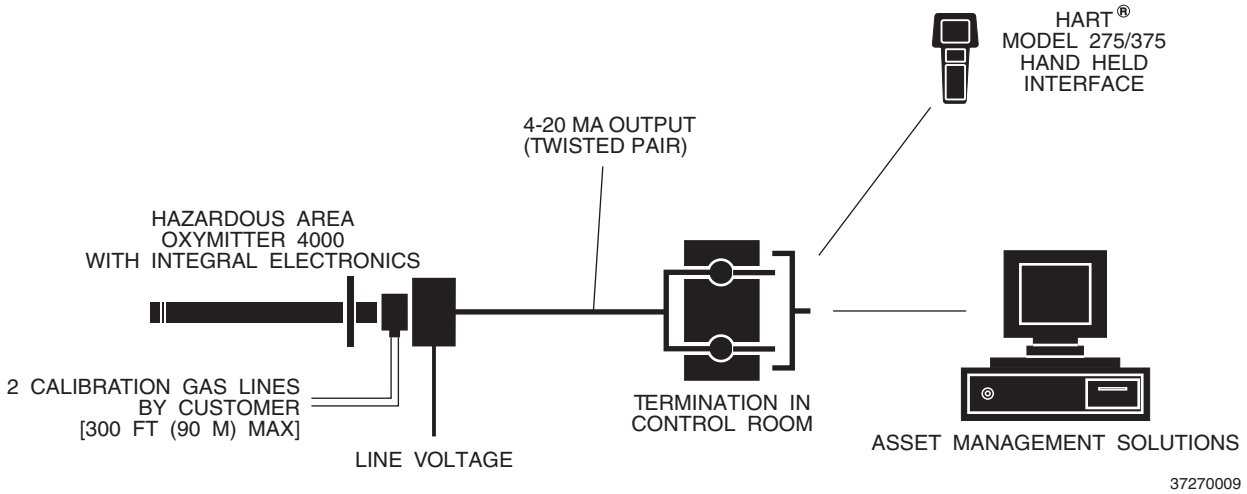


Figure 1-5. Hazardous Area Oxymitter 4000 HART Connections and AMS Application

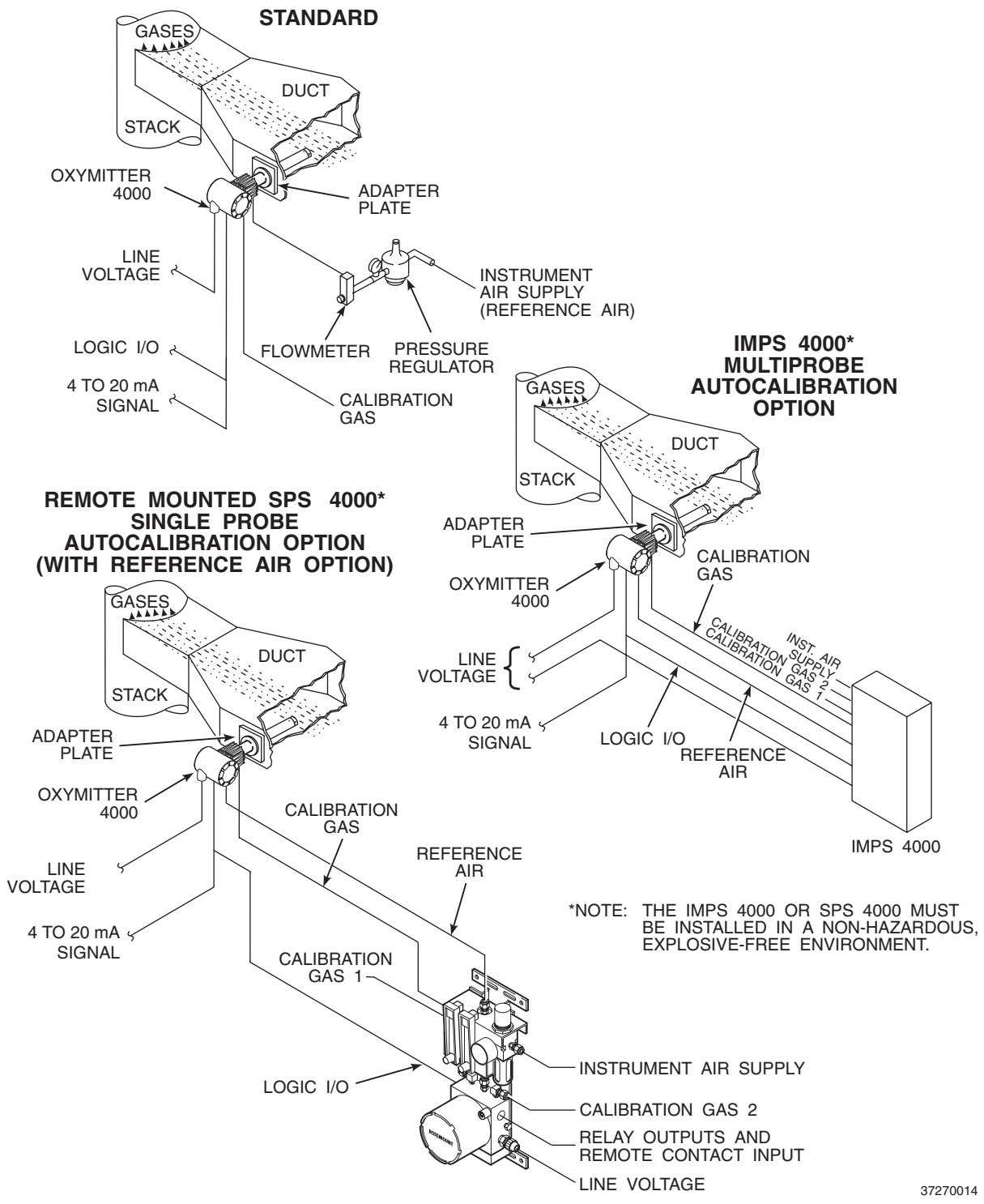


Figure 1-6. Typical System Installation – Oxymitter 4000 with Integral Electronics

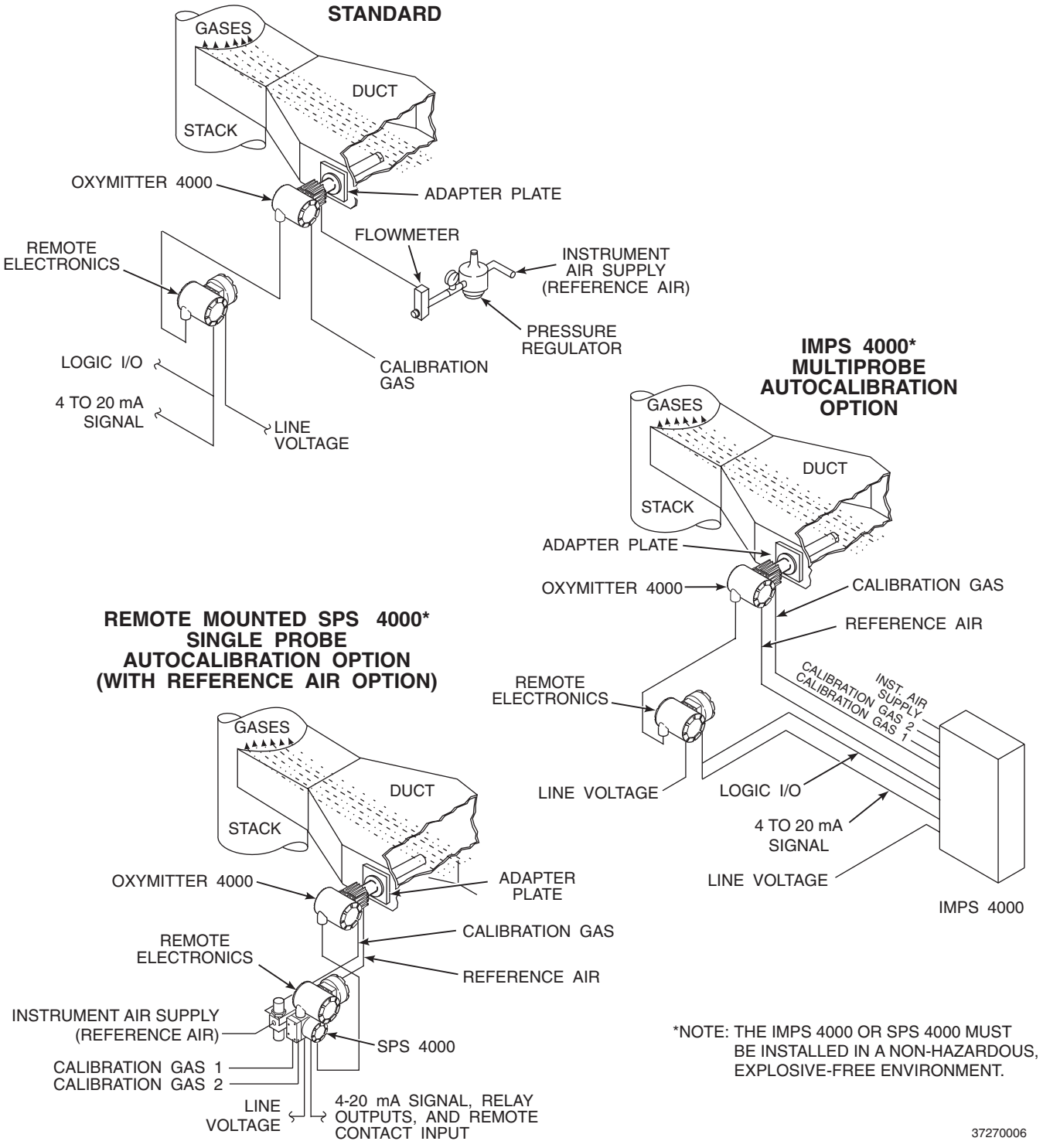


Figure 1-7. Typical System Installation – Oxymitter 4000 with Remote Electronics

A source of instrument air is optional at the Hazardous Area Oxymitter 4000 for reference air use. Since the unit can be equipped with an in-place calibration feature, provisions can be made to permanently connect calibration gas bottles to the Hazardous Area Oxymitter 4000.

If the calibration gas bottles will be permanently connected, a check valve is required next to the calibration fittings on the integral electronics.

This check valve is to prevent breathing of the calibration gas line and subsequent flue gas condensation and corrosion.

The check valve is in addition to the stop valve in the calibration gas kit and solenoid valves in the IMPS 4000 or SPS 4000.

NOTE

The integral electronics is rated NEMA 4X (IP66) and is capable of operation at temperatures up to 85°C (185°F).

The optional LOI is also rated for operation at temperatures up to 85°C (185°F). The infrared keypad functionality will degrade at temperatures above 70°C (158°F).

Retain the original packaging for the Hazardous Area Oxymitter 4000, in case the components are to be shipped to another site. This packaging is designed to protect the product.

1-3 IMPS 4000 (OPTIONAL)

If using an IMPS 4000 with a Hazardous Area Oxymitter 4000, the IMPS 4000 sequencer must be installed in a non-hazardous, explosive-free environment.

For further IMPS 4000 information, refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin.

1-4 SPS 4000 (OPTIONAL)

If using an SPS 4000 with a Hazardous Area Oxymitter 4000, the SPS 4000 sequencer must be installed in a non-hazardous, explosive-free environment.

For further SPS 4000 information, refer to the SPS 4000 Single Probe Autocalibration Sequencer Instruction Bulletin.

1-5 MODEL 751 REMOTE POWDERED LOOP LCD DISPLAY

The display, Figure 1-8, provides a simple, economical means to obtain accurate, reliable, and remote indication of important process variables. This display operates on the 4-20 mA line from the Hazardous Area Oxymitter 4000.

Refer to Model 751 remote powered loop LCD manual for calibration and wiring.

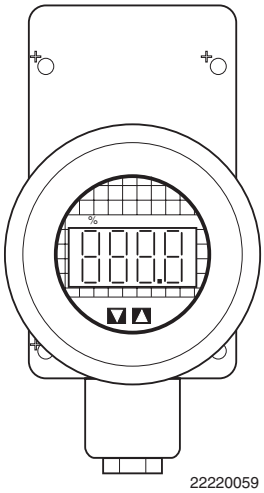


Figure 1-8. Model 751 Remote Powered Loop LCD Display

1-6 PROBE OPTIONS

a. Flame Arrestor Ceramic Diffusion Assembly

The flame arrestor ceramic diffusion assembly, Figure 1-9, includes a set of baffles between the cell and the stack gases. This keeps 816°C (1500°F) cell temperatures from igniting unburned fuel in the stack. The ceramic diffusion assembly is also available with a dust seal for use with the abrasive shield assembly.

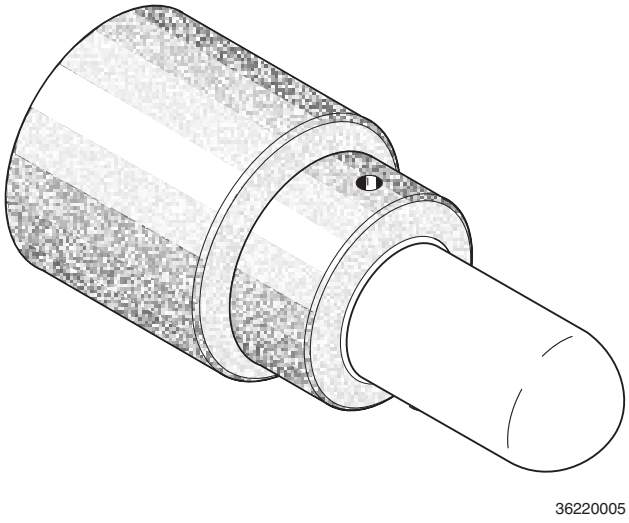


Figure 1-9. Flame Arrestor Ceramic Diffusion Assembly

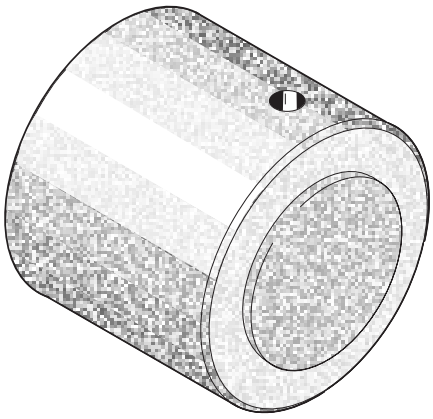


Figure 1-10. Flame Arrestor Snubber Diffusion Assembly

b. Flame Arrestor Snubber Diffusion Assembly

The flame arrestor snubber diffusion assembly, Figure 1-10, is satisfactory for most applications. This element is also available with a dust seal for use with an abrasive shield.

c. Abrasive Shield Assembly

The abrasive shield assembly, Figure 1-11, is a stainless-steel tube that surrounds the probe assembly. The shield protects against particle abrasion and condensations, provides a guide for ease of insertion, and acts as a position support, especially for longer probes. The abrasive shield assembly uses a modified diffusor and vee deflector assembly, fitted with dual dust seal packing.

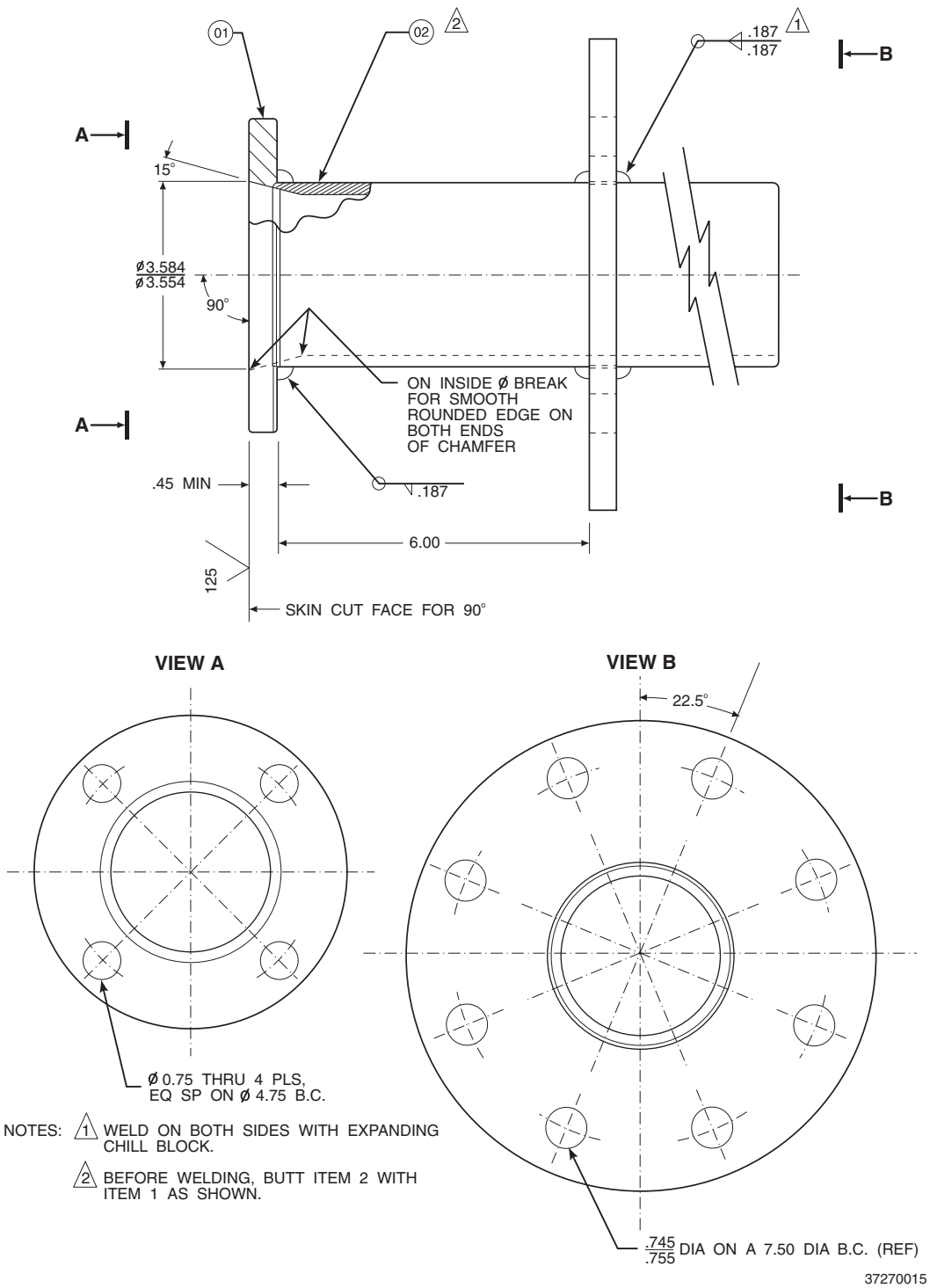


Figure 1-11. Abrasive Shield Assembly

NOTE

In highly abrasive applications, rotate the shield 90 degrees at normal service intervals to present a new wear surface to the abrasive flow stream.

1-7 SPECIFICATIONS

O_2 Range:	
Standard	0 to 10% O_2, 0 to 25% O_2, 0 to 40% O_2 (via HART)
Accuracy	±0.75% of reading or 0.05% O_2, whichever is greater
System Response to Calibration Gas	Initial – less than 3 sec., T90 – less than 8 sec.
Temperature Limits:	
Process	0° to 704°C (32° to 1300°F) up to 1300°C (2400°F) with optional accessories
Electronics Housing	-40° to 70°C (-40° to 158°F), ambient
Electronics Package	-40° to 85°C (-40° to 185°F) – operating temperature of electronics inside instrument housing, as measured by a HART communicator or Rosemount Asset Management Solutions software
Local Operator Interface	-40° to 70°C (-40° to 158°F), ambient -40° to 85°C (-40° to 185°F), internal [At temperatures above 70°C (158°F) inside instrument housing, the infrared keypad will cease to function, but the Oxymitter 4000 will continue to operate properly.]
Probe Lengths	18 in. (457 mm), 3 ft (0.91 m), 6 ft (1.83 m)
Mounting and Mounting Position	Vertical or horizontal; a spool piece (P/N 3D39761G02) is available to offset transmitter housing from hot ductwork.
Materials:	
Probe	Wetted or welded parts - 316L stainless steel (SS) Non-wetted parts - 304 SS, low-copper aluminum
Electronics Enclosure	Low-copper aluminum
Calibration	Manual, semi-automatic, or automatic
Calibration Gas Mixtures Recommended	0.4% O_2, Balance N_2 8% O_2, Balance N_2
Calibration Gas Flow	5 scfh (2.5 l/m)
Reference Air	0.5 scfh (0.25 l/hr), clean, dry, instrument-quality air (20.95% O_2), regulated to 5 psi (34 kPa)
Electronics	NEMA 4X, IP66 with fitting and pipe on reference exhaust port to clear dry atmosphere
Line Voltage	90-250 VAC, 48/62 Hz; 3/4 in.-14 NPT conduit port.
Pollution Degree	2
Over Voltage Category	II
Relative Humidity	5 to 95% (non-condensing)
Signals:	
Analog Output/HART	4-20 mA isolated from power supply, 950 ohms maximum load
Logic I/O	Two-terminal logic contact configurable as either an alarm output or as a bi-directional calibration handshake signal to IMPS 4000 or SPS 4000. Self-powered (+5 V), in series with 340 ohms Conduit port — 3/4 in.-14 NPT (for analog output and logic I/O signal lines)

Power Requirements:

Probe Heater.....	175 W nominal
Electronics.....	10 W nominal
Maximum	500 W

CE Fisher-Rosemount has satisfied all obligations coming from the European legislation to harmonize the product requirements in Europe.

1-8 HAZARDOUS AREA CERTIFICATIONS

a. Hazardous Area Oxymitter 4000 with Integral Electronics

KEMA/ATEX	II 2 G EEx d IIB+H_2 T6 (Elect Comp) / T2 (Probe)
CSA	Class I, Division 1, Groups B, C, D T2 Class I, Zone 1, Ex d IIB+H_2 T2 Class I, Zone 1, AEx d IIB+H_2 T2
FM	Class I, Division 1, Groups B, C, D T2 Class I, Zone 1, AEx d IIB+H_2 T2

b. Hazardous Area Oxymitter 4000 with Remote Electronics

KEMA/ATEX	II 2 G EEx d IIB+H_2 T2 II 2 G EEx de IIB+H_2 T6	(Remote Probe) (Remote Electronics)
CSA	Class I, Zone 1, Ex d IIB+H_2 T2 Class I, Zone 1, Ex de IIB+H_2 T6 Class I, Zone 1, AEx d IIB+H_2 T2 Class I, Zone 1, AEx de IIB+H_2 T6	(Remote Probe) (Remote Electronics) (Remote Probe) (Remote Electronics)
FM	Class I, Zone 1, AEx d IIB+H_2 T2 Class I, Zone 1, AEx de IIB+H_2 T6	(Remote Probe) (Remote Electronics)

Table 1-1. Product Matrix

OXT4C	OXYMITTER 4000 - EXPLOSION PROOF - IN SITU OXYGEN TRANSMITTER

Explosion Proof Oxygen Transmitter - Instruction Book

Code	Sensing Probe Type with Flame Arrestor
1	Ceramic Diffusion Element Probe (ANSI 3 in. 150 lbs)
2	Snubber Diffusion Element (ANSI 3 in. 150 lbs)
3	Ceramic Diffusion Element Probe (DIN 2527) - 1/4 in. Tube Fittings
4	Snubber Diffusion Element (DIN 2527) - 1/4 in. Tube Fittings
5	Ceramic Diffusion Element Probe (JIS)
6	Snubber Diffusion Element (JIS)
7	Ceramic Diffusion Element (ANSI 3 in. 300 lbs)
8	Ceramic Diffusion Element (ANSI 4 in. 300 lbs)

Code	Probe Assembly
0	18 in. (457 mm) Probe
1	18 in. (457 mm) Probe with 3 ft (0.91 m) Bypass
2	18 in. (457 mm) Probe with Abrasive Shield(1)
3	3 ft (0.91 m) Probe
4	3 ft (0.91 m) Probe with Abrasive Shield(1)
5	6 ft (1.83 m) Probe
6	6 ft (1.83 m) Probe with Abrasive Shield(1)

Code	Mounting Adapter - Stack Side
0	No Adapter Plate (“0” must be chosen under “Mounting Adapter - Probe Side” below)
1	New Installation - Square weld plate with studs
2	Model 218 Mounting Plate (with Model 218 Shield Removed)
3	Competitor’s Mount(2)

Code	Mounting Adapter - Probe Side
0	No Adapter Plate
1	Probe Only (ANSI)
2	New Bypass or New Abrasive Shield (ANSI)
4	Probe Only (DIN)
5	New Bypass or New Abrasive Shield (DIN)
7	Probe Only (JIS)
8	New Bypass or New Abrasive Shield (JIS)

Code	Electronic Housing and Filtered Customer Termination - NEMA 4X, IP66
11	HART® Integral Electronics, Standard Filtered Termination, ATEX Certification
12	HART® Integral Electronics, Transient Protected Filtered Termination, ATEX Certification
13	HART® Remote Electronics (requires cable), Standard Filtered Termination, ATEX Certification
14	HART® Remote Electronics (requires cable), Transient Protected Termination, ATEX Certification
21	HART® Integral Electronics, Standard Filtered Termination, CSA/FM Certification
22	HART® Integral Electronics, Transient Protected Termination, CSA/FM Certification
23	HART® Remote Electronics (requires cable), Standard Filtered Termination, CSA/FM Certification
24	HART® Remote Electronics (requires cable), Transient Protected Termination, CSA/FM Certification

OXT4C	3	3	1	1	11	Example

Table 1-1. Product Matrix (Continued)

Continued	Code	Operator Interface[3]
	1	Membrane Keypad - HART Capable
	2	Membrane Keypad - HART Capable, Glass Window
	3	LOI - HART Capable, Glass Window, English Only

Code	Language
1	English
2	German
3	French
4	Spanish
5	Italian

Code	Termination Filtering
00	No Option - Specified as part of Electronic Housing

Code	Calibration Accessories
00	No Hardware
01	Cal/Ref Flowmeters and Ref Pressure Regulator
02	IMPS 4000 (Safe Area Only)
03	SPS 4000 Remote Mounted (Safe Area Only)

Code	Hazardous Area Approval
00	Specified as part of the electronics

Code	Electronics to Probe Cable
00	No Cable
10	20 ft (6 m) Cable
11	40 ft (12 m) Cable
12	60 ft (18 m) Cable
13	80 ft (24 m) Cable
14	100 ft (30 m) Cable
15	150 ft (45 m) Cable
16	200 ft (61 m) Cable

Continued	1	3	00	03	00	10	Example

NOTES:

[1]Recommended uses: High velocity particulates in flue stream, installation within 11.5 ft (3.5 m) of soot blowers or heavy salt cake buildup. Applications: Pulverized coal, recovery boilers, lime kiln.

[2]Where possible, specify ANSI, DIN, or JIS designation; otherwise, provide details of the existing mounting plate as follows:

Plate with studs	Bolt circle diameter, number, and arrangement of studs; stud thread; and stud height above mounting plate.
Plate without studs	Bolt circle diameter, number, and arrangement of holes; thread; and depth of stud mounting plate with accessories.

[3]Startup, calibration, and operation can be implemented using the standard membrane keypad. Remote access and additional functionality available via HART Communications [Model 275/375 Handheld Communicator with Hazardous Area Oxymitter 4000 device descriptor (DD)] required.

Table 1-2. Calibration Components

Part Number	Description
1A99119G01	Two disposable calibration gas bottles — 0.4% and 8% O_2, balance nitrogen — 550 liters each*
1A99119G02	Two pressure regulators for calibration gas bottles
1A99119G03	Bottle rack

*Calibration gas bottles cannot be shipped via airfreight.

When the bottles are used with “CALIBRATION RECOMMENDED” features, the bottles should provide 2 to 3 years of calibrations in normal service.

Table 1-3. Intelligent Multiprobe Test Gas Sequencer Versions

Part Number	Description	Number of Hazardous Area Oxymitter 4000 Units
3D39695G01	IMPS	1
3D39695G02	IMPS	2
3D39695G03	IMPS	3
3D39695G04	IMPS	4
3D39695G05	IMPS w/115 V Heater	1
3D39695G06	IMPS w/115 V Heater	2
3D39695G07	IMPS w/115 V Heater	3
3D39695G08	IMPS w/115 V Heater	4
3D39695G09	IMPS w/220 V Heater	1
3D39695G10	IMPS w/220 V Heater	2
3D39695G11	IMPS w/220 V Heater	3
3D39695G12	IMPS w/220 V Heater	4

SECTION 2
INSTALLATION

WARNING

The Hazardous Area Oxymitter 4000 and probe abrasive shield are heavy. Use proper lifting and carrying procedures to avoid personal injury.

WARNING

Install all protective equipment covers and safety ground leads after installation. Failure to install covers and ground leads could result in serious injury or death.

2-1 MECHANICAL INSTALLATION

a. Selecting Location

1. The location of the Hazardous Area Oxymitter 4000 in the stack or flue is most important for maximum accuracy in the oxygen analyzing process. The Hazardous Area Oxymitter 4000 must be positioned so the gas it measures is representative of the process. Best results are normally obtained if the Hazardous Area Oxymitter 4000 is positioned near the center of the duct (40 to 60% insertion). Longer ducts may require several Hazardous Area Oxymitter 4000 units since the O_2 can vary due to stratification. A point too near the wall of the duct, or the inside radius of a bend, may not provide a representative sample because of the very low flow conditions. The sensing point should be selected so the process gas temperature falls within a range of 0° to 704°C (32° to 1300°F). Figure 2-1 through Figure 2-5 provide mechanical installation references.

   The ambient temperature of the electronics housing must not exceed 70°C (150°F). For higher ambient temperatures, we recommend the remote mounted electronics option.

NOTE

At temperatures up to 85°C (185°F) inside the housing, the infrared keypad will cease to function, but the transmitter will continue to operate properly.

2. Check the flue or stack for holes and air leakage. The presence of this condition will substantially affect the accuracy of the oxygen reading. Therefore, either make the necessary repairs or install the Hazardous Area Oxymitter 4000 upstream of any leakage.
3. Ensure the area is clear of internal and external obstructions that will interfere with probe installation and access to the membrane keypad or LOI. Allow adequate clearance for removal of the Hazardous Area Oxymitter 4000 (Figure 2-1 or Figure 2-3).

CAUTION

Do not allow the temperature of the Hazardous Area Oxymitter 4000 electronics to exceed 85°C (185°F) or damage to the unit may result.

b. Probe Installation

1. Ensure all components are available to install the Hazardous Area Oxymitter 4000. If equipped with a ceramic diffuser, make sure the diffuser is not damaged.
2. The Hazardous Area Oxymitter 4000 probe may be installed intact, as it is received.

NOTE

An abrasive shield is recommended for high velocity particulates in the flue stream (such as those in coal-fired boilers, kilns, and recovery boilers).

3. Weld or bolt mounting plate (Figure 2-5) onto the duct.

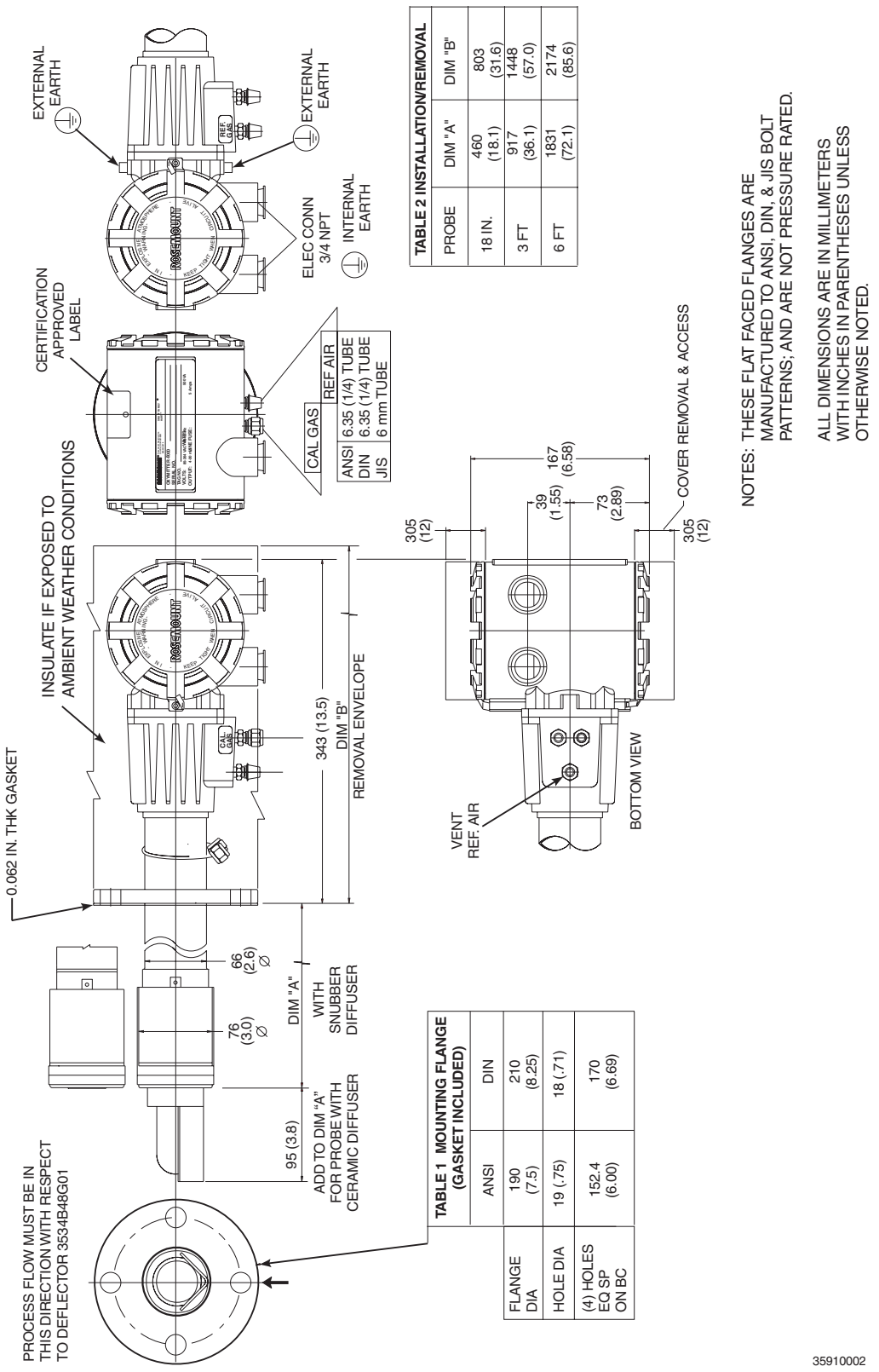


TABLE 2 INSTALLATION/REMOVAL		
PROBE	DIM "A"	DIM "B"
18 IN.	460 (18.1)	803 (31.6)
3 FT	917 (36.1)	1448 (57.0)
6 FT	1831 (72.1)	2174 (85.6)

TABLE 1 MOUNTING FLANGE (GASKET INCLUDED)		
	ANSI	DIN
FLANGE DIA	190 (7.5)	210 (8.25)
HOLE DIA	19 (.75)	18 (.71)
(4) HOLES EQ SP ON BC	152.4 (6.00)	170 (6.69)

Figure 2-1. Hazardous Area Oxymitter 4000 Probe Installation

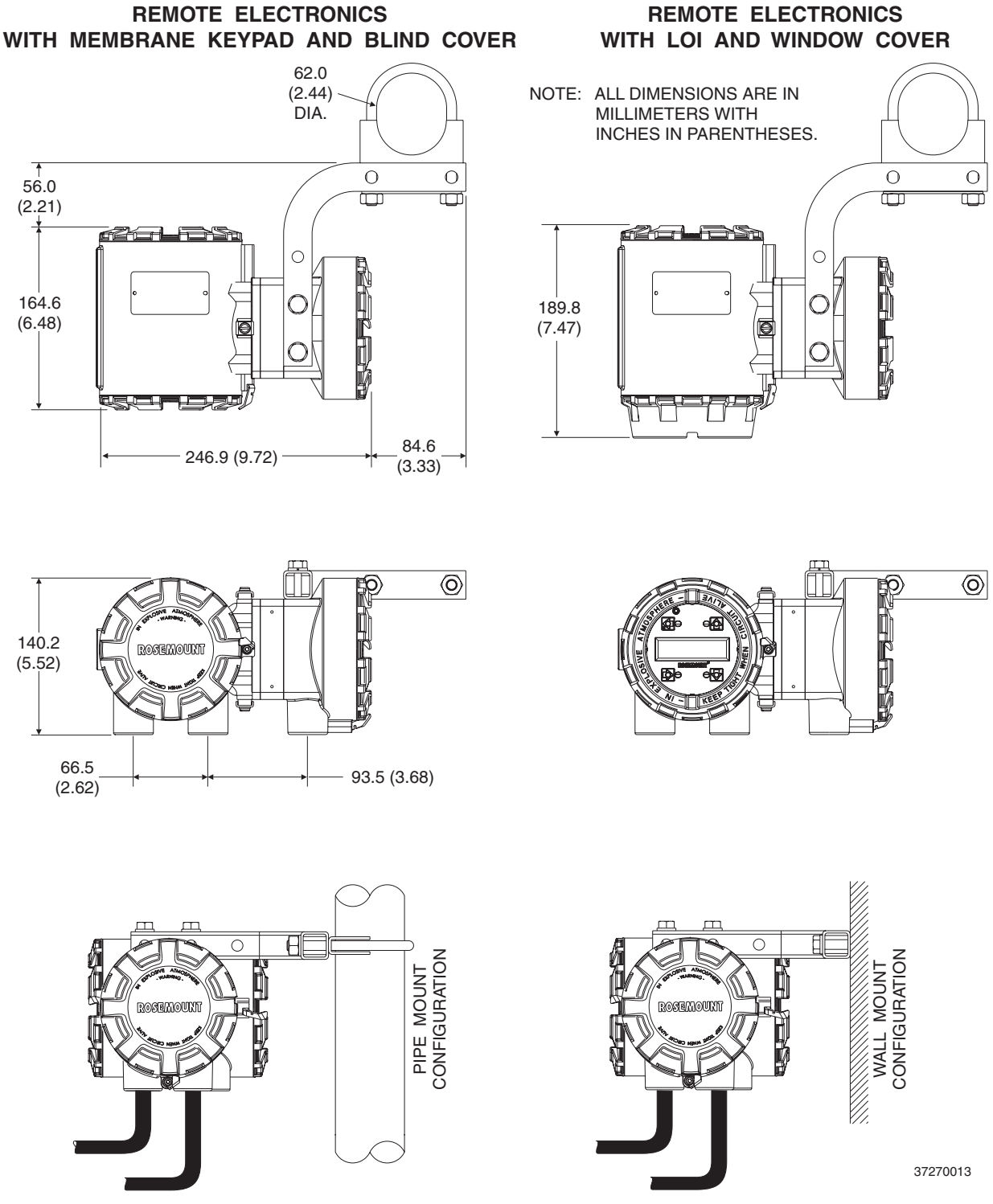


Figure 2-2. Hazardous Area Oxymitter 4000 Remote Electronics Installation

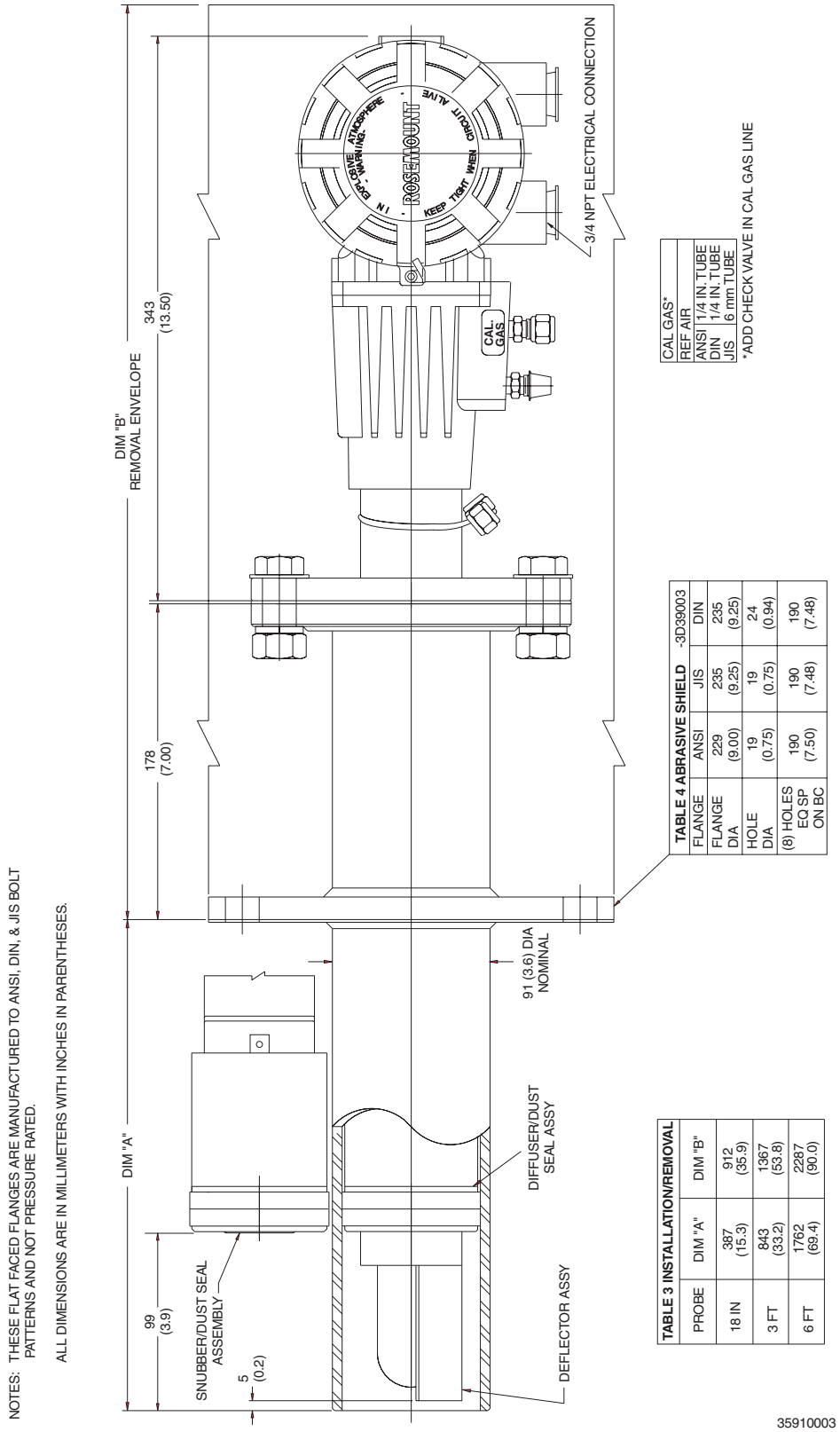


Figure 2-3. Hazardous Area Oxymitter 4000 Probe with Abrasive Shield

MOUNTING PLATE OUTLINE

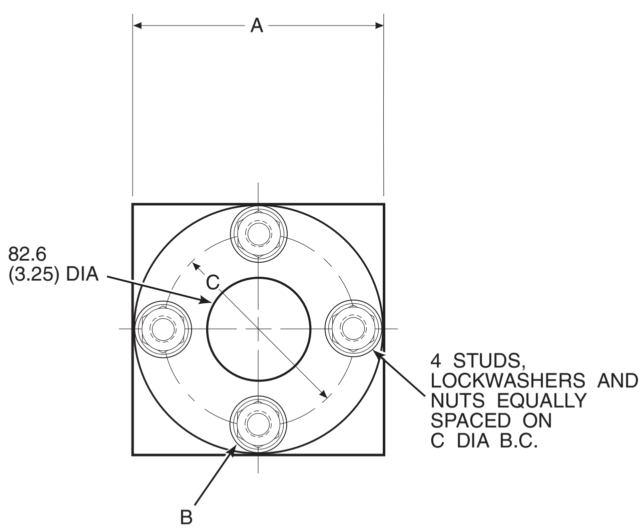
TABLE V. MOUNTING PLATE DIMENSIONS FOR HAZARDOUS AREA OXYMITTER 4000

DIMENSIONS MM (in.)	ANSI	DIN
"A"	197 (7.75)	216 (8.50)
"B" STUD SIZE	0.625-11	M16 x 2
"C" DIA B.C.	152.4 (6.00)	170.0 (6.69)

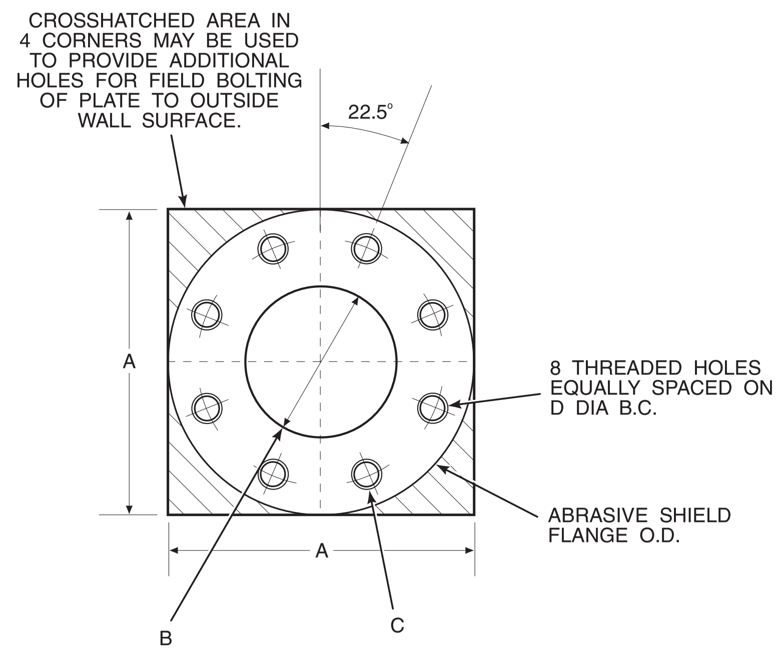
TABLE VI. MOUNTING PLATE DIMENSIONS FOR HAZARDOUS AREA OXYMITTER 4000 WITH ABRASIVE SHIELD

DIMENSIONS MM (in.)	ANSI	DIN	JIS
"A"	229 (9.00)	235 (9.25)	235 (9.25)
"B" DIA	121 (4.75)	100 (3.94)	125 (4.92)
"C" THREAD	0.625-11	M20 x 2.5	M16 x 2
"D" DIA B.C.	191 (7.50)	190 (7.48)	200 (7.89)

NOTE: DIMENSIONS ARE IN MILLIMETERS WITH INCHES IN PARENTHESES.



MOUNTING PLATE FOR HAZARDOUS AREA OXYMITTER 4000



MOUNTING PLATE FOR HAZARDOUS AREA OXYMITTER 4000 WITH ABRASIVE SHIELD

27540003

Figure 2-4. Hazardous Area Oxymitter 4000 Mounting Plate Dimensions

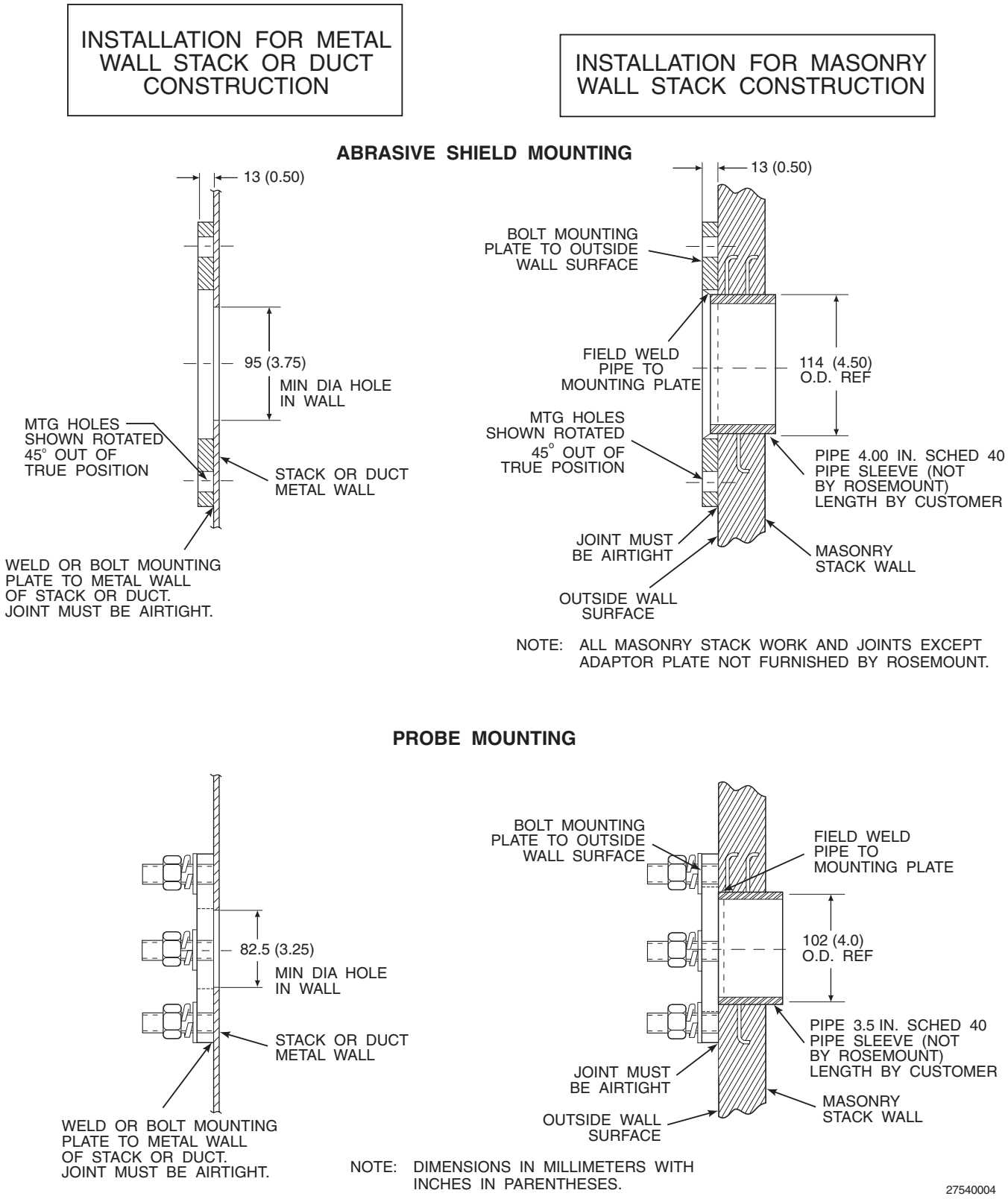


Figure 2-5. Hazardous Area Oxymitter 4000 Mounting Plate Installation

4. If using the optional ceramic diffusion element, the vee deflector must be correctly oriented. Before inserting the Hazardous Area Oxymitter 4000, check the direction of flow of the gas in the duct. Orient the vee deflector so the apex points upstream toward the flow (Figure 2-6). This may be done by loosening the setscrews and rotating the vee deflector to the desired position. Retighten the setscrews.

5. In vertical installations, ensure the system cable drops vertically from the Hazardous Area Oxymitter 4000 and the conduit is routed below the level of the electronics housing. This drip loop minimizes the possibility that moisture will damage the electronics. See Figure 2-7.

6. If the system has an abrasive shield, check the dust seal gaskets. The joints in the two gaskets must be staggered 180 degrees. Make sure the gaskets are in the hub grooves as the Hazardous Area Oxymitter 4000 slides into the 15 degree forcing cone in the abrasive shield.

NOTE

If process temperatures will exceed 200°C (392°F), use anti-seize compound on the stud threads to ease future removal of the Hazardous Area Oxymitter 4000.

7. Insert probe through the opening in the mounting plate and bolt the unit to the plate.

NOTE

To maintain CE compliance, ensure a good connection exists between the mounting plate studs or earthing screws on electronics housing and earth.

8. Ensure the Hazardous Area Oxymitter 4000 is properly earthed by way of both internal and external points.

CAUTION

Uninsulated stacks or ducts may cause ambient temperatures around the electronics to exceed 85°C (185°F), which may cause overheating damage to the electronics.

9. If duct work insulation is removed for Hazardous Area Oxymitter 4000 probe mounting, make sure the insulation is replaced afterward. See Figure 2-7.

NOTE

For probe temperatures that will exceed 85°C (185°F), we recommend the remote mounted electronics option.

10. Ensure the probe installation does not obscure the warnings on the housing covers.

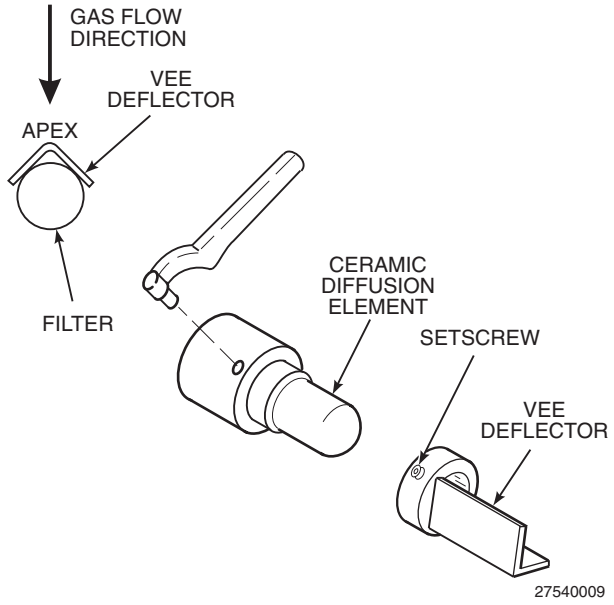


Figure 2-6. Orienting the Optional Vee Deflector

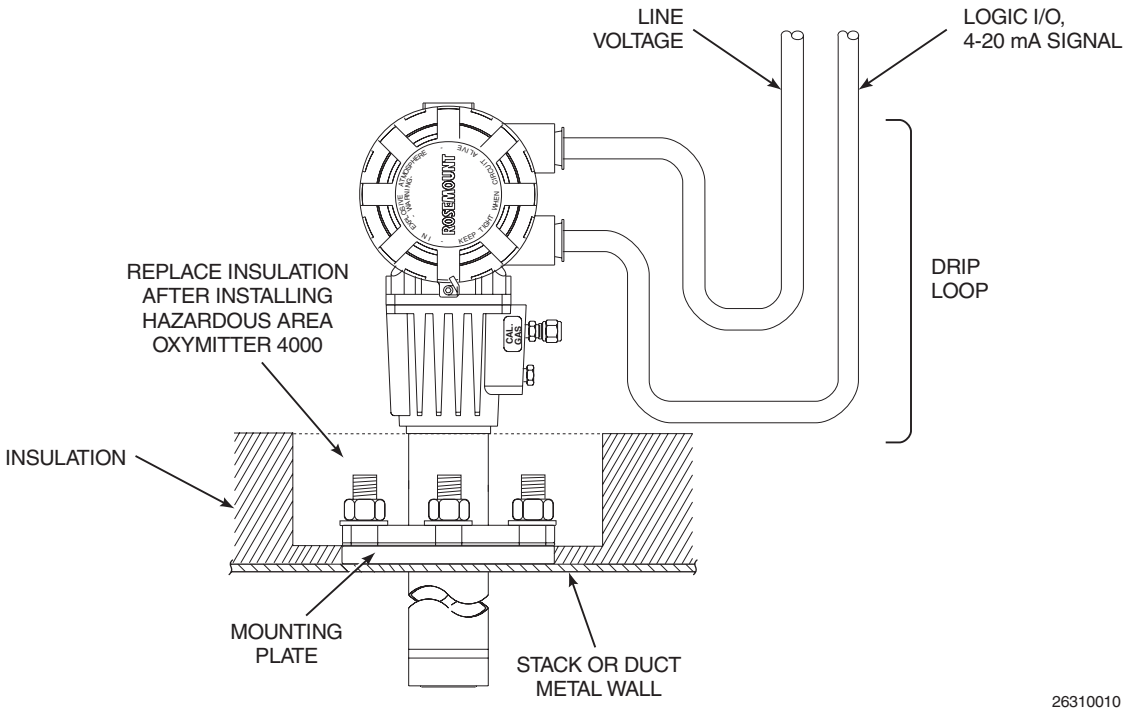


Figure 2-7. Installation with Drip Loop and Insulation Removal

c. Remote Electronics Installation

For a Hazardous Area Oxymitter 4000 with the remote electronics option, install the probe according to the instructions in paragraph 2-1.b. Install the remote electronics unit on a wall, stand pipe, or similar structure (Figure 2-2 and Figure 2-8).

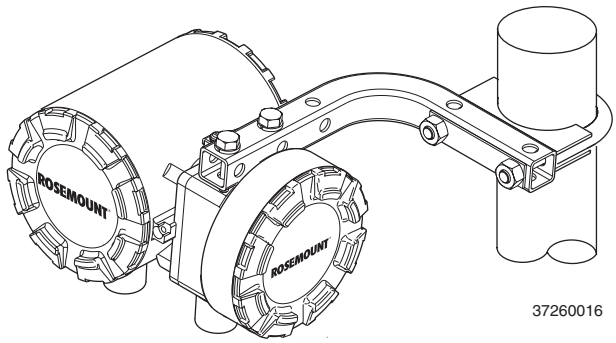


Figure 2-8. Remote Electronics Mounting

2-2 ELECTRICAL INSTALLATION (FOR HAZARDOUS AREA OXYMITTER 4000 WITH INTEGRAL ELECTRONICS)

All wiring must conform to local and national codes.

WARNING

Disconnect and lock out power before connecting the unit to the power supply.

WARNING

Install all protective equipment covers and safety ground leads after installation. Failure to install covers and ground leads could result in serious injury or death.

WARNING

To meet the Safety Requirements of IEC 1010 (EC requirement), and ensure safe operation of this equipment, connection to the main electrical power supply must be made through a circuit breaker (min 10 A) which will disconnect all current-carrying conductors during a fault situation. This circuit breaker should also include a mechanically operated isolating switch. If not, then another external means of disconnecting the supply from the equipment should be located close by. Circuit breakers or switches must comply with a recognized standard such as IEC 947.

WARNING

The probe and probe abrasive shield are heavy. Use proper lifting and carrying procedures to avoid personnel injury.

WARNING

To maintain explosion-proof protection, all cable entry devices and blanking elements for unused apertures must be certified flameproof, suitable for the conditions of use and be properly installed.

a. Remove screw (18, Figure 9-3), cover lock (19), and captive washer (20). Remove cover (17) from terminal block (15).

b. **Connect Line Voltage.** Connect the line, or L1, wire to the L1 terminal and the neutral, or L2 wire, to the N terminal. See Figure 2-9. The Hazardous Area Oxymitter 4000 automatically will configure itself for 90-250 VAC line voltage and 50/60 Hz. To avoid a shock hazard, the power terminal cover must be installed.

c. **Connect 4-20 mA Signal and Calibration Handshake/Logic I/O Leads (Figure 2-9).**

1. 4-20 mA Signal. The 4-20 mA signal represents the O_2 value and can also operate the Model 751 Loop LCD Display or any other loop powered display. Superimposed on the 4-20 mA signal is HART information that is accessible through a Model 275/375 Handheld Communicator or AMS software.

WARNING

If using an IMPS 4000 or an SPS 4000, install it in a non-hazardous, explosive-free environment.

2. Calibration Handshake/Logic I/O. The output signal can be used to trigger an alarm or to provide a calibration handshake signal to an IMPS or SPS 4000.

   If autocalibration is not utilized, a common bi-directional logic contact is provided for any of the equipment alarms listed in Table 8-1. The assignment of alarms that will actuate this contact is modified by one of seven additional configuration settings (mode 1 through mode 7) listed in Table 4-1.

   The logic contact is self-powered, +5 VDC, with a 340 ohm series resistance. An interposing relay is required if the logic contact will annunciate a higher voltage device, such as a light or horn. An interposing relay may also be required for certain DCS input cards. A Potter & Brumfield model R10S-E1Y1-J1.0K 3.2 mA DC (or equal) interposing relay will be mounted where the contact wires terminate in the control/relay room.

d. Install cover (17, Figure 9-3) and secure with captive washer (20), cover lock (19), and screw (18).

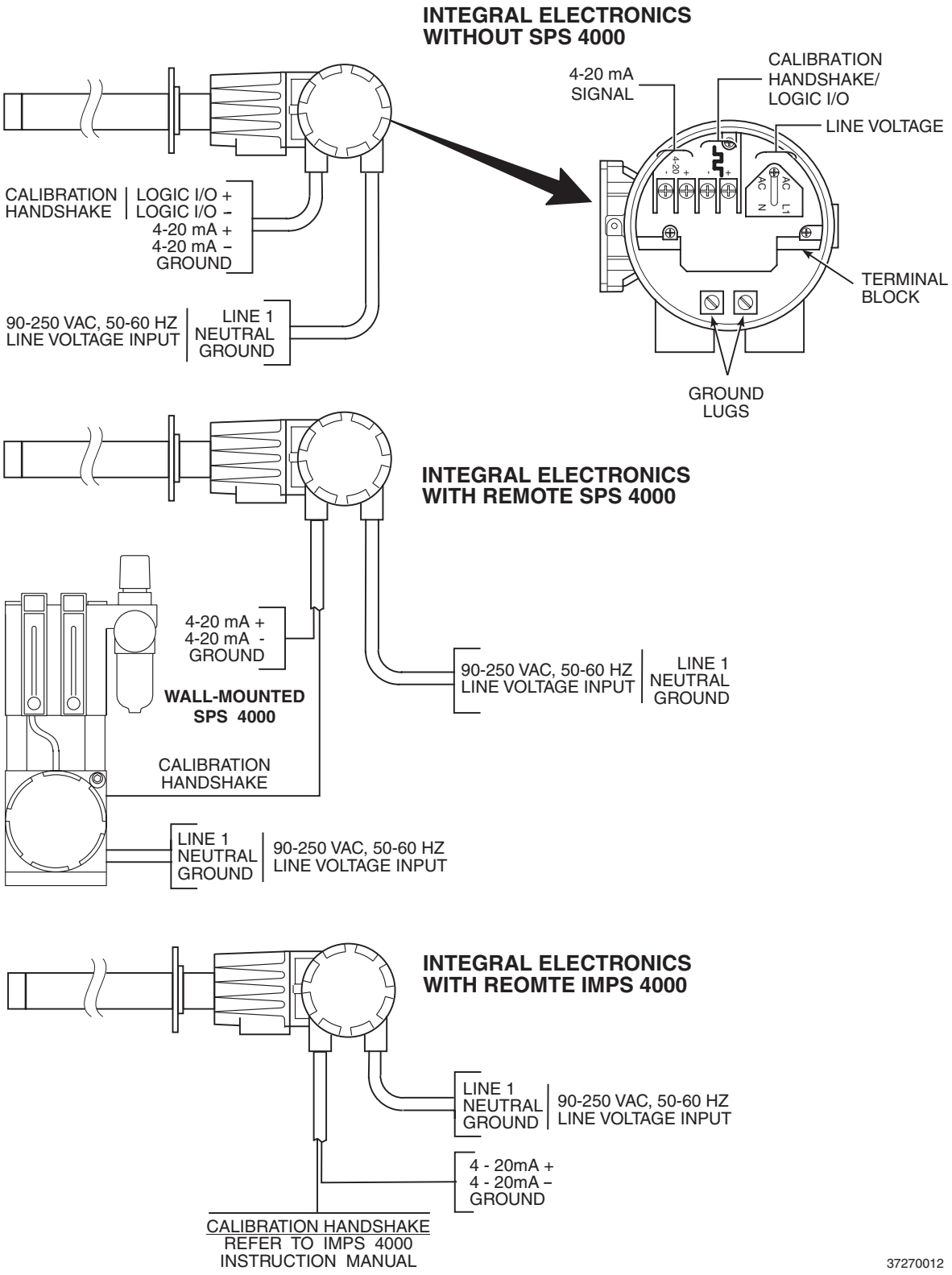


Figure 2-9. Electrical Installation – Hazardous Area Oxymitter 4000 with Integral Electronics

2-3 ELECTRICAL INSTALLATION (FOR HAZARDOUS AREA OXYMITTER 4000 WITH REMOTE ELECTRONICS)

All wiring must conform to local and national codes.

WARNING

Disconnect and lock out power before connecting the unit to the power supply.

WARNING

Install all protective equipment covers and safety ground leads after installation. Failure to install covers and ground leads could result in serious injury or death.

WARNING

To meet the Safety Requirements of IEC 1010 (EC requirement), and ensure safe operation of this equipment, connection to the main electrical power supply must be made through a circuit breaker (min 10 A) which will disconnect all current-carrying conductors during a fault situation. This circuit breaker should also include a mechanically operated isolating switch. If not, then another external means of disconnecting the supply from the equipment should be located close by. Circuit breakers or switches must comply with a recognized standard such as IEC 947.

WARNING

The probe and probe abrasive shield are heavy. Use proper lifting and carrying procedures to avoid personnel injury.

WARNING

To maintain explosion-proof protection, all cable entry devices and blanking elements for unused apertures must be certified flameproof, suitable for the conditions of use and be properly installed.

a. Remove screw (18, Figure 9-4), cover lock (19), captive washer (20), and left side blind cover (17) from the remote electronics.

b. **Connect Line Voltage.** Connect the line, or L1, wire to the L1 terminal and the neutral, or L2 wire, to the N terminal (Figure 2-10).

The Hazardous Area Oxymitter 4000 will automatically configure itself for 90-250 VAC line voltage and 50/60 Hz. To avoid a shock hazard, the power terminal cover must be installed.

c. **Connect 4-20 mA Signal and Calibration Handshake/Logic I/O Leads (Figure 2-10).**

1. 4-20 mA Signal. The 4-20 mA signal represents the O_2 value and can also operate the Model 751 Loop LCD Display or any other loop powered display. Superimposed on the 4-20 mA signal is HART information that is accessible through a Model 275/375 Handheld Communicator or AMS software.

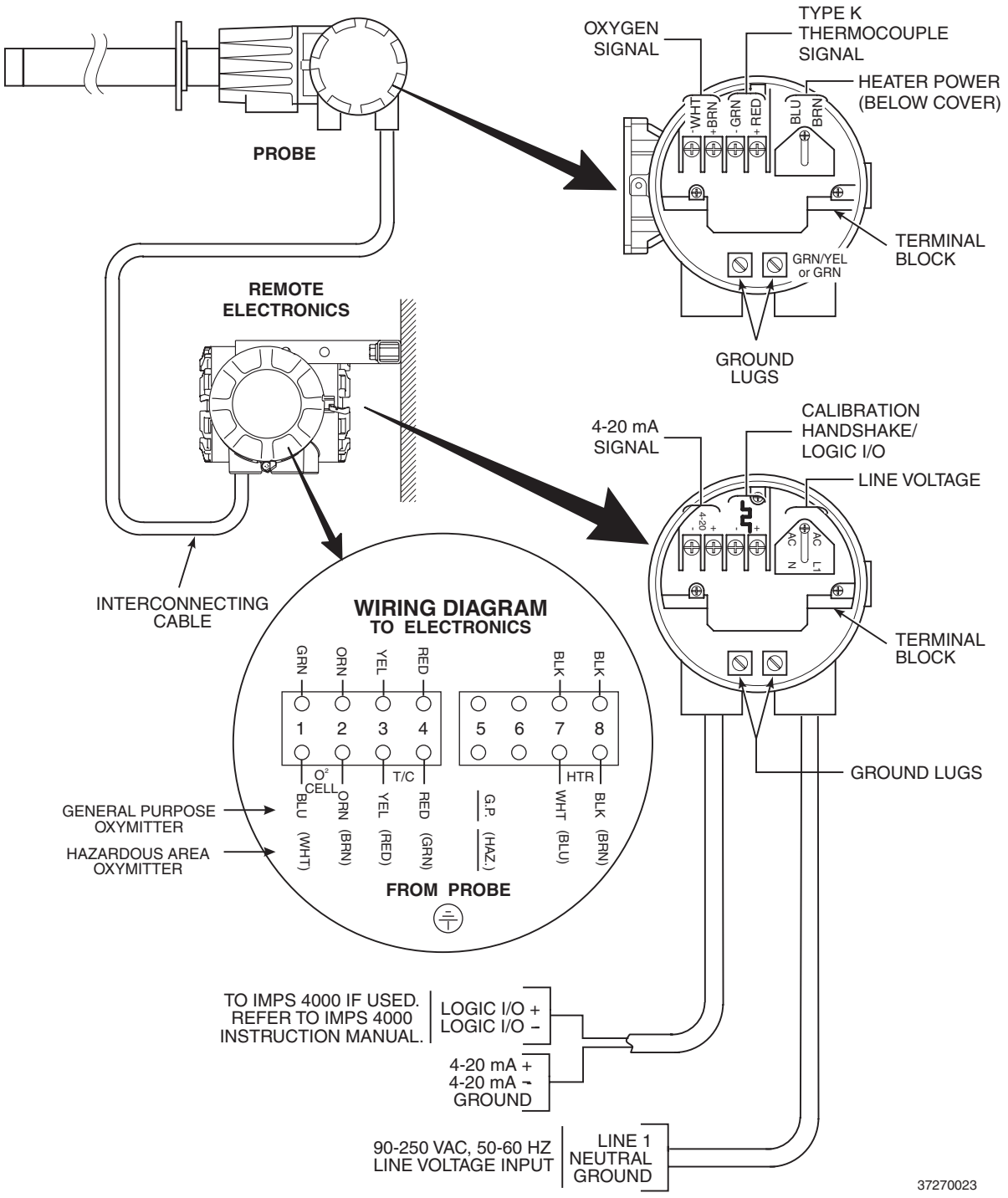


Figure 2-10. Electrical Installation – Hazardous Area Oxymitter 4000 with Remote Electronics (Sheet 1 of 2)

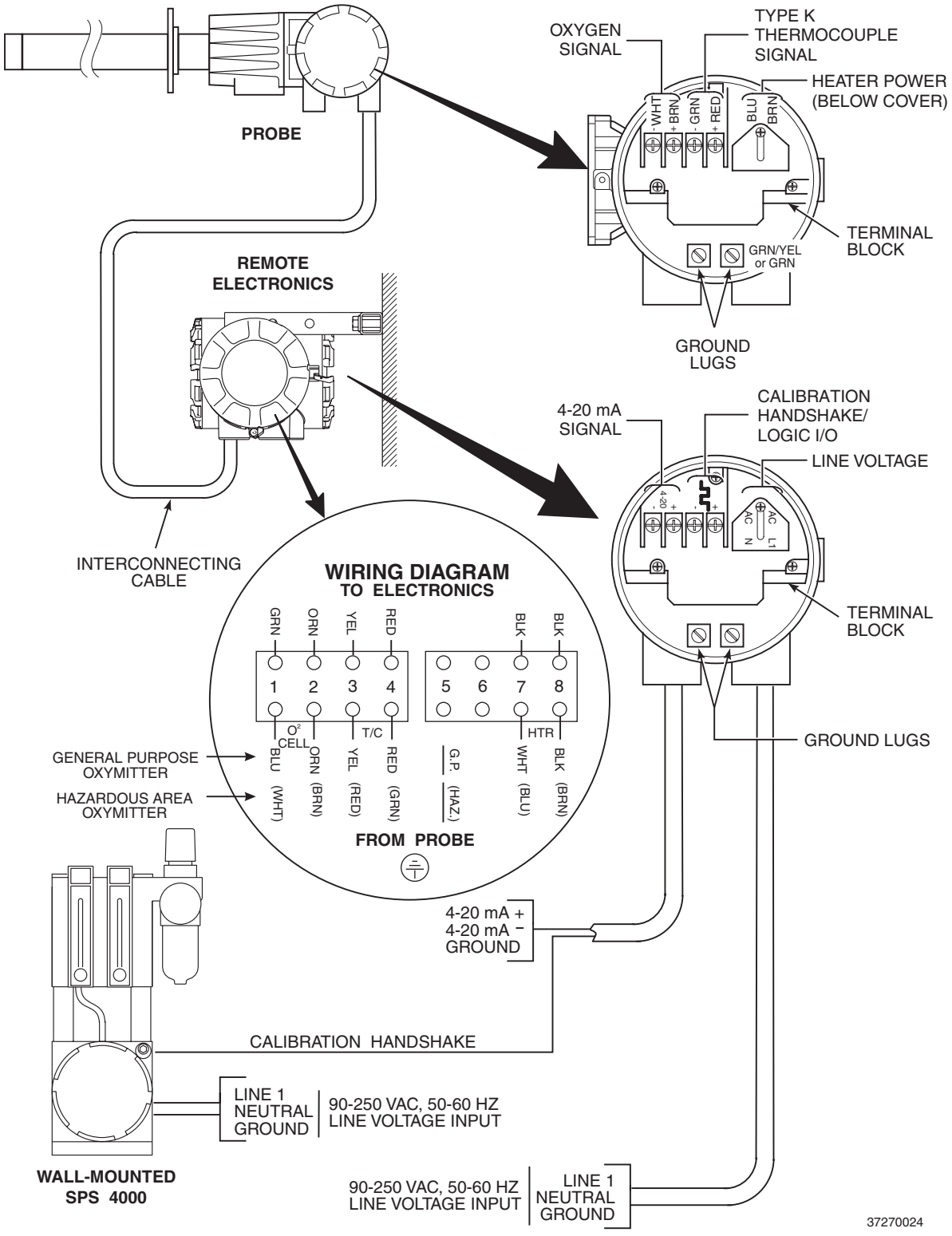


Figure 2-10. Electrical Installation – Hazardous Area Oxymitter 4000 with Remote Electronics (Sheet 2 of 2)

WARNING

If using an IMPS 4000 or an SPS 4000, install it in a non-hazardous, explosive-free environment.

2. Calibration Handshake/Logic I/O. The output signal can be used to trigger an alarm or to provide a calibration handshake signal to an IMPS or SPS 4000.

   If autocalibration is not utilized, a common bi-directional logic contact is provided for any of the equipment alarms listed in Table 8-1. The assignment of alarms that will actuate this contact is modified by one of seven additional configuration settings (mode 1 through mode 7) listed in Table 4-1.

   The logic contact is self-powered, +5 VDC, with a 340 ohm series resistance. An interposing relay is required if the logic contact will annunciate a higher voltage device, such as a light or horn. An interposing relay may also be required for certain DCS input cards. A Potter & Brumfield model R10S-E1Y1-J1.0K 3.2 mA DC (or equal) interposing relay will be mounted where the contact wires terminate in the control/relay room.

d. Install cover (17, Figure 9-4) and secure with captive washer (20), cover lock (19), and screw (18).

e. Install Interconnecting Cable

NOTE

If interconnect cable was not purchased with the Hazardous Area Oxymitter 4000, consult the factory for the proper wire type and gauge.

1. Remove cover (17, Figure 9-4) from the junction box (24). Connect the electronics end of the interconnecting cable (30) to the “FROM PROBE” side of the terminal block (Figure 2-10).

WARNING

If using an IMPS 4000 or an SPS 4000, install it in a non-hazardous, explosive-free environment.

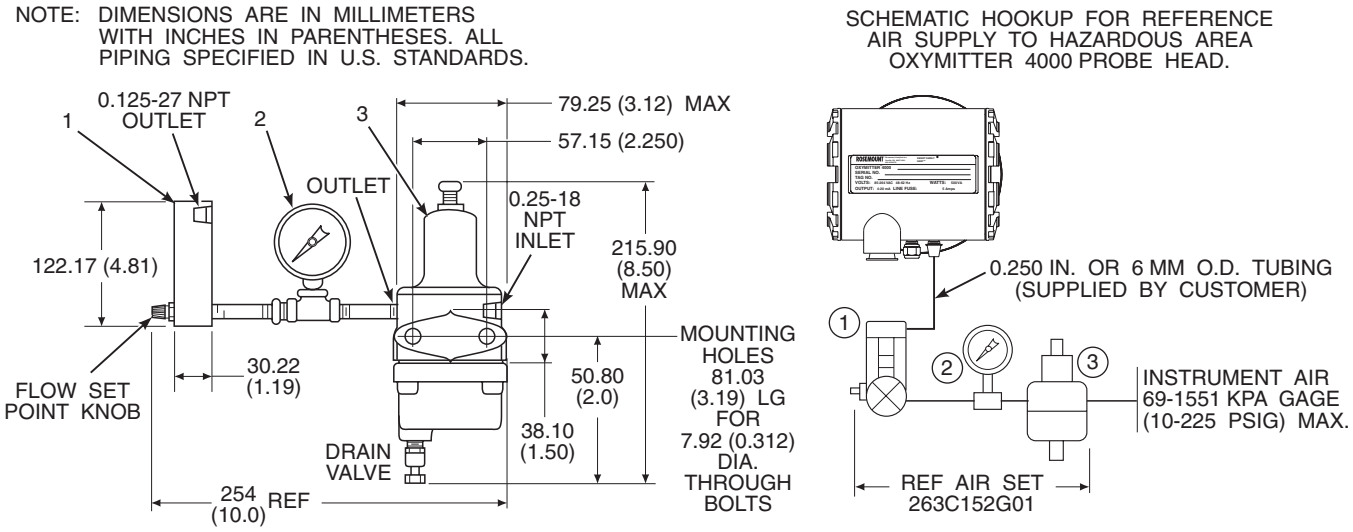
2. Loosen screw (18, Figure 9-3), cover lock (19) and washer (20) at the probe head. Remove cover (17).
3. See (Figure 2-10). Connect the heater power leads, the thermocouple leads, and the oxygen signal leads of the interconnecting cable to the terminal block. The cable leads are tagged for polarity. To avoid a shock hazard, the heater power terminal cover must be installed.
4. Install covers (17, Figure 9-3 and Figure 9-4) and secure with captive washers (20), cover locks (19), and screws (18).

2-4 PNEUMATIC INSTALLATION

a. Reference Air Package

After the Hazardous Area Oxymitter 4000 is installed, connect the reference air set to the Hazardous Area Oxymitter 4000. Refer to Figure 2-11.

Instrument Air (Reference Air): 68.95 kPa gage (10 psig) minimum, 1551.38 kPa gage (225 psig) maximum at 0.5 scfm (0.25 l/hr) maximum; less than 40 parts-per-million total hydrocarbons. Regulator outlet pressure should be set at 35 kPa (5 psi).



REPLACEMENT PARTS			
1	FLOWMETER	0.006-0.057 SCMH (0.2-2.0 SCFH)	771B635H02
2	PRESSURE GAGE	0-103 KPA GAGE (0-15 PSIG)	275431-006
3	COMBINATION FILTER-REG.	0-207 KPA GAGE (0-30 PSIG)	4505C21G01

37270008

Figure 2-11. Air Set, Plant Air Connection

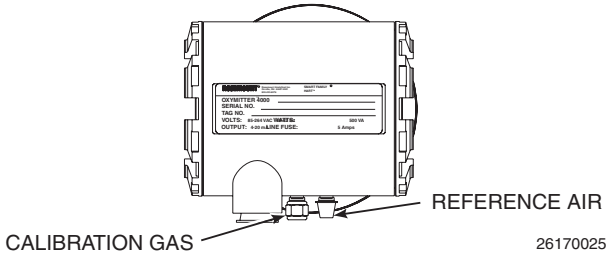


Figure 2-12. Hazardous Area Oxymitter 4000 Gas Connections

CAUTION

Do not use 100% nitrogen as a low gas (zero gas). It is suggested that gas for the low (zero) be between 0.4% and 2.0% O_2. Do not use gases with hydrocarbon concentrations of more than 40 parts per million. Failure to use proper gases will result in erroneous readings.

b. Calibration Gas

Two calibration gas concentrations are used with the Hazardous Area Oxymitter 4000, Low Gas - 0.4% O_2 and High Gas - 8% O_2. See Figure 2-12 for the Hazardous Area Oxymitter 4000 connections.

WARNING

If using an IMPS 4000 or an SPS 4000, install it in a non-hazardous, explosive-free environment.

2-5 IMPS 4000 CONNECTIONS

Ensure the IMPS 4000 is installed in a safe (non-hazardous, explosive-free) area and verify the wiring and pneumatic connections per the IMPS 4000 Intelligent Multi-probe Test Gas Sequencer Instruction Bulletin.

2-6 SPS 4000 CONNECTIONS

Ensure the SPS 4000 is installed in a safe (non-hazardous, explosive-free) area and verify the wiring and pneumatic connections per the SPS 4000 Single Probe Autocalibration Sequencer Instruction Bulletin.

NOTE

Upon completing installation, make sure that the Hazardous Area Oxymitter 4000 is turned on and operating prior to firing up the combustion process. Damage can result from having a cold Hazardous Area Oxymitter 4000 exposed to the process gases.

During outages, and if possible, leave all Hazardous Area Oxymitter 4000 units running to prevent condensation and premature aging from thermal cycling.

CAUTION

If the ducts will be washed down during outage, MAKE SURE to power down the Hazardous Area Oxymitter 4000 units and remove them from the wash area.

SECTION 3
CONFIGURATION OF HAZARDOUS AREA OXYMITTER 4000 WITH MEMBRANE KEYPAD

WARNING

Install all protective equipment covers and safety ground leads before equipment startup. Failure to install covers and ground leads could result in serious injury or death.

3-1 GENERAL

a. Verify Mechanical Installation

Ensure the Hazardous Area Oxymitter 4000 is installed correctly. See Section 2, INSTALLATION.

WARNING

Opening the electronics housing in hazardous areas may cause an explosion causing severe injury, or death. It may be required to get a hot work permit from your company safety officer before you open the housing.

b. Verify Terminal Block Wiring

1. Remove screw (18, Figure 9-3 or Figure 9-4), cover lock (19), and captive washer (20) that secure cover (17) on left side of housing (11). Remove the cover.

2. Check the terminal block wiring (Figure 3-1). Be sure the power, the 4-20 mA signal, and the logic outputs are properly connected and secure. To avoid a shock hazard, the power terminal cover must be installed.

   For units with remote electronics, check the terminal block wiring at the probe and at the remote electronics unit.

3. Install the cover (17, Figure 9-3 or Figure 9-4) over terminal block (15) and secure with captive washer (20), cover lock (19), and screw (18).

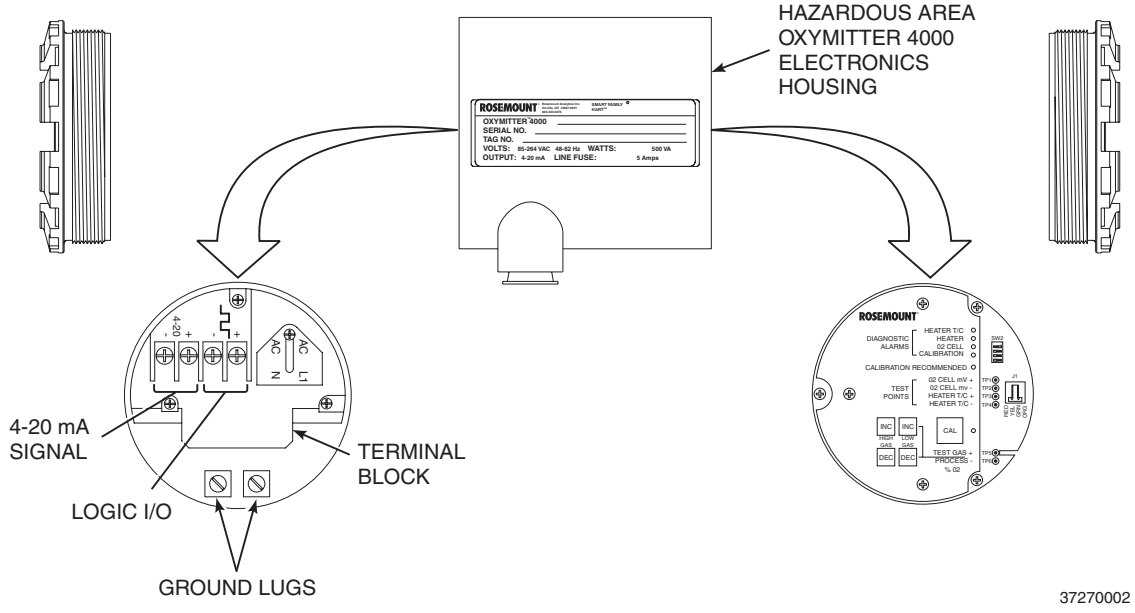


Figure 3-1. Electronics Housing Terminals and Membrane Keypad

c. Verify Hazardous Area Oxymitter 4000 Configuration

Located on the microprocessor board, the top board, are two switches that configure outputs for the Hazardous Area Oxymitter 4000 (Figure 3-2). SW1 determines if the 4-20 mA signal is internally or externally powered. SW2 determines:

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

1. Hazardous Area Oxymitter 4000 status, HART or LOCAL.
2. Oxygen range, 0 to 10% O_2 or 0 to 25% O_2. (0 to 40% O_2 is also configurable only through HART/AMS.)
3. The 4-20 mA signal, at fault or power up, 3.5 mA or 21.6 mA.

CAUTION

Remove power from the Hazardous Area Oxymitter 4000 before changing defaults. If defaults are changed under power, damage to the electronics package may occur.

d. SW1

The two settings are internally or externally powering the 4-20 mA signal. The factory setting is for the 4-20 mA signal to be internally powered.

e. SW2

The factory sets this switch as follows:

1. Position 1 is HART/LOCAL. This switch setting controls the configuration of the Hazardous Area Oxymitter 4000. The defaults cannot be changed via HART-/AMS unless the switch is in the HART position. Placing SW2, position 1 in the LOCAL position forces the O_2 range to the setting of position 2. The position 1 switch must be placed in the LOCAL position or changes in SW2, position 2 will have no effect.
2. Position 2 determines the O_2 range. This can be set to either 0 to 10% O_2 or 0 to 25% O_2. The factory setting is 0 to 10% O_2.

WARNING

Typically, the probe's sensing cell, in direct contact with the process gases, is heated to approximately 736°C (1357°F). The external temperature of the probe body may exceed 450°C (842°F). If operating conditions also contain high oxygen levels and combustible gases, the Hazardous Area Oxymitter 4000 may self-ignite.

If necessary, the O_2 range can be configured from 0 to 40% O_2. To select values within this range, set SW2, position 1 to HART and then enter the range via HART/AMS. Do not change SW2, position 1 to LOCAL unless you want to operate in the range specified by SW2, position 2.

3. Position 3 determines the output at startup or at an alarm. The settings are 3.5 mA or 21.6 mA. The factory setting is 3.5 mA. At startup, the current at the analog output is 3.5 mA or 21.6 mA.
4. Position 4 can be used to set the heater for 115 or 220 Vac operation. This switch is functional only when the software is set for manual voltage selection (Auto Tune = No). Otherwise, the internal electronics auto detect the input line voltage and sets the heater voltage accordingly (Auto Tune = Yes).

f. Once the cell is up to operating temperature, the O_2 percentage can be read:

1. Access TP5 and TP6 next to the membrane keypad. Attach a multimeter across TP5 and TP6. The calibration and process gases can now be monitored. Pressing the INC or DEC once will cause the output to switch from the process gas to the calibration gas. Pressing INC or DEC a second time will increase or decrease the calibration gas parameter. If the keys have been inactive for one minute, the output reverts to the process gas. When a calibration has been initiated, the value at TP5 and TP6 is the $\%O_2$ seen by the cell. Oxygen levels, as seen on the multimeter, are:

   8.0% O_2 = 8.0 VDC
   0.4% O_2 = 0.4 VDC

2. HART/AMS.
3. Model 751. The loop-driven LCD display.

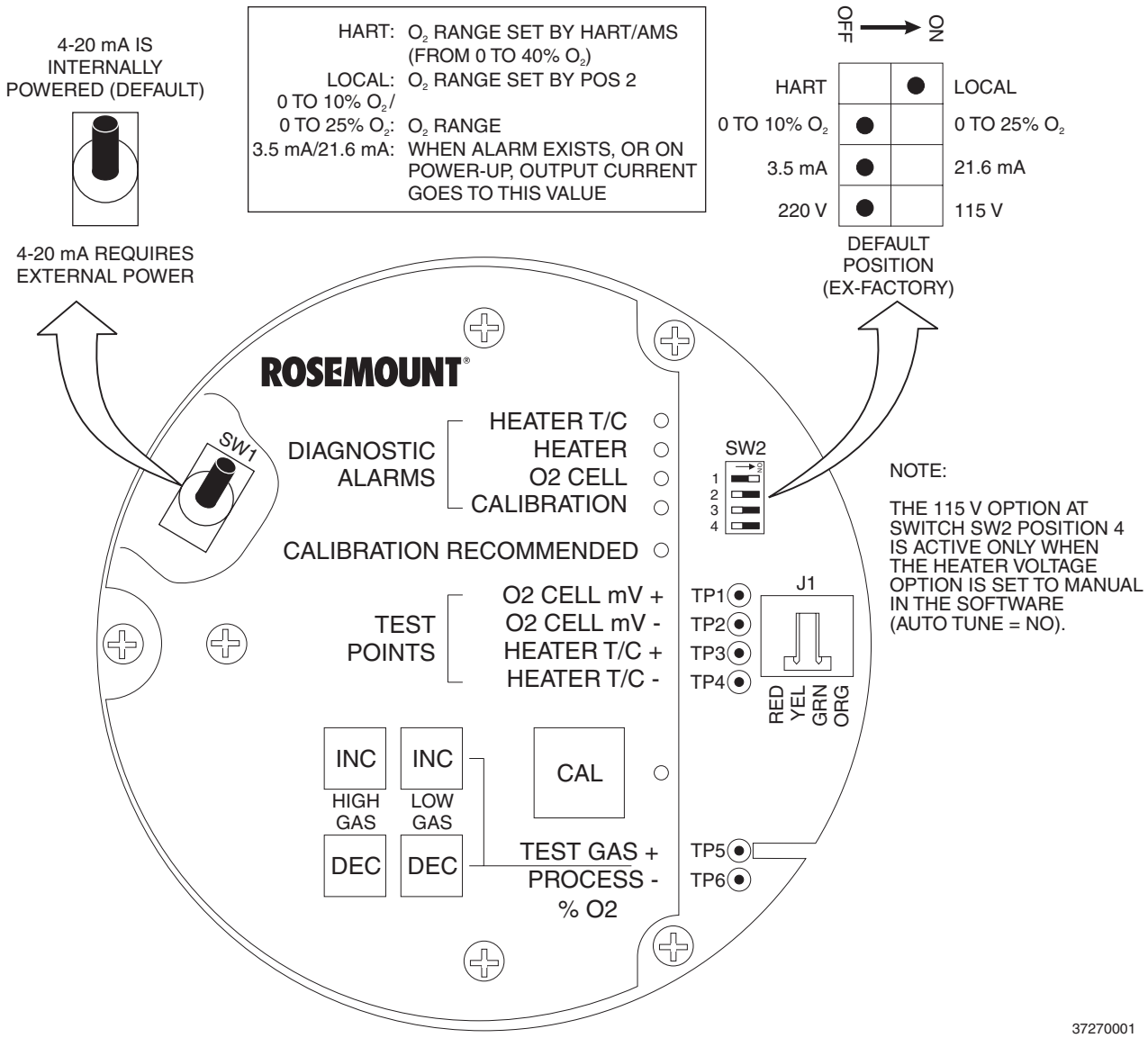


Figure 3-2. Defaults – Hazardous Area Oxymitter 4000 with Membrane Keypad

CAUTION

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

3-2 LOGIC I/O

This two-terminal logic contact can be configured either as a solid-state relay-activated alarm or as a bi-directional calibration handshake signal to an IMPS 4000 or SPS 4000. The configuration of this signal depends on the setting of the LOGIC I/O PIN MODE via HART/AMS or LOI. The ten different modes available are explained in Table 3-1.

a. Alarm

When configured as an alarm, this signal alerts you to an out-of-spec condition. The output is +5 Vdc in series with a 340 ohm resistor.

For optimum performance, Rosemount recommends connecting the output to a Potter & Brumfield 3.2 mA DC relay (P/N R10S-E1Y1-J1.0K).

Of the ten modes in Table 3-1, modes 0 through 7 are the alarm modes. The factory default is mode 5 for Hazardous Area Oxymitter 4000 units without an IMPS 4000 or SPS 4000. In this mode, the output will signal when a unit alarm or a CALIBRATION RECOMMENDED indication occurs.

b. Calibration Handshake Signal

If using an optional IMPS 4000 or SPS 4000, the logic I/O must be configured for calibration handshaking. Of the ten modes in Table 3-1, only modes 8 and 9 are configured for calibration handshaking. For a Hazardous Area Oxymitter 4000 with an IMPS 4000 or an SPS 4000, the factory sets the default to mode 8. In this mode, the logic I/O will be used to communicate between the Hazardous Area Oxymitter 4000 and the sequencer and to signal the sequencer when a CALIBRATION RECOMMENDED indication occurs.

Table 3-1. Logic I/O Configuration (as set at HART/AMS or LOI)

Mode	Configuration
0	The unit is not configured for any alarm condition.
1	The unit is configured for a Unit Alarm.
2	The unit is configured for Low O_2.
3	The unit is configured for both a Unit Alarm and Low O_2.
4	The unit is configured for a High AC Impedance/CALIBRATION RECOMMENDED.
5*	The unit is configured for both a Unit Alarm and a High AC Impedance/CALIBRATION RECOMMENDED.
6	The unit is configured for both a Low O_2 and High AC Impedance/CALIBRATION RECOMMENDED.
7	The unit is configured for a Unit Alarm, a Low O_2, and a High AC Impedance/CALIBRATION RECOMMENDED.
8**	The unit is configured for a calibration handshake with IMPS 4000 or SPS 4000. CALIBRATION RECOMMENDED will initiate the calibration cycle.
9	The unit is configured for a calibration handshake. CALIBRATION RECOMMENDED will not initiate the calibration cycle with the IMPS 4000 or SPS 4000.

* The default condition for a Hazardous Area Oxymitter 4000 without an IMPS 4000 or SPS 4000.
** The default condition for a Hazardous Area Oxymitter 4000 with an IMPS 4000 or SPS 4000.

3-3 RECOMMENDED CONFIGURATION

a. 4-20 mA Signal Upon Critical Alarm

Rosemount recommends that the factory default be utilized. The 4-20 mA signal will go to the 3.5 mA level upon any critical alarm which will cause the O_2 reading to be unusable. Customer can also select 21.6 mA as the failure setting if normal operations cause O_2 readings to go below the zero % O_2 (3.5 mA) level.

If the O_2 measurement is being utilized as part of an automatic control loop, the loop should be placed into manual upon this failure event or other appropriate action should be taken.

b. Calibration

Rosemount recommends utilizing an autocalibration system, actuated by the "calibration recommended" diagnostic. New O_2 cells may operate for more than a year, but older cells may require recalibration every few weeks as they near the end of their life. This strategy ensures that the O_2 reading is always accurate, and eliminates many unnecessary calibrations based on calendar days or weeks since previous calibration. When utilizing the SPS 4000 or IMPS 4000, consider wiring some or all associated alarm contacts.

1. CALIBRATION INITIATE. Contact from the control room to an SPS 4000 or IMPS 4000 (one per probe) provides the ability to manually initiate a calibration at any time from the control room. Note that calibrations can also be initiated from a HART handheld communicator, from Asset Management Solutions software, or from the keypad on the Hazardos Area Oxymitter 4000.

2. IN CALIBRATION. One contact per probe provides notification to the control room that the "calibration recommended" diagnostic has initiated an automatic calibration through the SPS 4000 or IMPS 4000. If the O_2 signal is being utilized in an automatic control loop, this contact should be utilized to place the control loop into manual during calibration.

3. CALIBRATION FAILED. One contact per probe from an SPS 4000 or IMPS 4000 to the control room for notification that the calibration procedure failed. Grouped with this alarm is an output from a pressure switch which indicates when the calibration gas bottles are empty.

4. 4-20 mA SIGNAL DURING CALIBRATION. The 4-20 mA signal can be configured to respond normally during any calibration, or it can be configured to hold the last O_2 value upon the initiation of calibration. The factory default is for the 4-20 mA signal to track (operate normally) throughout calibration. Holding the last O_2 value may be useful if several probes are being averaged for the purpose of automatic control. Unless several probes are being averaged, always place control loops that are using the O_2 signal into the manual mode prior to starting the calibration.

SECTION 4
CONFIGURATION OF HAZARDOUS AREA OXYMITTER 4000 WITH LOI

WARNING

Install all protective equipment covers and safety ground leads before equipment startup. Failure to install covers and ground leads could result in serious injury or death.

4-1 GENERAL

a. Verify Mechanical Installation

Ensure the Hazardous Area Oxymitter 4000 is installed correctly. See Section 2, INSTALLATION.

WARNING

Opening the electronics housing in hazardous areas may cause an explosion causing severe injury, or death. It may be required to get a hot work permit from your company safety officer before you open the housing.

b. Verify Terminal Block Wiring

1. Remove screw (18, Figure 9-3 or Figure 9-4), cover lock (19), and captive washer (20) that secure cover (17) on left side of housing (11). Remove the cover to expose the terminal block (15).

2. Check the terminal block wiring (Figure 3-1). Be sure the power, the 4-20 mA signal, and the logic outputs are properly connected and secure. To avoid a shock hazard, the power terminal cover must be installed.

   For units with remote electronics, check the terminal block wiring at the probe and at the remote electronics unit.

3. Install the cover (17, Figure 9-3 or Figure 9-4) over terminal block (15) and secure with captive washer (20), cover lock (19), and screw (18).

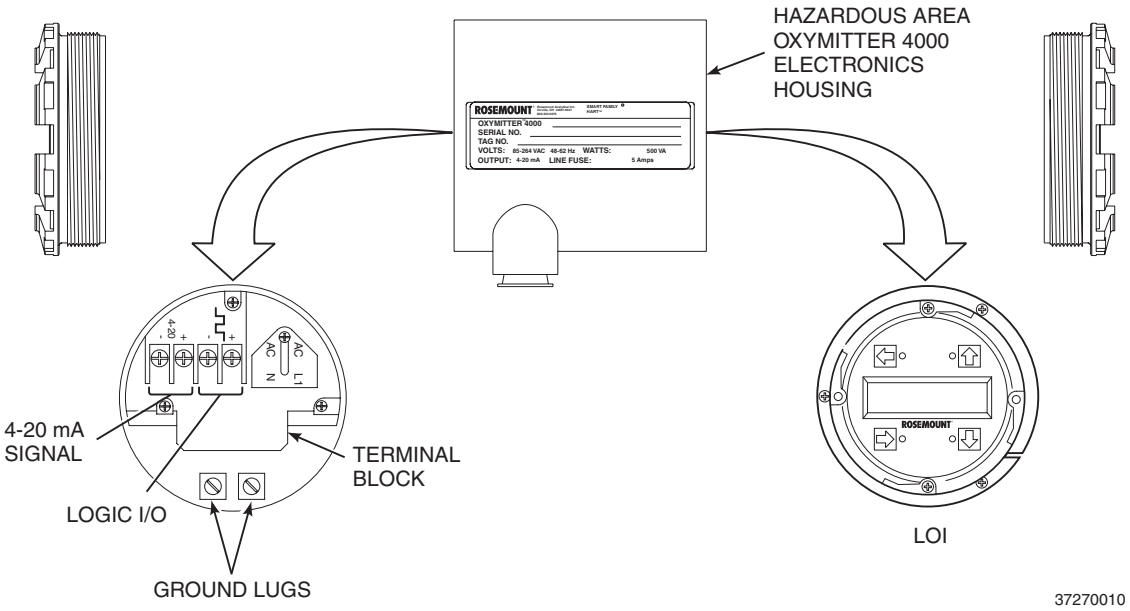


Figure 4-1. Electronics Housing Terminals with LOI

c. Verify Hazardous Area Oxymitter 4000 Configuration

Located on the microprocessor board are two switches that configure Hazardous Area Oxymitter 4000 outputs (Figure 4-2). To access these switches, the LOI module must be removed. SW1 determines if the 4-20 mA signal is internally or externally powered. SW2 determines:

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

1. Hazardous Area Oxymitter 4000 status, HART or LOCAL.
2. Oxygen range, 0 to 10% O_2 or 0 to 25% O_2. (0 to 40% O_2 is also configurable only through HART/AMS.)
3. The 4-20 mA signal, at fault or power up, 3.5 mA or 21.6 mA.

CAUTION

Remove power from the Hazardous Area Oxymitter 4000 before changing defaults. If defaults are changed under power, damage to the electronics package may occur.

d. SW1

The two settings are internally or externally powering the 4-20 mA signal. The factory setting is for the 4-20 mA signal to be internally powered.

e. SW2

The factory sets this switch as follows:

1. Position 1 is HART/LOCAL. This switch setting controls the configuration of the Hazardous Area Oxymitter 4000. The defaults cannot be changed via HART/AMS or the LOI unless the switch is in the HART position. Placing SW2, position 1 in the LOCAL position forces the O_2 range to the setting of position 2. The position 1 switch must be in the LOCAL position or changes in SW2, position 2 will have no effect.
2. Position 2 determines the O_2 range. This can be set to either 0 to 10% O_2 or 0 to 25% O_2. The factory setting is 0 to 10% O_2.

WARNING

Typically, the probe's sensing cell, in direct contact with the process gases, is heated to approximately 736°C (1357°F). The external temperature of the probe body may exceed 450°C (842°F). If operating conditions also contain high oxygen levels and combustible gases, the Hazardous Area Oxymitter 4000 may self-ignite.

If necessary, the O_2 range can be configured from 0 to 40% O_2. To select values within this range, set SW2, position 1 to HART and then enter the range via HART/AMS or the LOI. Do not change SW2, position 1 to LOCAL unless you want to operate in the range specified by SW2, position 2.

3. Position 3 determines the output at startup or at an alarm. The settings are 3.5 mA or 21.6 mA. The factory setting is 3.5 mA. At startup, the current at the analog output is 3.5 mA or 21.6 mA.
4. Position 4 can be used to set the heater for 115 or 220 Vac operation. This switch is functional only when the software is set for manual voltage selection (Auto Tune = No). Otherwise, the internal electronics auto detect the input line voltage and sets the heater voltage accordingly (Auto Tune = Yes).

f. Once the cell is up to operating temperature, the O_2 percentage can be read:

1. To access TP5 and TP6 under the LOI module (Figure 4-2), power down the Oxymitter 4000 and remove the LOI module. Attach alligator leads from a multimeter across TP5 and TP6 (Figure 3-2). Install the LOI module and power up the Oxymitter 4000. Allow time for the cell to reach operating temperature. The calibration and process gases can now be monitored. When a calibration has been initiated, the value at TP5 and TP6 is the % O_2 seen by the cell. Oxygen levels, as seen on the multimeter, are:

   8.0% O_2 = 8.0 VDC
   0.4% O_2 = 0.4 VDC

2. HART/AMS.
3. Model 751. The loop-driven LCD display.

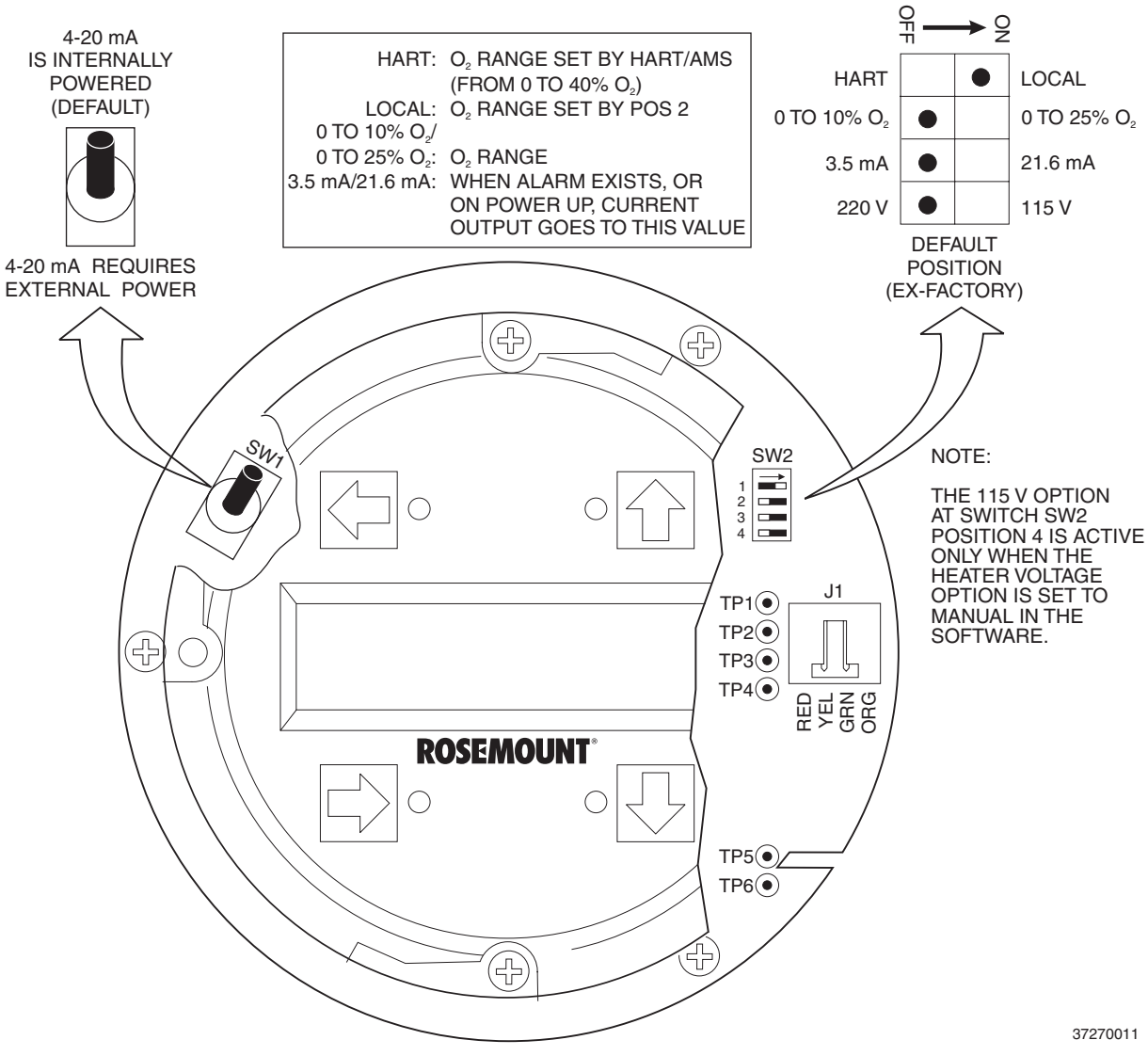


Figure 4-2. Defaults – Hazardous Area Oxymitter 4000 with LOI

CAUTION

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

4-2 LOGIC I/O

This two-terminal logic contact can be configured either as a solid-state relay-activated alarm or as a bi-directional calibration handshake signal to an IMPS 4000 or SPS 4000. The configuration of this signal depends on the setting of the LOGIC I/O PIN MODE via HART/AMS or LOI. The ten different modes available are explained in Table 4-1.

a. Alarm

When configured as an alarm, this signal alerts you to an out-of-spec condition. The output is +5 Vdc in series with a 340 ohm resistor.

For optimum performance, Rosemount recommends connecting the output to a Potter & Brumfield 3.2 mA DC relay (P/N R10S-E1Y1-J1.0K).

Of the ten modes in Table 4-1, mode 1 through mode 7 are the alarm modes. The factory default is mode 5 for Hazardous Area Oxymitter 4000 units without an IMPS 4000 or SPS 4000. In this mode, the output will signal when a unit alarm or a CALIBRATION RECOMMENDED indication occurs.

b. Calibration Handshake Signal

If using an optional IMPS 4000 or SPS 4000, the logic I/O must be configured for calibration handshaking. Of the ten modes in Table 4-1, only modes 8 and 9 are configured for calibration handshaking. For a Hazardous Area Oxymitter 4000 with an IMPS 4000 or an SPS 4000, the factory sets the default to mode 8. In this mode, the logic I/O will be used to communicate between the Hazardous Area Oxymitter 4000 and the sequencer and to signal the sequencer when a CALIBRATION RECOMMENDED indication occurs.

Table 4-1. Logic I/O Configuration (as set at HART/AMS or LOI)

Mode	Configuration
0	The unit is not configured for any alarm condition.
1	The unit is configured for a Unit Alarm.
2	The unit is configured for Low O_2.
3	The unit is configured for both a Unit Alarm and Low O_2.
4	The unit is configured for a High AC Impedance/CALIBRATION RECOMMENDED.
5*	The unit is configured for both a Unit Alarm and a High AC Impedance/CALIBRATION RECOMMENDED.
6	The unit is configured for both a Low O_2 and High AC Impedance/CALIBRATION RECOMMENDED.
7	The unit is configured for a Unit Alarm, a Low O_2, and a High AC Impedance/CALIBRATION RECOMMENDED.
8**	The unit is configured for a calibration handshake with IMPS 4000 or SPS 4000. CALIBRATION RECOMMENDED will initiate the calibration cycle.
9	The unit is configured for a calibration handshake. CALIBRATION RECOMMENDED will not initiate the calibration cycle with the IMPS 4000 or SPS 4000.

* The default condition for a Hazardous Area Oxymitter 4000 without an IMPS 4000 or SPS 4000.
** The default condition for a Hazardous Area Oxymitter 4000 with an IMPS 4000 or SPS 4000.

4-3 RECOMMENDED CONFIGURATION

a. 4-20 mA Signal Upon Critical Alarm

Rosemount recommends that the factory default be utilized. The 4-20 mA signal will go to the 3.5 mA level upon any critical alarm which will cause the O_2 reading to be unusable. Customer can also select 21.6 mA as the failure setting if normal operations cause O_2 readings to go below the zero % O_2 (3.5 mA) level.

If the O_2 measurement is being utilized as part of an automatic control loop, the loop should be placed into manual upon this failure event or other appropriate action should be taken.

b. Calibration

Rosemount recommends utilizing an auto-calibration system, actuated by the "calibration recommended" diagnostic. New O_2 cells may operate for more than a year, but older cells may require recalibration every few weeks as they near the end of their life. This strategy ensures that the O_2 reading is always accurate, and eliminates many unnecessary calibrations based on calendar days or weeks since previous calibration. When utilizing the SPS 4000 or IMPS 4000, consider wiring some or all associated alarm contacts.

1. CALIBRATION INITIATE. Contact from the control room to an SPS 4000 or IMPS 4000 (one per probe) provides the ability to manually initiate a calibration at any time from the control room. Note that calibrations can also be initiated from a HART handheld communicator, from Asset Management Solutions software, or from the keypad on the Oxymitter 4000.

2. IN CALIBRATION. One contact per probe provides notification to the control room that the "calibration recommended" diagnostic has initiated an automatic calibration through the SPS 4000 or IMPS 4000. If the O_2 signal is being utilized in an automatic control loop, this contact should be utilized to place the control loop into manual during calibration.

3. CALIBRATION FAILED. One contact per probe from an SPS 4000 or IMPS 4000 to the control room for notification that the calibration procedure failed. Grouped with this alarm is an output from a pressure switch which indicates when the calibration gas bottles are empty.

4. 4-20 mA SIGNAL DURING CALIBRATION. The 4-20 mA signal can be configured to respond normally during any calibration, or it can be configured to hold the last O_2 value upon the initiation of calibration. The factory default is for the 4-20 mA signal to track (operate normally) throughout calibration. Holding the last O_2 value may be useful if several probes are being averaged for the purpose of automatic control. Unless several probes are being averaged, always place control loops that are using the O_2 signal into the manual mode prior to starting the calibration.

SECTION 5
STARTUP AND OPERATION OF HAZARDOUS AREA OXYMITTER 4000 WITH MEMBRANE KEYPAD

5-1 POWER UP

a. Startup Display

When power is applied to the probe, the cell heater turns on. It takes approximately one half hour for the cell to heat to operating temperature. This condition is indicated by the top four LEDs (DIAGNOSTIC ALARMS) on the membrane keypad (Figure 5-1). Starting with the CALIBRATION LED, the LEDs light in ascending order until all four LEDs are on. At this point, all four turn off and the cycle starts again. This ramp cycle continues until the cell is up to operating temperature.

b. Operating Display

The ramp cycle turns into a cycle where the diagnostic LEDs light in sequence from the top to the bottom, one at a time. After the bottom LED turns on, the sequence starts again at the top with the HEATER T/C LED (Figure 5-1).

c. Error

If there is an error condition at startup, one of the diagnostics LEDs will be blinking. Refer to Section 8 TROUBLESHOOTING, to determine the cause of the error. Clear the error, cycle power, and the operating display should return.

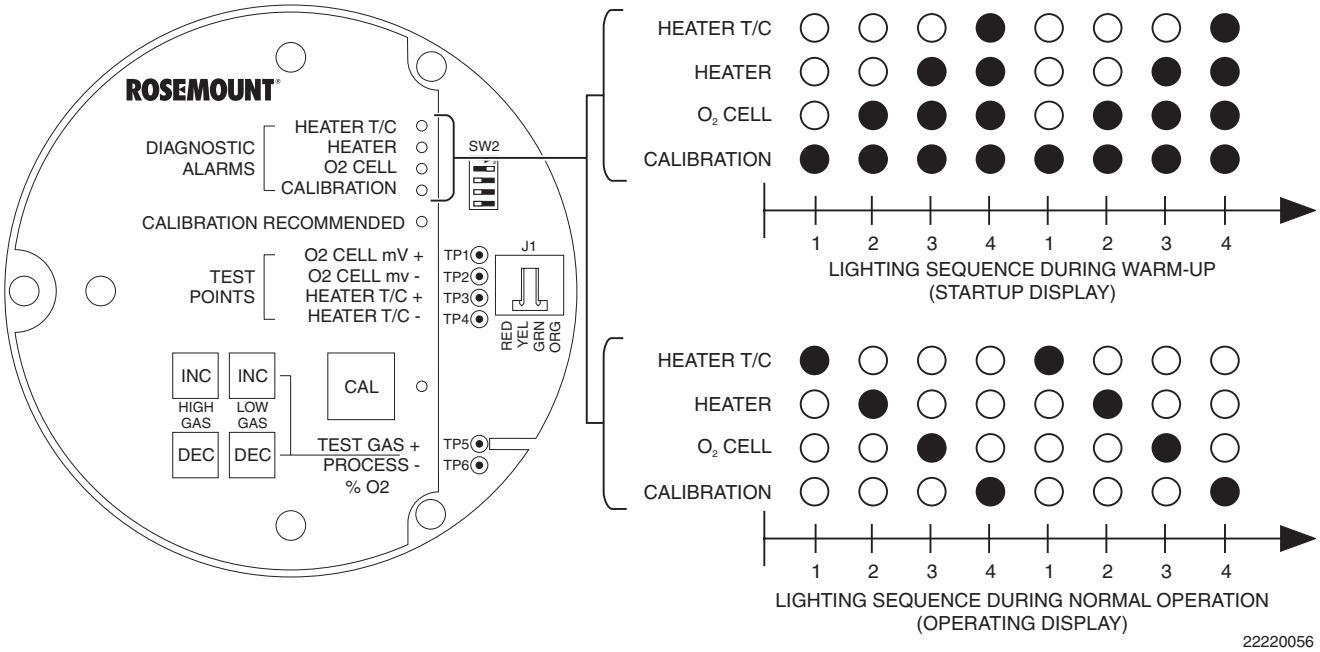


Figure 5-1. Startup and Normal Operation

d. Keypad

The five membrane keys on the membrane keypad are only used during calibration to adjust the high and low gas and to initiate the calibration sequence (Figure 5-2).

e. Reference Air

Ensure reference air, if used, is set to 56.6 l/hr (2 scfh).

5-2 OPERATION

a. Overview

Ensure the Hazardous Area Oxymitter 4000 is at normal operation. The diagnostic LEDs will display the operating cycle. All other LEDs should be off (See Figure 5-3).

1. DIAGNOSTIC ALARM LEDS. If there is an error in the system, one of these LEDs will flash various blink codes (see Section 8, TROUBLESHOOTING). In the case of multiple errors, only one will be displayed based on a priority system. Correct the problem and cycle power. The operating display will return or the next error will be displayed. The alarms are:

   HEATER T/C
   HEATER
   O_2 CELL
   CALIBRATION

2. CALIBRATION RECOMMENDED LED. Turns on when the system determines that a calibration is recommended. Further information is available in Section 9, MAINTENANCE AND SERVICE.

3. TEST POINTS. Test points 1 through 6 allow you to monitor with a multimeter: the heater thermocouple, the O_2 cell millivolt value, and the process O_2.

   (a) TP1 and TP2 monitor the oxygen cell millivolt output, which equates to the percentage of oxygen present.

   (b) TP3 and TP4 monitor the heater thermocouple.

   (c) TP5 and TP6 monitor the process gas or the calibration gas parameter.

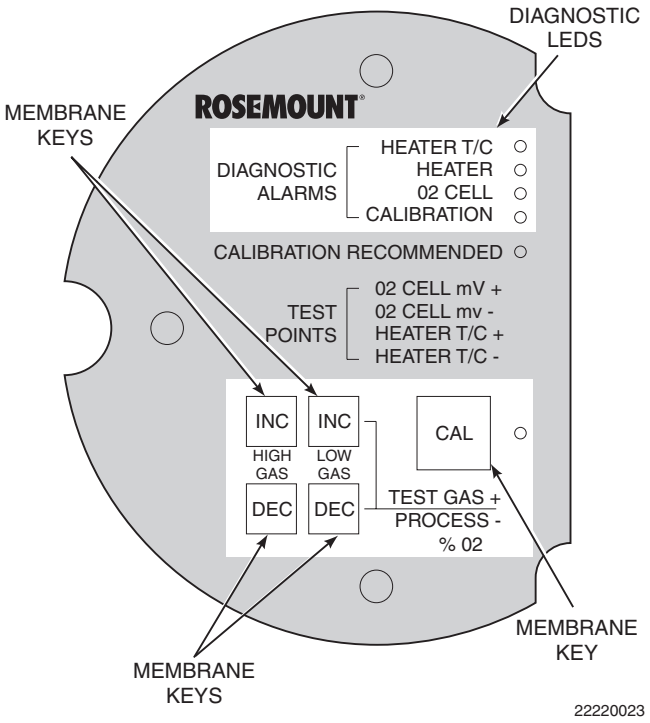


Figure 5-2. Calibration Keys

4. CAL LED. The CAL LED is on steady or flashing during calibration. Further information is available in Section 9, MAINTENANCE AND SERVICE.

5. Keys.

   (a) INC and DEC. The INC and DEC keys are used to set the values of the calibration gases. Attach a multimeter across TP5 and TP6. The calibration and process gases can now be monitored. Pressing the INC or DEC once will cause the output to switch from the process gas to the calibration gas. Pressing INC or DEC a second time will increase or decrease the calibration gas parameter. If the keys have been inactive for one minute, the output reverts to the process gas. When a calibration has been initiated, the value at TP5 and TP6 is the % O_2 seen by the cell.

      Oxygen levels, as seen on the multimeter, are:

      8.0% O_2 = 8.0 volts DC

      0.4% O_2 = 0.4 volts DC

   (b) CAL. The CAL key can:

      1 Initiate a calibration.

      2 Sequence through calibration.

      3 Abort the calibration.

NOTE

Refer to Section 9, MAINTENANCE AND SERVICE, for calibration instructions.

b. Model 751 Remote Powered Loop LCD Display (Optional)

Refer to Remote Powered Loop LCD manual for calibration and operation.

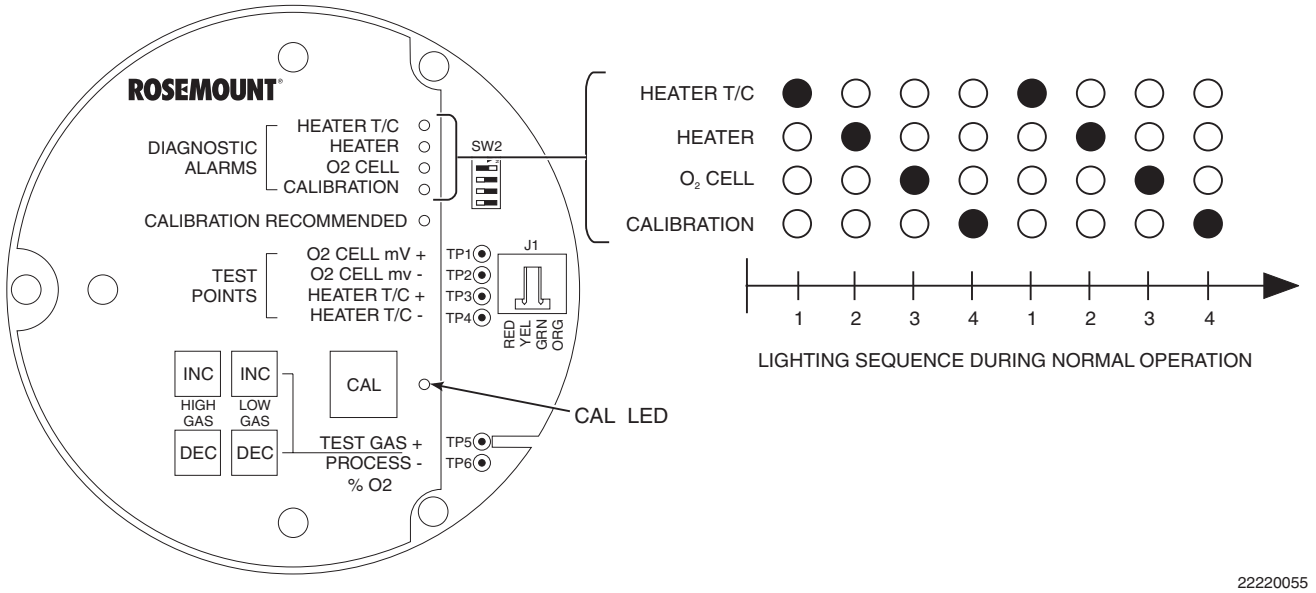


Figure 5-3. Normal Operation

SECTION 6
STARTUP AND OPERATION OF HAZARDOUS AREA OXYMITTER 4000 WITH LOI

6-1 POWER UP

a. Startup Display

When power is applied to the probe, the cell heater turns on. It takes approximately one half hour for the cell to heat to operating temperature. This condition is indicated by a "warm up" display on the LOI (Figure 6-1). This message will continue to display until the cell is up to operating temperature.

b. Operating Display

The normal operating display is the % O_2 concentration. The "normal" display is shown in Figure 6-2.

c. Error

If there is an error condition at startup, an alarm message will be displayed. Refer to Section 8, TROUBLESHOOTING, to determine the cause of the error. Clear the error, cycle power, and the % O_2 display should return.

d. LOI

The Local Operator Interface can be used to change the software and alarm settings, to adjust the high and low gas settings, and to initiate the calibration sequence. Refer to the LOI menu (Figure 6-4).

e. Reference Air

Ensure the reference air, if used, is set to 56.6 l/hr (2 scfh).

6-2 START UP OXYMITTER 4000 CALIBRATION

Refer to Section 9, MAINTENANCE AND SERVICE, for calibration instructions.

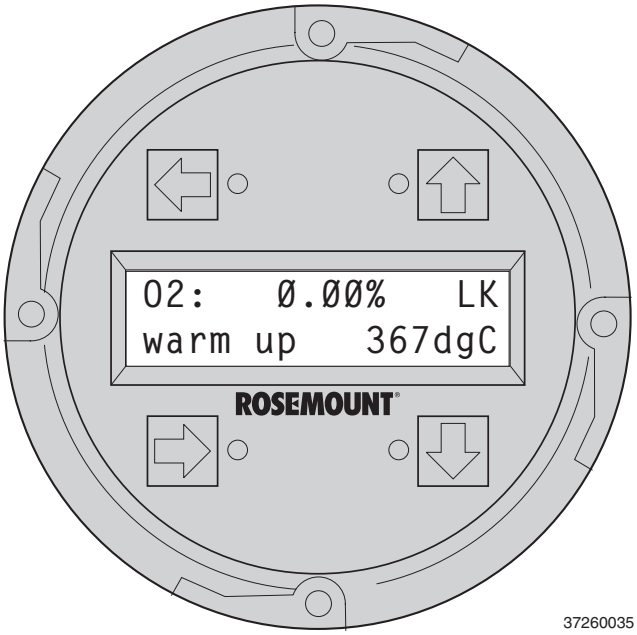


Figure 6-1. Startup Display

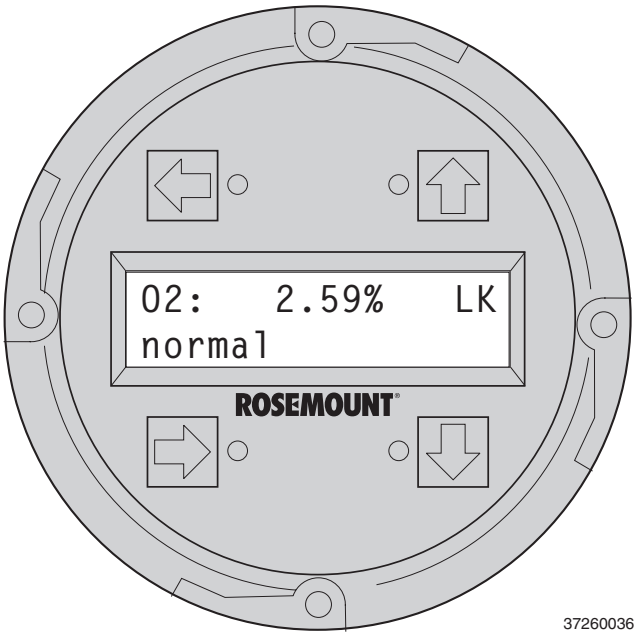


Figure 6-2. Normal Display

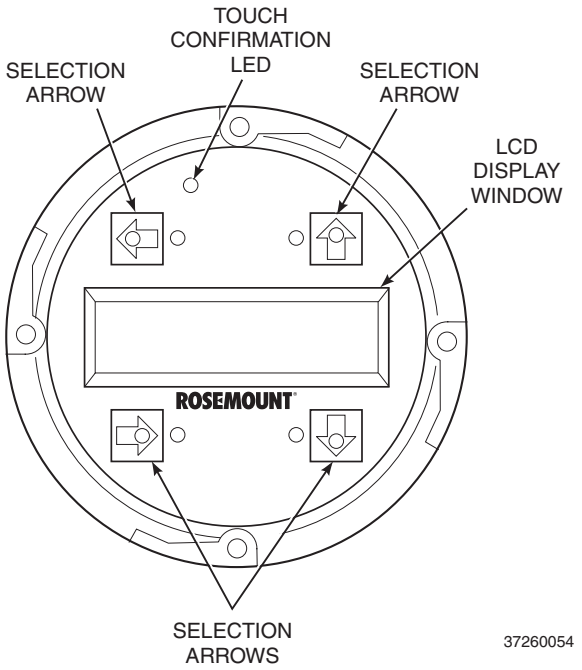


Figure 6-3. LOI Features

6-3 NAVIGATING THE LOCAL OPERATOR INTERFACE

a. Overview

The Local Operator Interface (LOI), shown in Figure 6-3, utilizes a bright blue gas-florescent display. Intensity is adjustable. There is an Infra-red LED source and a detector for each key. The detectors can detect a finger placed above the button through the glass window. There is no need to open the instrument in bad weather or in hazardous areas in order to access the electronics.

It should be noted that the Hazardous Area Oxymitter 4000 also utilizes HART communications, permitting access to all instrument functionality anywhere the 4-20 mA signal terminates via a HART model 275/375 handheld communicator.

b. Lockout

The Local Operator Interface (LOI) has a lockout feature that prevents nuisance actuation by someone brushing against the glass window, raindrops, dirt, insects, etc. This lockout mode is automatically established when no buttons are pushed for 30 seconds (default). This countdown to lockout is configurable.

In order to unlock the display, input a "Z" pattern. First, push the top left (gray) arrow, then the top right, followed by the bottom left and finally the bottom right. The "LK" notation in the upper right corner of the display will now disappear. Push the gray arrow at the top left hand corner once more to enter into the menu structure. Once one moves deeper into the menu structure, additional time is provided to the user so that the lockout initiation does not become a nuisance. This additional “revert” time is defaulted at one hour and is also user configurable.

6-4 LOI KEY DESIGNATIONS

The gray key (top left) key will move one level higher in the menu structure. When entering numbers, this key will move the cursor to the left. This key also doubles as an “Enter” key, once numbers are entered, and when the cursor is moved to it’s left-most position. The new data entry value will appear in the top line of the LOI display once it’s accepted.

The blue key (bottom left) acts as a selector when choosing from among a number of menu items. This key also will move the cursor to the right when entering numbers.

Up/Down keys (to the left side of the keypad) are used to increment up and down when selecting from a series of menu picks. They are also used for incrementing values up and down for data input.

6-5 LOI MENU TREE

This LOI menu for the Oxymitter 4000 is shown in Figure 6-4. This menu tree is specific to the Oxymitter 4000. The menu tree will assist in navigating the LOI.

Menu items in normal text display information, only. Menu Items in italics permit data entry. Menu items in bold text are procedures.

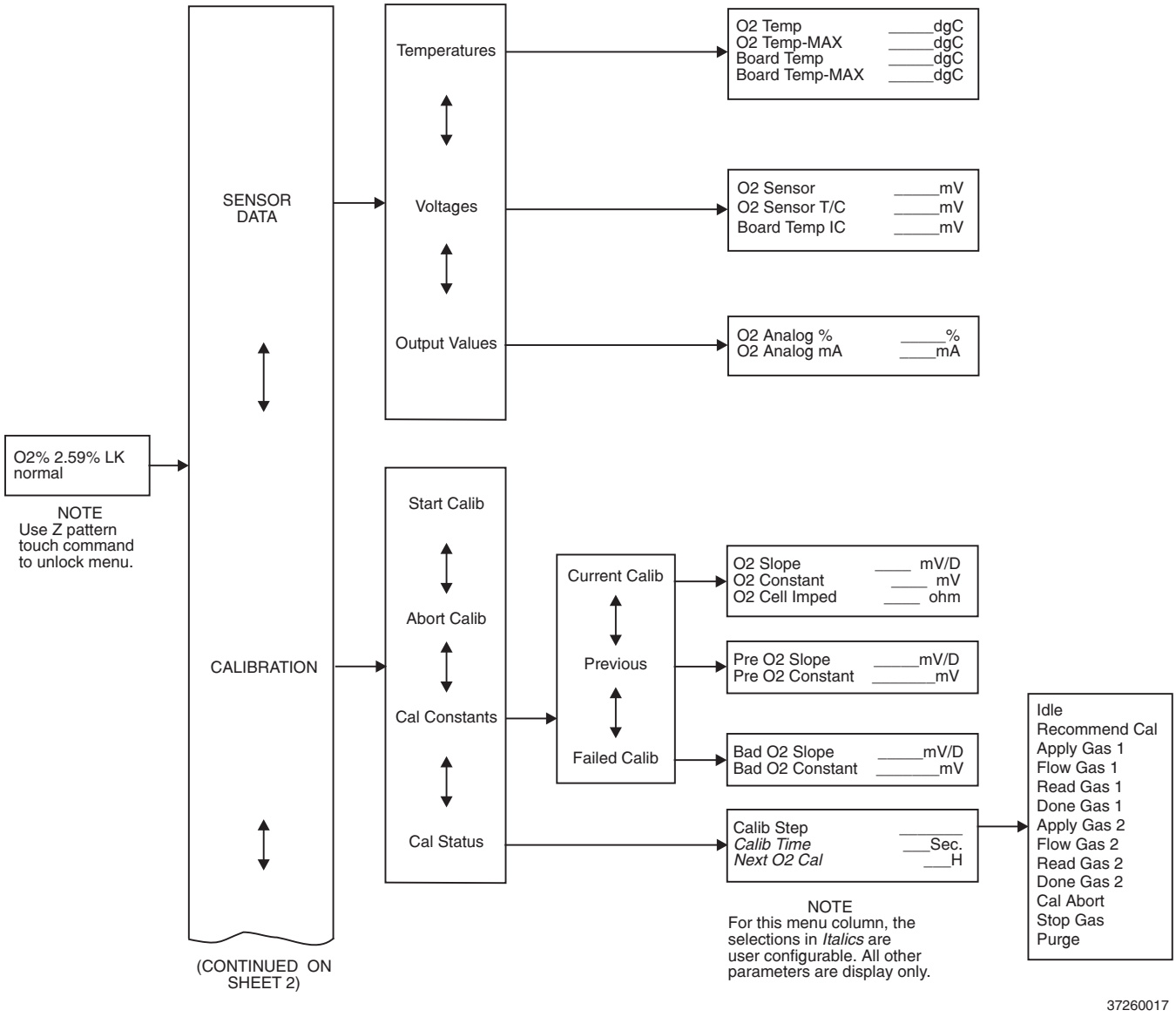


Figure 6-4. Local Operator Interface Menu Tree (Sheet 1 of 2)

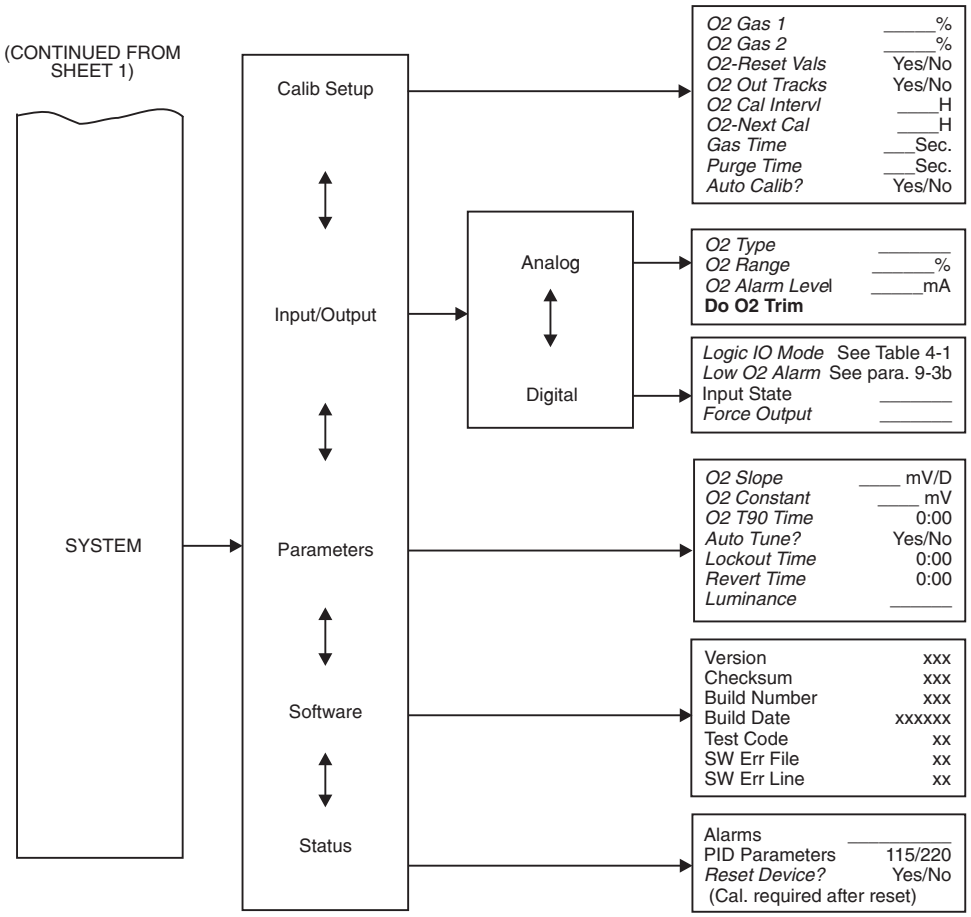


Figure 6-4. Local Operator Interface Menu Tree (Sheet 2 of 2)

6-6 HAZARDOUS AREA OXYMITTER 4000 SETUP AT THE LOI

In setting up the Hazardous Area Oxymitter 4000 from the LOI, it's best to start at the SYSTEM/Calibration Setup menu, Figure 6-4.

a. SYSTEM/Calibration Setup

1. O2 Gas #1 – Enter the high or low cal gas value (the order is not important).
2. O2 Gas #2 – Enter the second cal gas value.

NOTE

Refer to Section 9, MAINTENANCE AND SERVICE, for calibration instructions.

NOTE

Rosemount Analytical recommends 0.4% O_2 and 8% O_2 for calibration gases.

3. O2 - Reset Values – Resets factory default values.
4. O2 Output Tracks – 4 to 20 mA signal can be held at the last value during calibration, or the signal can be left to track the cal gases.
5. O2 Cal Interval – If automatic calibration is selected, this selects the interval between calibrations.
6. O2-Next Cal – If automatic calibration is selected, this selects the time until the first initial calibration takes place.

7. Gas Time – How long should each cal gas flow. Factory default is 300 seconds, but the user may want to vary this depending upon the length of calibration gas tubing runs.

8. Purge Time – Used if the O_2 output is selected to hold the last value during calibration. After the second cal gas is removed, how long until the sensor comes back to the normal process reading, and the 4-20 mA signal can be released.

9. Auto Calib? – Select "Yes" if an SPS or IMPS autocalibration system is part of the system.

b. SYSTEM/Input/Output

1. Analog – Pertaining to the analog 4-20 mA signal representing O_2.

   (a) O2 Type – 4-20 mA signal may be configured to increase with increasing O_2 or the reverse.

   (b) O2 Range – Upper O_2 range is user selectable.

   (c) O2 Alarm Level – User can configure the digital output to alarm at a given O_2 level.

   (d) Do O2 Trim – Procedure for calibrating the 4-20 mA signal to a precision mA source. Procedure is intuitive.

2. Digital – A bi-directional logic signal may be configured as an alarm, or as a calibration handshake signal.

   (a) Logic I/O Mode – One of 9 different sets of conditions can be set for the digital signal. See Table 8-2.

   (b) Low O2 Alarm – If any of the conditions noted above include a low O_2 process alarm, set the value here.

   (c) Input State – Notes the current condition of the bi-directional digital signal.

   (d) Force Output – Forces the output state of the signal to either open or closed. This is used primarily when diagnosing potential problems with this signal.

c. SYSTEM/Parameters

1. O2 Slope – O_2 slope is data regarding the strength of the sensing cell output. This information is automatically calculated after a calibration, and the user does not normally input this data.

2. O2 Constant – O_2 constant is the amount of voltage a cell generates with ambient air as the calibration gas. Again, this is normally calculated as a result of calibration, and is not normally input by the user.

3. O2 T90 Time – Some users may feel that the O_2 reading is too active for certain processes. This feature permits the user to dampen the O_2 signal. The default value is zero seconds dampening.

4. Auto Tune – The electronics detects the line voltage powering the instrument automatically, and picks proper algorithms for heater control. User can force a high voltage algorithm, or a low, but Auto Tune is the default, and is recommended.

5. Lockout Time – Keypad lockout time default is 30 sec., but is user configurable. A "Z" keypad pattern will unlock the keypad.

6. Revert Time – Once a user goes one level deep into the menu structure, an additional "revert time" is provided to prevent nuisance lockouts. One hour is the default, and it is user configurable.

7. Luminance – Gas florescence brightness is user adjustable.

d. SYSTEM/Status

1. Alarms – Diagnostic alarms. See Section 8, TROUBLESHOOTING.

2. PID Parameter – Displays the line voltage, powering the Oxymitter, and infers the temperature control algorithm being used to control heater temperature.

3. Reset Device – Device can be reset here as opposed to re-powering. Calibration parameters will be lost.

e. SYSTEM/Software

This is data regarding the Oxymitter 4000 software version, and errors that may have occurred.

f. SENSOR DATA

Displays information about the O_2 cell and thermocouple.

1. Temperatures

   (a) O2 Temp – Indicates the thermocouple temperature at the sensing cell; this should always be 736°C.

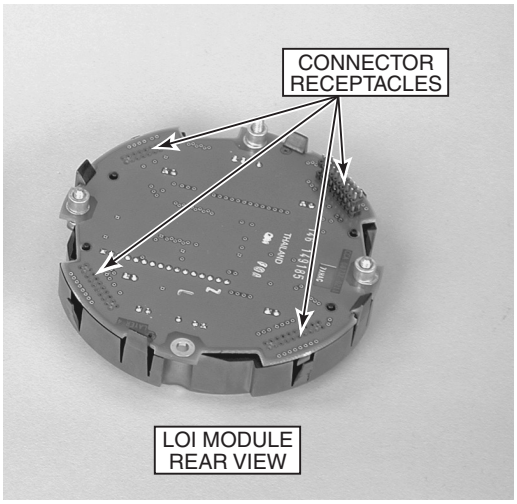
   (b) O2 Temp Max. – Maximum temperature the cell has seen. (Some process temperatures can exceed the 736°C setpoint temperature, and this will indicate this condition.)

   (c) Board Temp – The temperature inside the Oxymitter electronics housing (85°C is the max.).

   (d) Board Temp Max. – This is the maximum temperature that the electronics has experienced over time.

6-7 LOI INSTALLATION

The LOI connects to the top of the electronic assembly in the electronics housing. There are four matching connectors on the back of the LOI module, Figure 6-5, that allow the LOI to be oriented as desired by the user.



37260055

Figure 6-5. LOI Module Connectors

6-8 OXYMITTER 4000 TEST POINTS

Refer to Figure 6-6. System test points are located on the board below the LOI module. Test points 1 through 6 allow you to monitor with a multimeter: the heater thermocouple, the O_2 cell millivolt, and the process O_2.

a. TP1 and TP2 monitor the oxygen cell millivolt output which equates to the percentage of oxygen present.

b. TP3 and TP4 monitor the heater thermocouple.

c. TP5 and TP6 monitor the process gas or the calibration gas parameter.

6-9 MODEL 751 REMOTE POWERED LOOP LCD DISPLAY (OPTIONAL)

Refer to Remote Powered Loop LCD manual for calibration and operation.

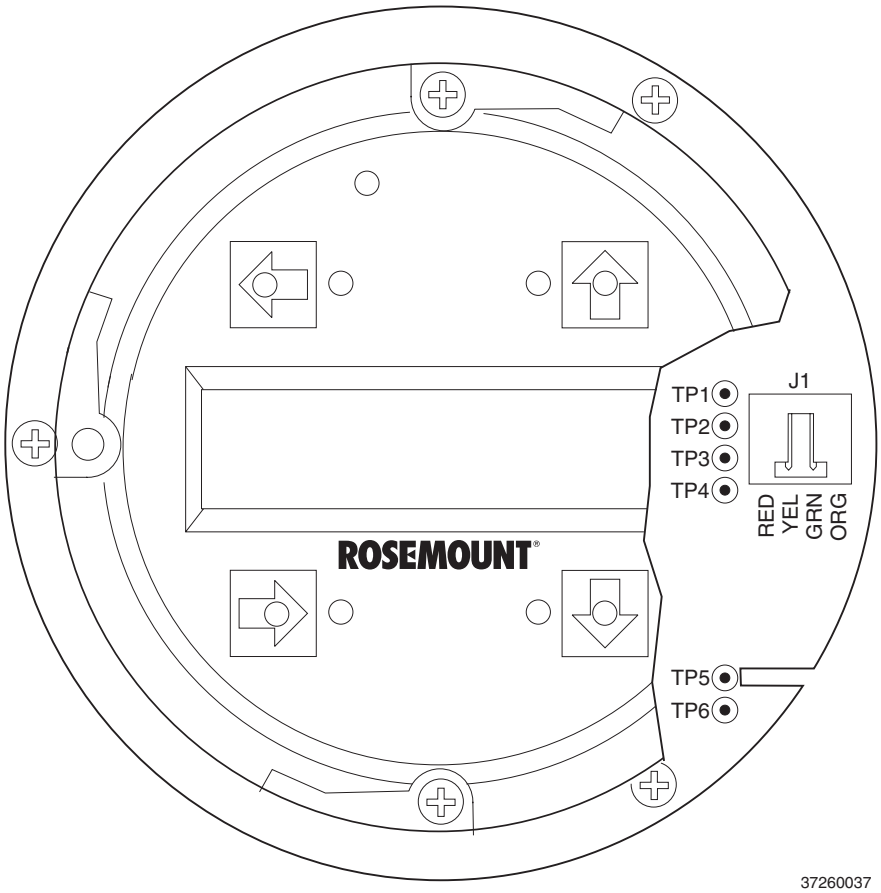


Figure 6-6. Test Points

SECTION 7
HART/AMS

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

7-1 OVERVIEW

The HART Communicator is a handheld communications interface device. It provides a common communications link to all microprocessor-based instruments that are HART compatible. The handheld communicator contains an 8 x 21 character liquid crystal display (LCD) and 25 keys. A pocket-sized manual, included with the HART Communicator, details the specific functions of all the keys.

To interface with the Hazardous Area Oxymitter 4000, the HART Communicator requires a termination point along the 4-20 mA current loop and a minimum load resistance of 250 ohms between the communicator and the power supply.

The HART Communicator accomplishes its task using a frequency shift keying (FSK) technique. With the use of FSK, high-frequency digital communication signals are superimposed on the Hazardous Area Oxymitter 4000's 4-20 mA current loop. The HART communicator does not disturb the 4-20 mA signal, since no net energy is added to the loop.

The HART Communicator may be interfaced with a personal computer (PC), providing that special software has been installed. To connect the HART Communicator to a PC, an interface adapter is required. Refer to the proper HART Communicator documentation in regard to the PC interface option.

7-2 HART COMMUNICATOR SIGNAL LINE CONNECTIONS

The HART Communicator can connect to the Hazardous Area Oxymitter 4000's analog output signal line at any wiring termination in the 4-20 mA current loop. There are two methods of connecting the HART Communicator to the signal line. For applications in which the signal line has a load resistance of 250 ohms or more, refer to method 1. For applications in which the signal line load resistance is less than 250 ohms, refer to method 2.

a. Method 1, For Load Resistance ≥ 250 Ohms

Refer to Figure 7-1 and the following steps to connect the HART Communicator to a signal line 250 ohms or more of load resistance.

WARNING

Explosions can result in death or serious injury. Do not make connections to the HART Communicator's serial port, 4-20 mV signal line, or NiCad recharger jack in an explosive atmosphere.

Using the supplied lead set, connect the HART Communicator in parallel with to the Hazardous Area Oxymitter 4000. Use any wiring termination points in the analog output 4-20 mA signal line.

b. Method 2, For Load Resistance < 250 Ohms

Refer to Figure 7-2 and the following steps to connect the HART Communicator to a signal line with less than 250 ohms load resistance.

WARNING

Explosions can result in death or serious injury. Do not make connections to the HART Communicator's serial port, 4-20 mA signal line, or NiCad recharger jack in an explosive atmosphere.

1. At a convenient point, break the analog output 4-20 mA signal line and install the optional 250 ohm load resistor.
2. Plug the load resistor into the loop connectors (located on the rear panel of the HART Communicator).

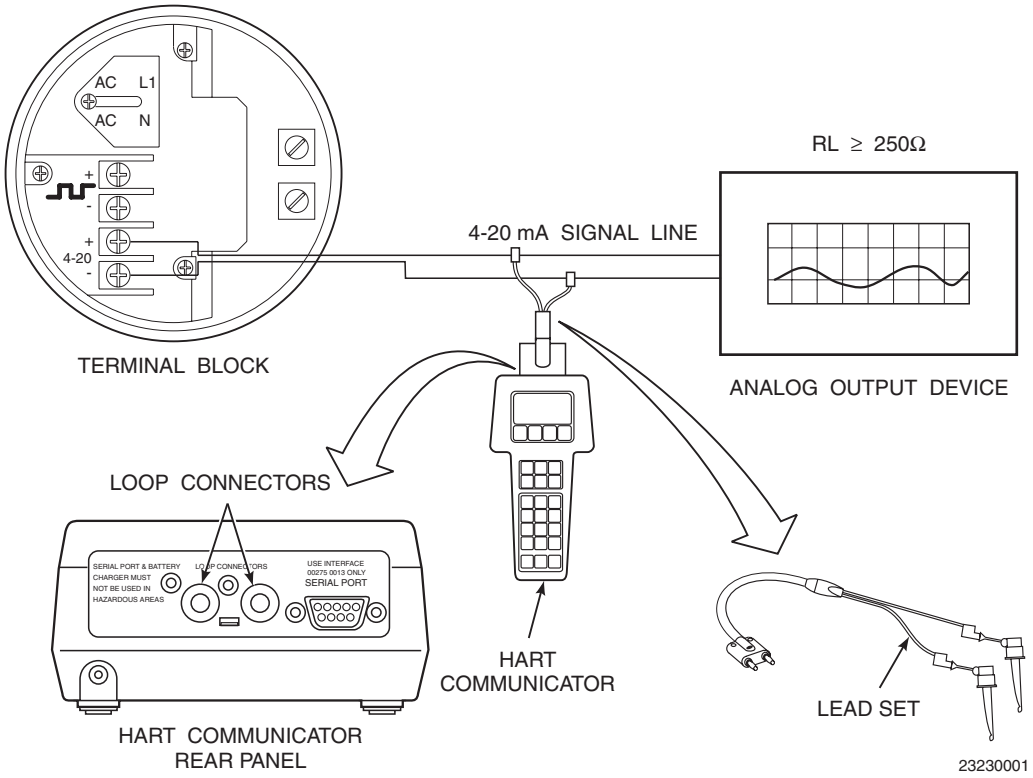


Figure 7-1. Signal Line Connections, ≥ 250 Ohms Load Resistance

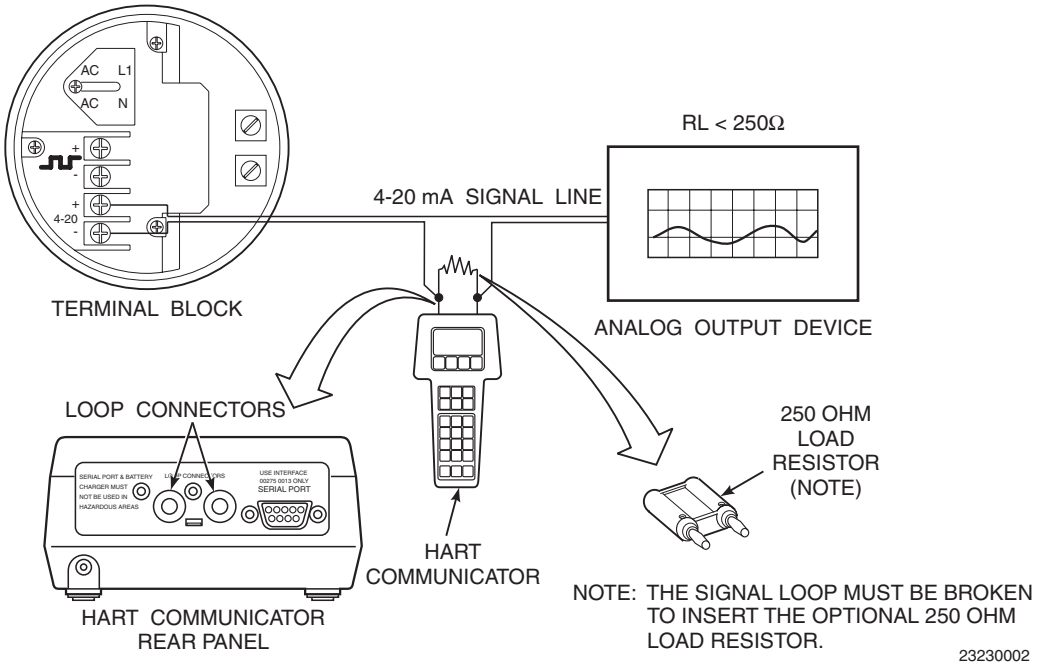


Figure 7-2. Signal Line Connections, < 250 Ohms Load Resistance

7-3 HART COMMUNICATOR PC CONNECTIONS

There is an option to interface the HART Communicator with a personal computer. Load the designated AMS software into the PC. Then link the HART Communicator to the PC using the interface PC adapter that connects to the serial port (on the communicator rear panel).

Refer to the proper HART Communicator documentation in regard to the PC interface option.

7-4 OFF-LINE AND ON-LINE OPERATIONS

The HART Communicator can be operated both off-line and on-line.

a. Off-line operations are those in which the communicator is not connected to the Hazardous Area Oxymitter 4000. Off-line operations can include interfacing the HART Communicator with a PC (refer to applicable HART documentation regarding HART/PC applications.

b. In the on-line mode, the communicator is connected to the 4-20 mA analog output signal line. The communicator is connected in parallel to the Hazardous Area Oxymitter 4000 or in parallel to the 250 ohm load resistor.

NOTE

If the HART Communicator is turned on while connected to the 4-20 mA analog output signal line, an undefined status indication appears while the communicator warms up. Wait until the warmup period ends to continue.

c. The opening menu displayed on the LCD is different for on-line and off-line operations. When powering up a disconnected (off-line) communicator, the LCD will display the Main Menu. When powering up a connected (on-line) communicator, the LCD will display the On-line Menu. Refer to the HART Communicator manual for detailed menu information.

7-5 LOGIC I/O CONFIGURATIONS

The Hazardous Area Oxymitter 4000 logic I/O output can be configured for ten different modes through HART/AMS. The factory default condition is Mode 5. A list of possible configurations appear in Table 7-1.

The Unit Alarm configuration available for Modes 1, 3, 5, and 7 refers to the diagnostic alarm faults in Table 8-1.

7-6 HART/AMS MENU TREE FOR HAZARDOUS AREA OXYMITTER 4000 APPLICATIONS

This section consists of a menu tree for the HART Communicator. This menu is specific to Hazardous Area Oxymitter 4000 applications.

Table 7-1. Logic I/O Configuration (as set at HART/AMS or LOI)

Mode	Configuration
0	The unit is not configured for any alarm condition.
1	The unit is configured for a Unit Alarm.
2	The unit is configured for Low O_2.
3	The unit is configured for both a Unit Alarm and Low O_2.
4	The unit is configured for a High AC Impedance/CALIBRATION RECOMMENDED.
5*	The unit is configured for both a Unit Alarm and a High AC Impedance/CALIBRATION RECOMMENDED.
6	The unit is configured for both a Low O_2 and High AC Impedance/CALIBRATION RECOMMENDED.
7	The unit is configured for a Unit Alarm, a Low O_2, and a High AC Impedance/CALIBRATION RECOMMENDED.
8**	The unit is configured for a calibration handshake with an IMPS 4000 or SPS 4000. CALIBRATION RECOMMENDED will initiate the calibration cycle.
9	The unit is configured for a calibration handshake. CALIBRATION RECOMMENDED will not initiate the calibration cycle with an IMPS 4000 or SPS 4000.

*The default condition for a Hazardous Area Oxymitter 4000 without an IMPS 4000 or SPS 4000.
**The default condition for a Hazardous Area Oxymitter 4000 with an IMPS 4000 or SPS 4000.

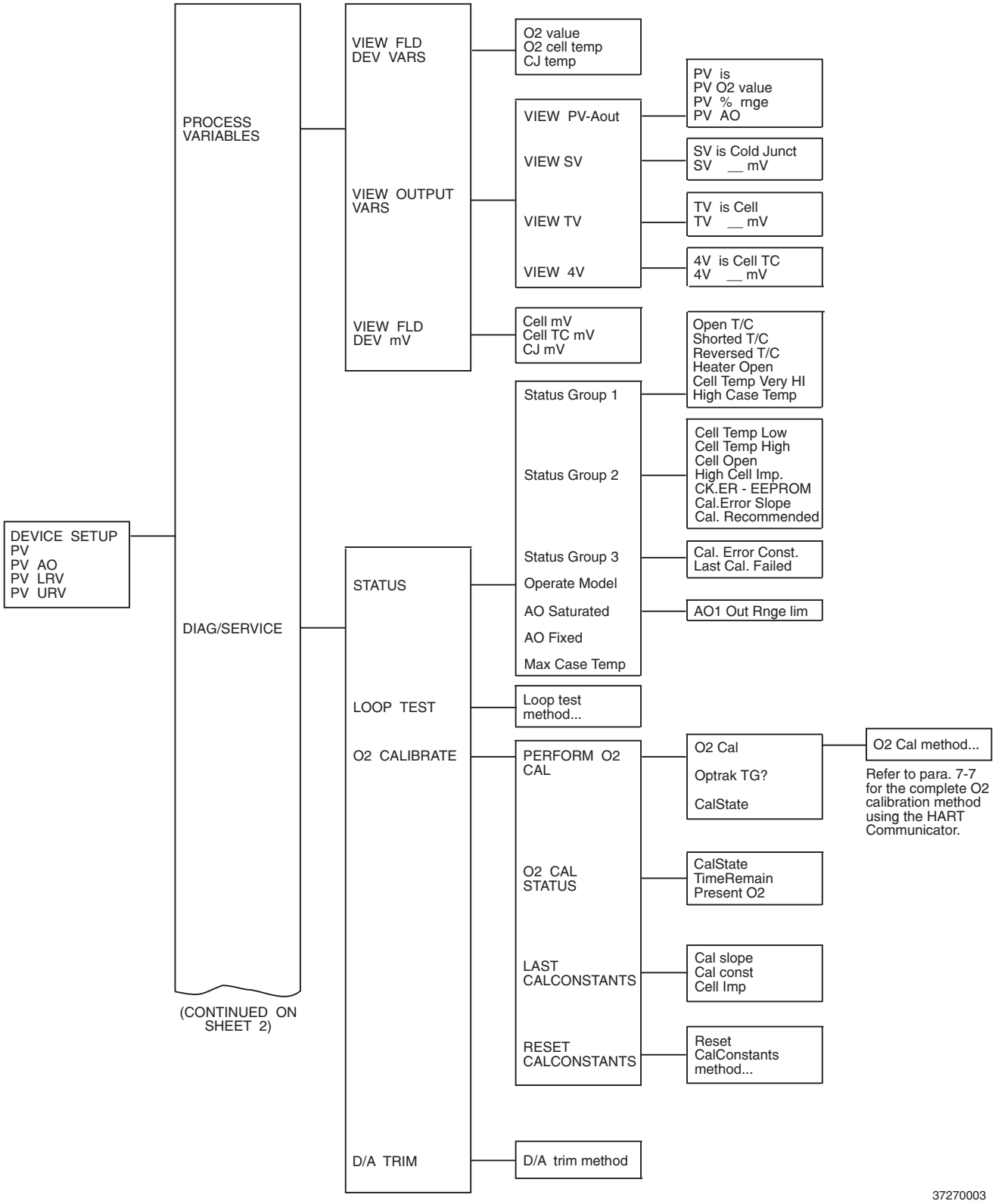


Figure 7-3. HART/AMS Menu Tree (Sheet 1 of 3)

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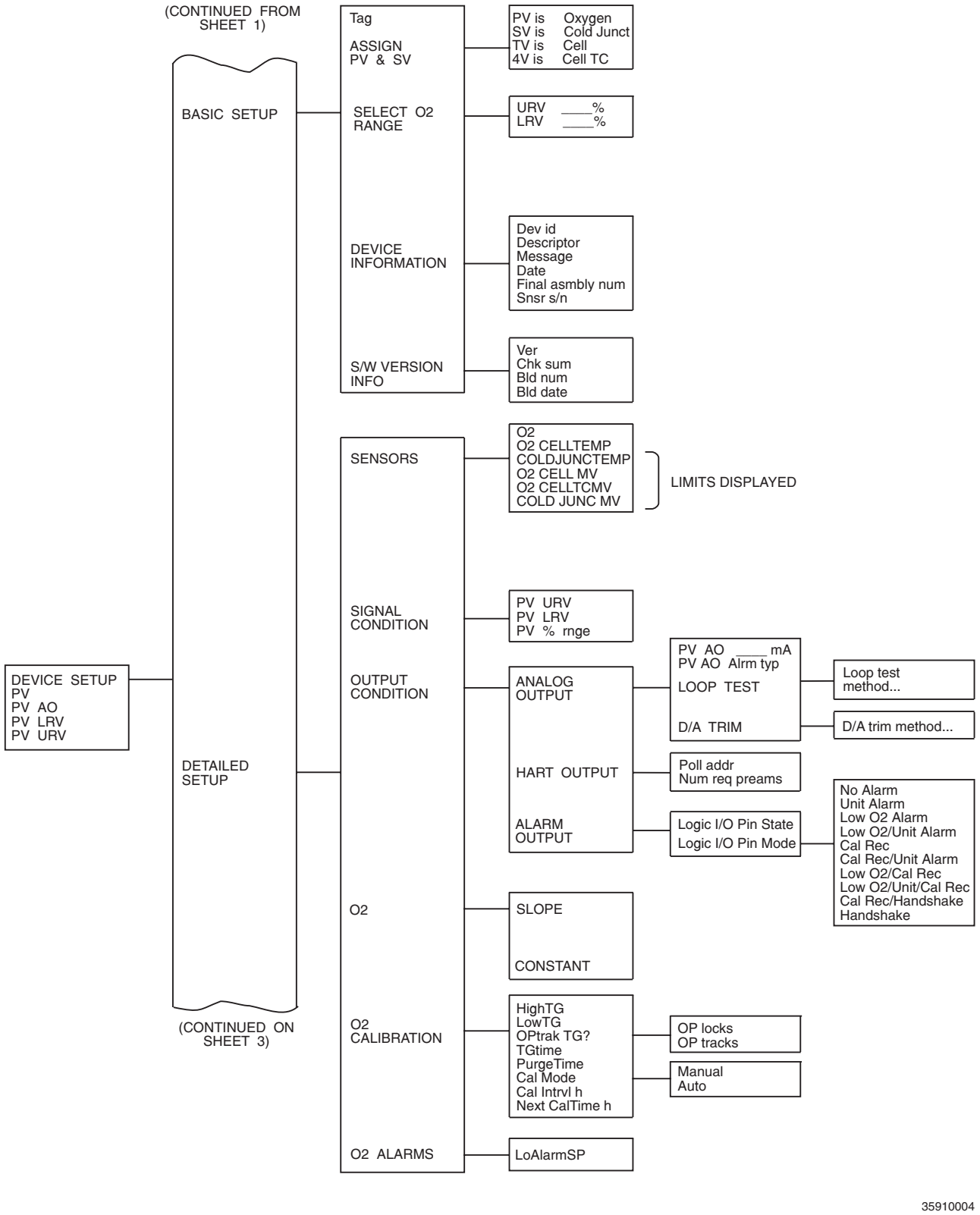


Figure 7-3. HART/AMS Menu Tree (Sheet 2 of 3)

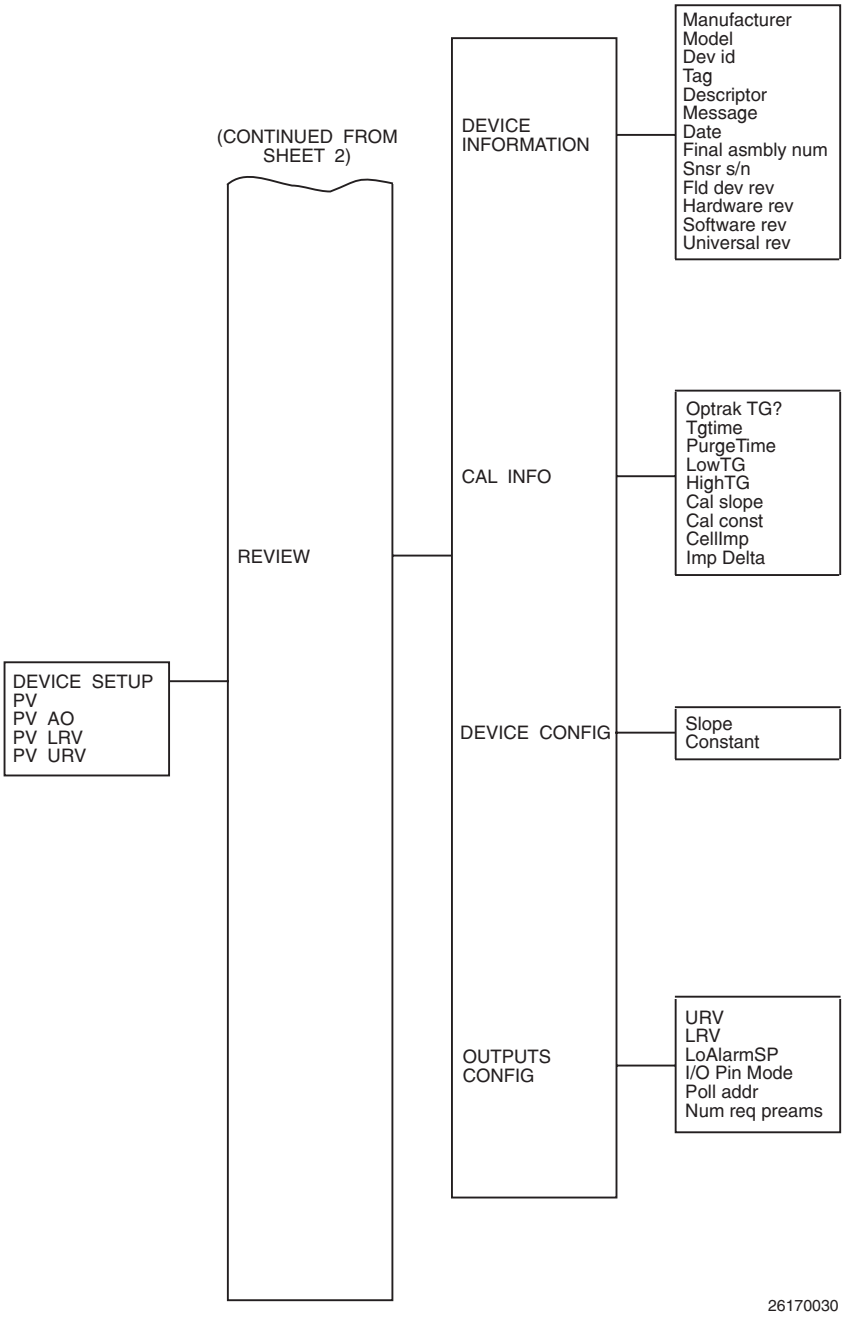


Figure 7-3. HART/AMS Menu Tree (Sheet 3 of 3)

7-7 HART COMMUNICATOR O_2 CAL METHOD

Use the following procedure to perform a calibration using the HART Communicator. If necessary, use the menu tree in Figure 7-3 (sheet 1 of 3) for reference.

NOTE

To select a menu item, either use the up and down arrow keys to scroll to the menu item and press the right arrow key or use the number keypad to select the menu item number. To return to a preceding menu, press the left arrow key.

a. From the PERFORM O_2 CAL screen, select menu item 1, O_2 CAL, to access the O_2 calibration procedure.

WARNING

Failure to remove the Hazardous Area Oxymitter 4000 from automatic control loops prior to performing this procedure may result in a dangerous operating condition.

b. In the first O_2 CAL screen, a "Loop should be removed from automatic control" warning appears. Remove the Hazardous Area Oxymitter 4000 from any automatic control loops to avoid a potentially dangerous operating condition and press OK.

c. The next several screens indicate the calibration status. At each of the following status prompts, select menu item 2, NEXT CAL STEP:

COMPLETE
CAL RECOMMENDED
APPLY GAS 1
GAS 1 FLOW

d. At this point, select menu item 4, EXIT, to leave the O_2 CAL procedure.

e. From the PERFORM O_2 CAL screen, view menu item 3, CALSTATE, to monitor the calibration status as it updates. Or, access the O_2 CALIBRATE screen and select menu item 2, O_2 CAL STATUS, to view menu item 1, CAL-STATE; menu item 2, TIMERE-MAIN; and menu item 3, PRESENT O_2, as the calibration status updates.

f. When CALSTATE displays APPLY GAS 2, return to the O_2 CAL procedure.

g. When the "Loop should be removed from automatic control" warning appears, press OK.

h. At the APPLY GAS 2 status prompt, select menu item 2, NEXT CAL STEP. When the status displays GAS 2 FLOW, select menu item 4, EXIT, to leave the O_2 CAL procedure.

i. From the PERFORM O_2 CAL screen, view menu item 3, CALSTATE, to monitor the calibration status as it updates. Or, access the O_2 CALIBRATE screen and select menu item 2, O_2 CAL STATUS, to view menu item 1, CAL-STATE; menu item 2, TIMERE-MAIN; and menu item 3, PRESENT O_2, as the calibration status updates.

j. When CALSTATE displays STOP GAS, return to the O_2 CAL procedure.

k. When the "Loop should be returned to automatic control" message appears, return the Hazardous Area Oxymitter 4000 to the automatic control loops previously removed and press OK.

l. At the STOP GAS status prompt, select menu item 2, NEXT CAL STEP. When the status displays PURGING, select menu item 4, EXIT, to leave the O_2 CAL procedure.

m. From the PERFORM O_2 CAL screen, view menu item 3, CALSTATE, to monitor the calibration status as it updates. Or, access the O_2 CALIBRATE screen and select menu item 2, O_2 CAL STATUS, to view menu item 1, CAL-STATE; menu item 2, TIMERE-MAIN; and menu item 3, PRESENT O_2, as the calibration status updates.

n. When CALSTATE displays COMPLETE, the calibration is finished.

7-8 DEFINING A TIMED CALIBRATION VIA HART

Use the following procedure to specify a time interval (in hours) at which the Hazardous Area Oxymitter 4000 will be automatically calibrated. If necessary, use the menu tree in Figure 7-3 (sheet 2 of 3) for reference.

NOTE

To select a menu item, either use the up and down arrow keys to scroll to the menu item and press the right arrow key or use the number keypad to select the menu item number. To return to a preceding menu, press the left arrow key.

a. From the DEVICE SETUP screen, select DETAILED SETUP.

b. From the DETAILED SETUP screen, select O_2 CALIBRATION.

c. From the O_2 CALIBRATION screen, select menu item 6, CAL MODE. Set the CAL MODE to AUTO.

d. Return to the O_2 CALIBRATION screen and select menu item 7, CAL INTRVL.

e. At the prompt, input a time interval (in hours) at which an automatic calibration will occur; then press ENTER.

SECTION 8
TROUBLESHOOTING

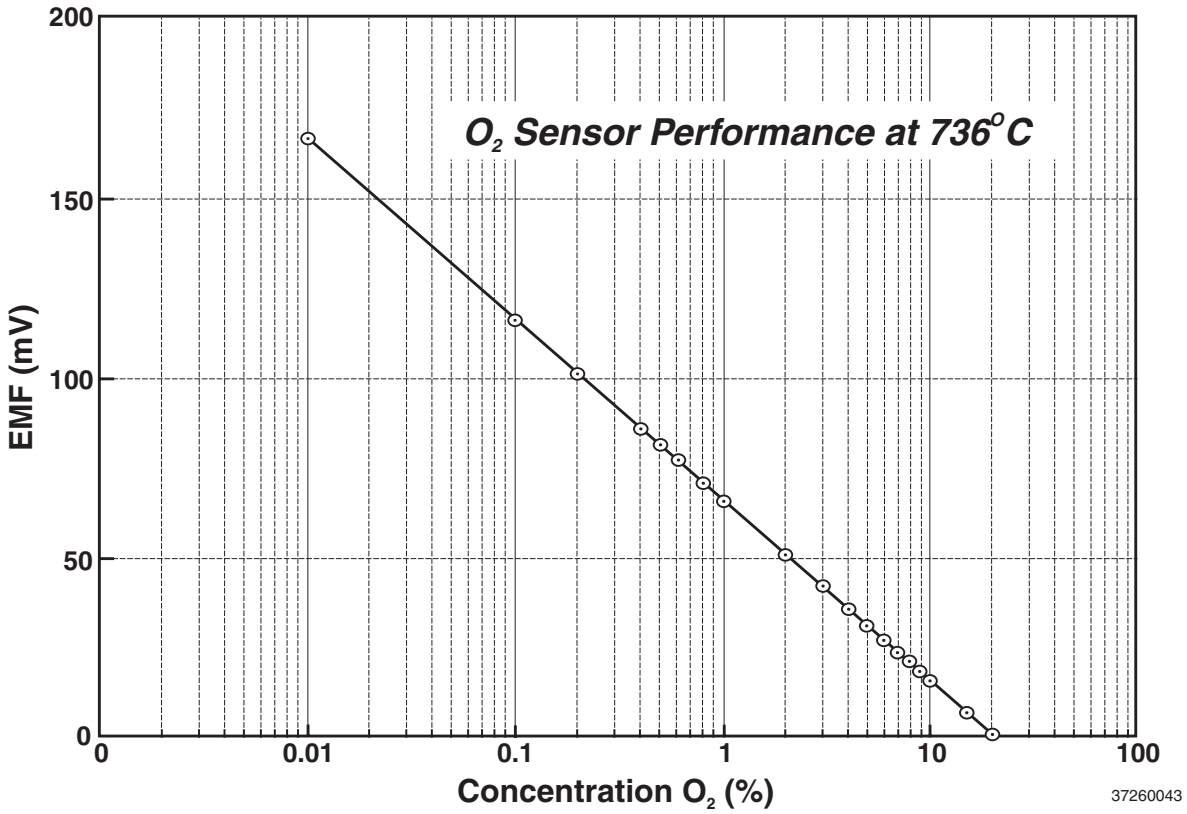
8-1 OVERVIEW

While the Hazardous Area Oxymitter 4000 electronics provides a significant number of diagnostic alarms to assist in troubleshooting potential problems, it's good to place these alarms in perspective with respect to the instrument's operating principles:

a. When the Zirconium Oxide sensing cell is heated to its setpoint [736°C (1357°F)], the cell will generate a voltage that represents the difference between the process O_2% and the reference O_2% inside the probe (20.95% O_2 ambient air).

b. Test points, Figure 8-1, are provided to read the raw millivolt value generated by the ther-mocouple that controls both the cell temperature and the raw cell signal.

c. The cell temperature at test points 3 and 4 should always be stable at approximately 29 to 30 millivolts, which represents the 736°C setpoint temperature.



O_2 %	100	20	15	10	9	8	7	6	5	4
EMF(mV)	-34	1.0	7.25	16.1	18.4	21.1	23.8	27.2	31.2	36.0
O_2 %	3	2	1	0.8	0.6	0.5	0.4	0.2	0.1	0.01
EMF(mV)	42.3	51.1	66.1	71.0	77.5	81.5	86.3	101.4	116.6	166.8

Figure 8-1. O_2 Sensor mV Reading vs. % O_2 at 736°C (Reference Air, 20.9% O_2)

d. When flowing calibration gasses, the raw cell millivolt value at test points 1 and 2 should represent the levels on the chart in Figure 8-1. Note that the raw cell millivolt value increases logarithmically as the O_2 concentration decreases.

WARNING

Install all protective equipment covers and safety ground leads after troubleshooting. Failure to install covers and ground leads could result in serious injury or death.

8-2 GENERAL

The troubleshooting section describes how to identify and isolate faults that may develop in the Hazardous Area Oxymitter 4000. When troubleshooting, reference the following.

a. Grounding

It is essential that adequate grounding precautions are taken when installing the system. Thoroughly check both the probe and electronics to ensure the grounding quality has not degraded during fault finding. The system provides facilities for 100% effective grounding and the total elimination of ground loops.

b. Electrical Noise

The Hazardous Area Oxymitter 4000 has been designed to operate in the type of environment normally found in a boiler room or control room. Noise suppression circuits are employed on all field terminations and main inputs. When fault finding, evaluate the electrical noise being generated in the immediate circuitry of a faulty system. Ensure all cable shields are connected to earth.

c. Loose Integrated Circuits

The Hazardous Area Oxymitter 4000 uses a microprocessor and supporting integrated circuits (IC). If the electronics are handled roughly during installation or located where subjected to severe vibration, the ICs could work loose. Before troubleshooting the system, ensure all ICs are fully seated.

d. Electrostatic Discharge

Electrostatic discharge can damage the ICs used in the electronics. Before removing or handling the processor board or the ICs, ensure you are at ground potential.

8-3 ALARM INDICATIONS

The majority of the fault conditions for the Hazardous Area Oxymitter 4000 will be indicated by one of the four LEDs referred to as diagnostic, or unit alarms on the operator's keypad (Figure 8-2). An LED will flash a code that will correspond to an error message. Only one LED will blink at a time. An alarm code guide is provided inside the screw-on cover for the electronics.

Alarm indications will be also available via the optional LOI or the HART Model 275/375 handheld communicator and Rosemount's Asset Management software. When the error is corrected and/or power is cycled, the diagnostic alarms will clear or the next error on the priority list will appear.

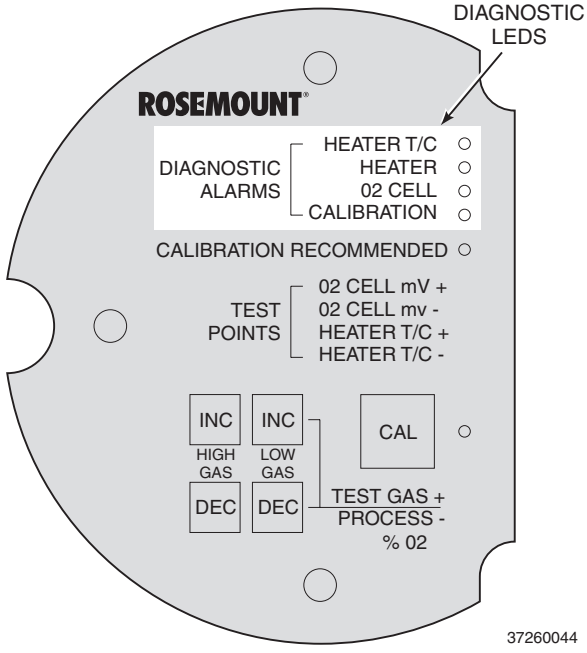


Figure 8-2. Diagnostic LEDs

8-4 ALARM CONTACTS

a. If autocalibration is not utilized, a common bi-directional logic contact is provided for any of the diagnostic alarms listed in Table 8-1. The assignment of alarms which can actuate this contact can be modified to one of seven additional groupings (mode 0 through mode 7) listed in Table 7-1.

The logic contact is self-powered, +5 VDC, with a 340 ohm series resistance. An interposing relay will be required if this contact is to be utilized to annunciate a higher voltage device, such as a light or horn. An interposing relay may also be required for certain DCS input cards.

A Potter & Brumfield R10S-E1Y1-J1.0K 3.2 mA DC or an equal interposing relay will be mounted where the contact wires terminate in the control/relay room.

b. If autocalibration systems are utilized, the bi-directional logic contact is utilized as a "hand-shake" signal between the autocalibration system (SPS 4000 or IMPS 4000) and is unavailable for alarming purposes. The following additional contacts are provided through the autocalibration systems:

1. SPS 4000 and IMPS 4000, 1-4 probes.

   (a) One contact closure per probe from the control room to the SPS 4000 or IMPS 4000 for "calibration initiate".

   (b) One contact output per probe from the SPS 4000 or IMPS 4000 to the control room for "in calibration" notification.

   (c) One contact output per probe from the SPS 4000 or IMPS 4000 to the control room for "calibration failed" notification. (Includes output from pressure switch indicating "cal gas bottles empty").

2. Additional IMPS 4000 Alarm Contacts.

   (a) One contact per IMPS 4000 for "low calibration gas flowing".

   (b) One contact per IMPS 4000 for "high calibration gas flowing".

NOTE

The 4-20 mA signal can be configured to respond normally during any calibration, or can be configured to hold the last O_2 value upon the initiation of calibration. Factory default is for the 4-20 mA signal to operate normally throughout calibration.

NOTE

Holding the last O_2 value may be useful if several probes are being averaged for the purpose of automatic control. Unless several probes are being averaged, always place any control loops using the O_2 signal into manual prior to calibrating.

8-5 IDENTIFYING AND CORRECTING ALARM INDICATIONS

For a Hazardous Area Oxymitter 4000 with a membrane keypad, faults are indicated by four diagnostic, or unit, alarm LEDs. A pattern of repeating blinks define the problem. A condensed table of the errors and the corresponding blink codes can be found on the inside right cover of the electronics housing. Table 8-1 also identifies the blink code and fault status of each LED as well as the output of the 4-20 mA signal line and a fault number that corresponds to the troubleshooting instructions provided in this section.

For a Hazardous Area Oxymitter 4000 with the optional LOI, alarm messages are displayed on the LOI display window when the alarm status display is accessed via the LOI menu. A listing of the alarm/fault messages and the related fault status descriptions and fault numbers are shown in Table 8-2.

Table 8-1. Diagnostic/Unit Alarm Fault Definitions – Membrane Keypad Only

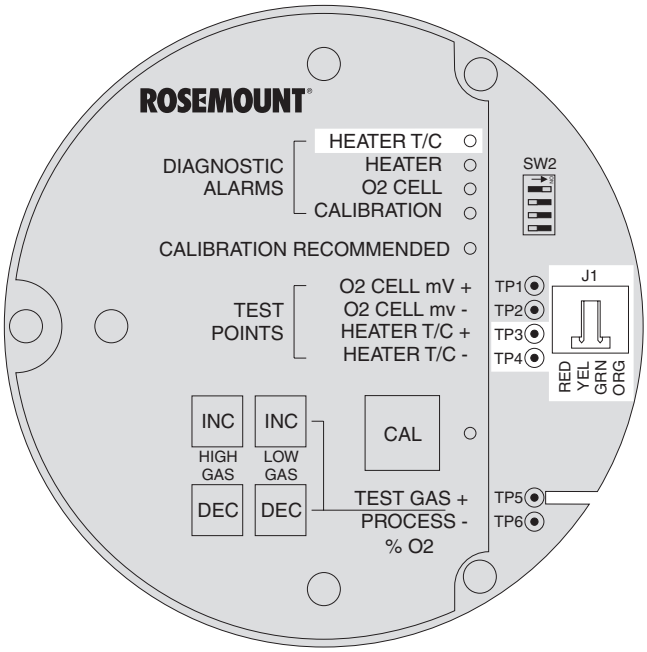
LED	Flashes	Status	4-20 mA Line	Fault	Self-Clearing
HEATER T/C	1	OPEN	Dependent on position 3 of SW2*	1	NO
	2	SHORTED	Dependent on position 3 of SW2*	2	NO
	3	REVERSED	Dependent on position 3 of SW2*	3	NO
	4	A/D COMM ERROR	Dependent on position 3 of SW2*	4	NO
HEATER	1	OPEN	Dependent on position 3 of SW2*	5	NO
	2	HIGH HIGH TEMP	Dependent on position 3 of SW2*	6	NO
	3	HIGH CASE TEMP	Dependent on position 3 of SW2*	7	YES
	4	LOW TEMP	Dependent on position 3 of SW2*	8	YES
	5	HIGH TEMP	Dependent on position 3 of SW2*	9	YES
O_2 CELL	1	HIGH mV	Dependent on position 3 of SW2*	10	YES
	3	BAD	Track O_2	11	YES
	4	EEPROM CORRUPT	Dependent on position 3 of SW2*	12	NO
CALIBRATION	1	INVALID SLOPE	Track O_2	13	YES
	2	INVALID CONSTANT	Track O_2	14	YES
	3	LAST CALIBRATION FAILED	Track O_2	15	YES
	**	CALIBRATION RECOMMENDED	Track O_2		YES

* Critical alarm conditions will render the O_2 measurement as unusable, and any of these events will cause the 4-20 mA signal to go to a user-selectable limit of 3.5 mA or 21.6 mA (position 3 of SW2). Factory default value is 3.5 mA. Alarms which are not “self-clearing” will require recycling of power to the electronics.

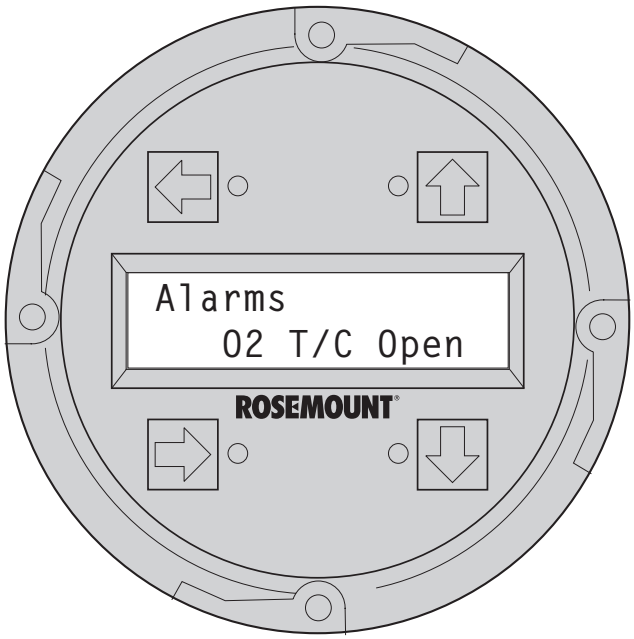
** The CALIBRATION RECOMMENDED alarm flashes the Calibration Recommended alarm LED on the operator’s keypad.

Table 8-2. Diagnostic/Unit Alarm Fault Definitions – LOI

Message	Status	Fault Number	Self-Clearing
O2 T/C OPEN	HEATER T/C OPEN	1	NO
O2 T/C SHORTED	HEATER T/C SHORTED	2	NO
O2 T/C REVERSED	HEATER T/C POLARITY REVERSED	3	NO
ADC ERROR	A/D COMM ERROR	4	NO
O2 HEATER OPEN	O2 HEATER OPEN	5	NO
VERY HI O2 TEMP	VERY HIGH PROCESS TEMPERATURE	6	NO
BOARD TEMP HI	ELECTRONICS OVERHEATED	7	YES
O2 TEMP LOW	LOW PROCESS TEMPERATURE	8	YES
O2 TEMP HI	HIGH PROCESS TEMPERATURE	9	YES
O2 CELL OPEN	O2 CELL OPEN	10	YES
O2 CELL BAD	O2 CELL FAILED	11, 13, 14	YES
EEPROM CORRUPT	EEPROM FAILED	12	NO
CALIB FAILED	LAST CALIBRATION FAILED	15	YES
LINE FREQ ERROR	INCORRECT INPUT LINE FREQUENCY DETECTED ON POWER UP		NO



KEYPAD



LOI

37260019

Figure 8-3. Fault 1, Open Thermocouple

a. Fault 1, Open Thermocouple

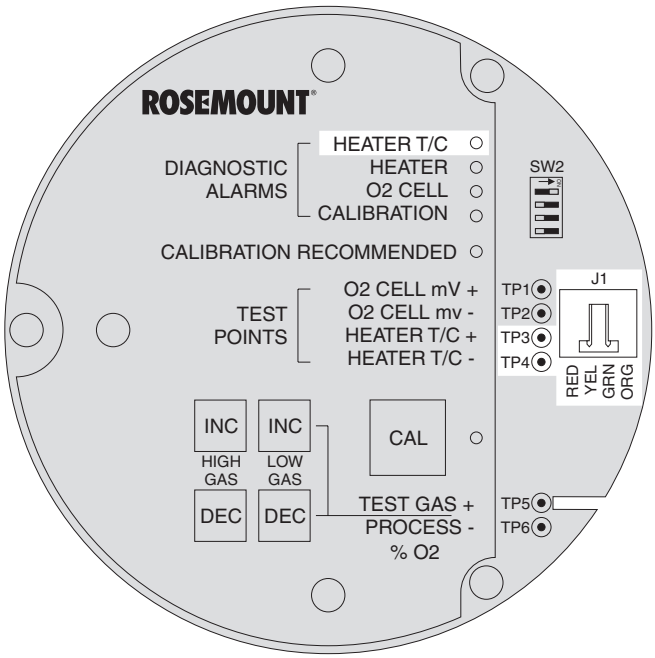
Figure 8-3 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view). The upper view also shows J1 and test points TP1 through TP6, located on the microprocessor board, below the membrane keypad or the LOI module.

Membrane Keypad. When Fault 1 is detected, the HEATER T/C LED flashes once, pauses for three seconds, and repeats.

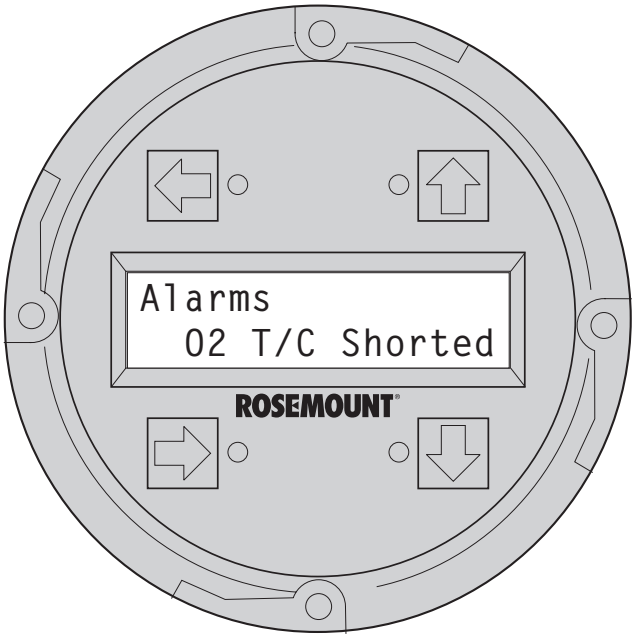
1. Check connector J1. Ensure the connector is properly seated.
2. Using a multimeter, measure the voltage from TP3+ to TP4-. If the reading is 1.2 VDC ±0.1 VDC, the thermocouple is open.
3. Remove power. Disconnect J1. Measure the resistance across the red and yellow thermocouple leads. The resistance should be approximately 1 ohm.
4. If the thermocouple is open, see paragraph 9-4g, Heater Strut Replacement.

LOI. When Fault 1 is detected, the LOI displays the “O2 T/C Open” message.

1. Remove power. Unscrew and remove the LOI module from the electronic assembly.
2. Reconnect power to the Oxymitter 4000.
3. Perform the diagnostic steps 1 through 4 shown for the membrane keypad.



KEYPAD



LOI

37260020

Figure 8-4. Fault 2, Shorted Thermocouple

b. Fault 2, Shorted Thermocouple

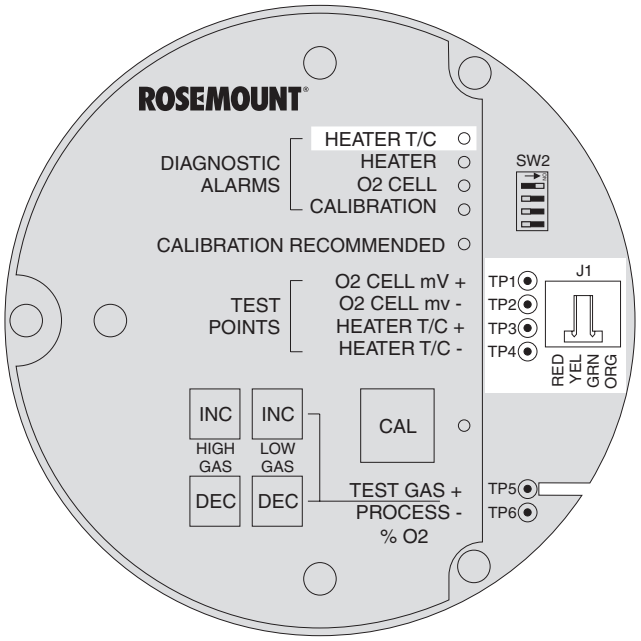
Figure 8-4 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view). The upper view also shows J1 and test points TP1 through TP6, located on the microprocessor board, below the membrane keypad or the LOI module.

Membrane Keypad. When Fault 2 is detected, the HEATER T/C LED flashes twice, pauses for three seconds, and repeats.

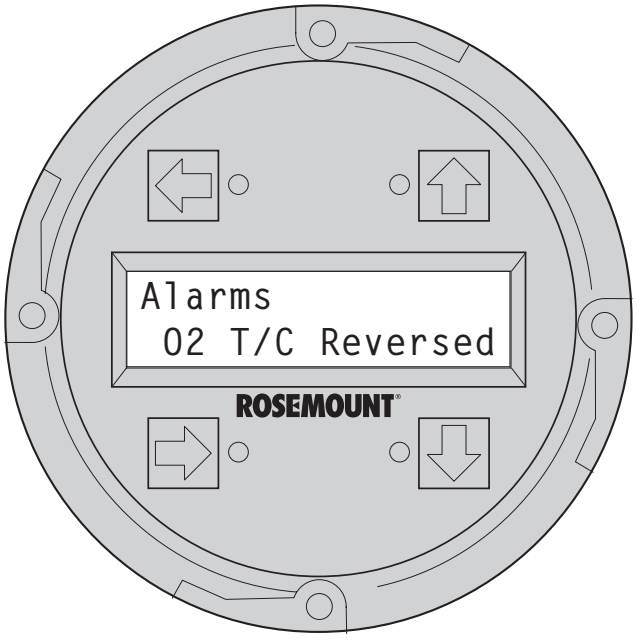
1. Using a multimeter, measure the voltage from TP3+ to TP4-. If the reading is 0 ±0.5 mV, then a shorted thermocouple is likely.
2. Remove power and disconnect J1.
3. Measure the resistance from TP3+ to TP4-. The reading should be approximately 20K ohms.
4. If so, the short is not on the PC board. The thermocouple wiring or the thermocouple is shorted. See paragraph 9-4g, Heater Strut Replacement.

LOI. When Fault 2 is detected, the LOI displays the “O2 T/C Shorted” message.

1. Remove power. Unscrew and remove the LOI module from the electronic assembly.
2. Reconnect power to the Oxymitter 4000.
3. Perform the diagnostic steps 1 through 4 shown for the membrane keypad.



KEYPAD



LOI

37260021

Figure 8-5. Fault 3, Reversed Thermocouple

c. Fault 3, Reversed Thermocouple Wiring or Faulty PC Board

Figure 8-5 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view). The upper view also shows J1 and test points TP1 through TP6, located on the microprocessor board, below the membrane keypad or the LOI module.

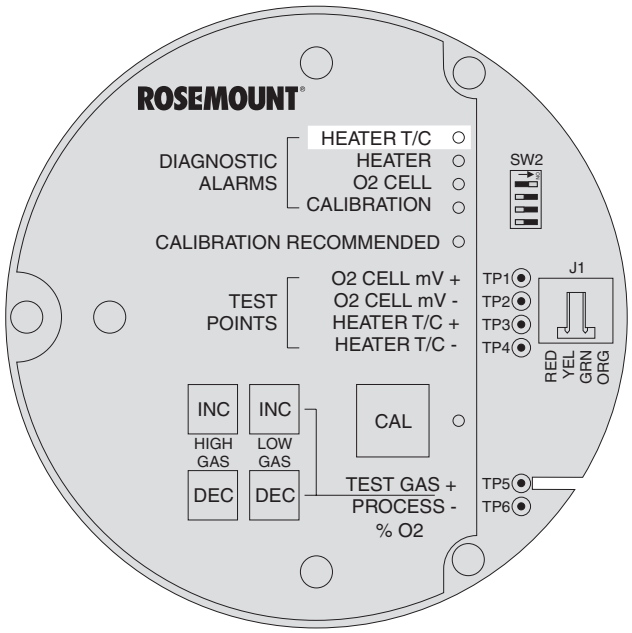
Membrane Keypad. When Fault 3 is detected, the HEATER T/C LED flashes three times, pauses for three seconds, and repeats.

1. Using a multimeter, measure the voltage from TP3+ to TP4-. If the reading is negative, the thermocouple wiring is reversed.
2. Check red and yellow wires in the J1 connector for the proper placement.
3. If the wiring is correct, the fault is in the PC board. See paragraph 9-4c, Electronic Assembly Replacement.

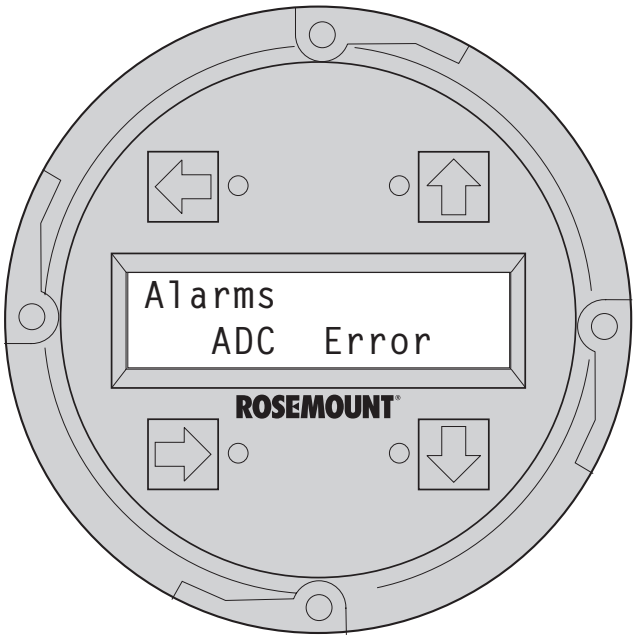
LOI. When Fault 3 is detected, the LOI displays the “O2 T/C Reversed” message.

1. Remove power. Unscrew and remove the LOI module from the electronic assembly.
2. Reconnect power to the Oxymitter 4000.
3. Perform the diagnostic steps 1 through 3 shown for the membrane keypad.

8



KEYPAD



LOI

37260022

Figure 8-6. Fault 4, A/D Comm Error

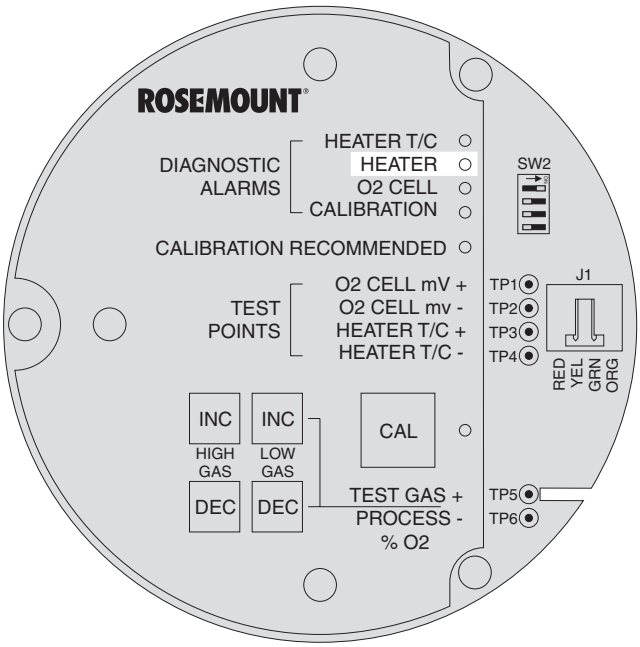
d. Fault 4, A/D Comm Error

Membrane Keypad. When Fault 4 is detected, the HEATER T/C LED flashes four times, pauses for three seconds, and repeats (Figure 8-6).

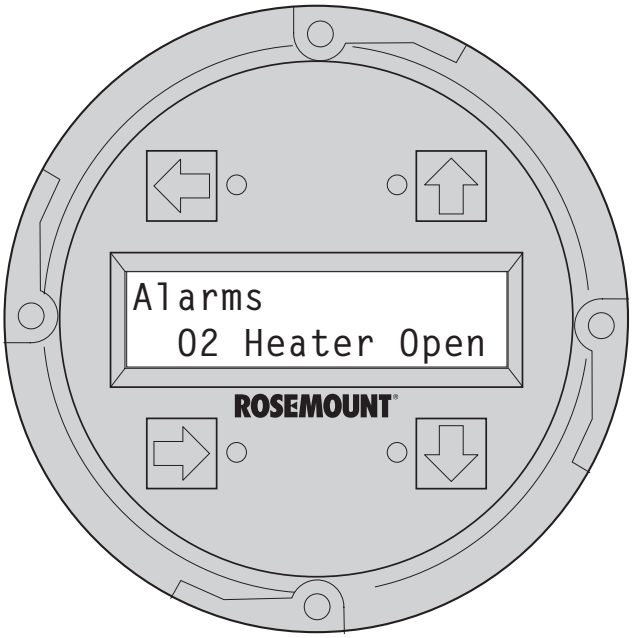
1. Call the factory for assistance.

LOI. When Fault 4 is detected, the LOI displays the “ADC Error” message.

1. Call the factory for assistance.



KEYPAD



LOI

37260023

Figure 8-7. Fault 5, Open Heater

e. Fault 5, Open Heater

Figure 8-7 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

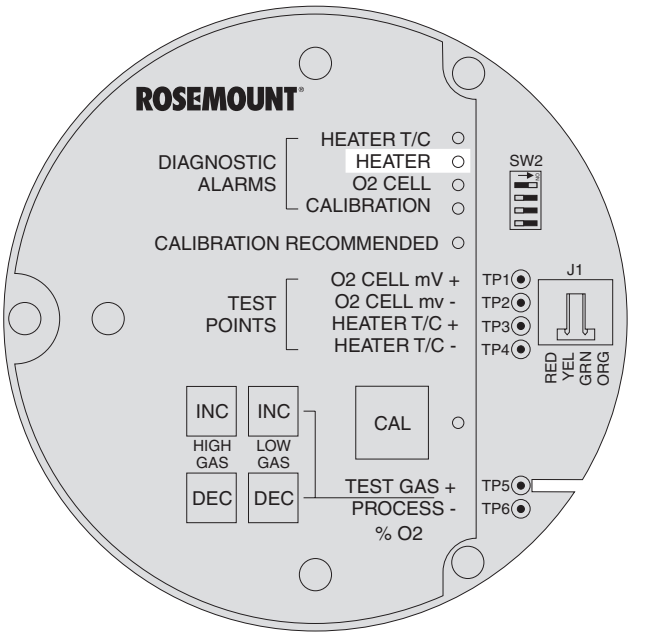
Membrane Keypad. When Fault 5 is detected, the HEATER LED flashes once, pauses for three seconds, and repeats.

1. Remove power.
2. Remove the electronic assembly per paragraph 9-4c, Electronic Assembly Replacement.
3. Using a multimeter, measure the resistance across the terminals of heater connector, J8.
4. The measurement should be approximately 72 ohms. If the heater is open, see paragraph 9-4g, Heater Strut Replacement.

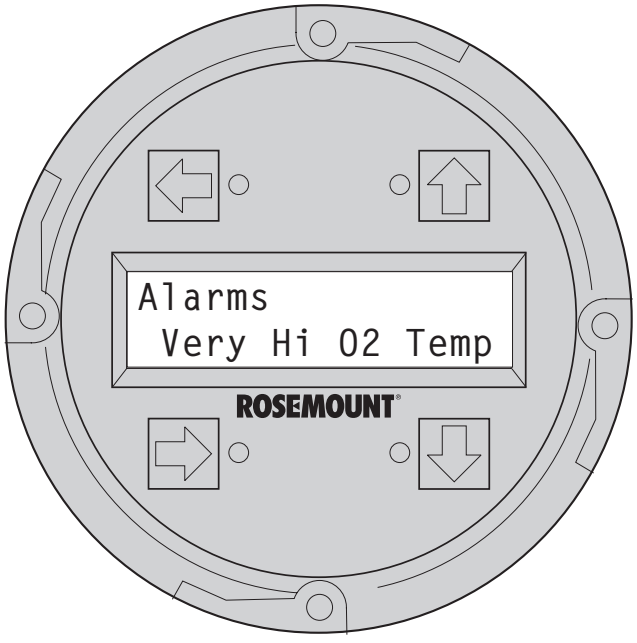
LOI. When Fault 5 is detected, the LOI displays the “O2 Heater Open” message.

1. Remove power. Unscrew and remove the LOI module from the electronic assembly.
2. Perform the diagnostic steps 2 through 4 shown for the membrane keypad.

8



KEYPAD



LOI

37260024

Figure 8-8. Fault 6, High High Heater Temp

f. Fault 6, High High Heater Temp

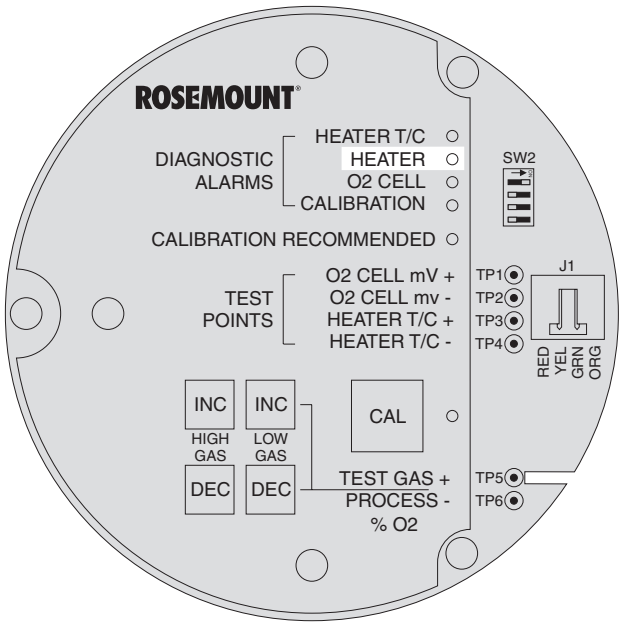
Figure 8-8 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

Membrane Keypad. When Fault 6 is detected, the HEATER LED flashes twice, pauses for three seconds, and repeats.

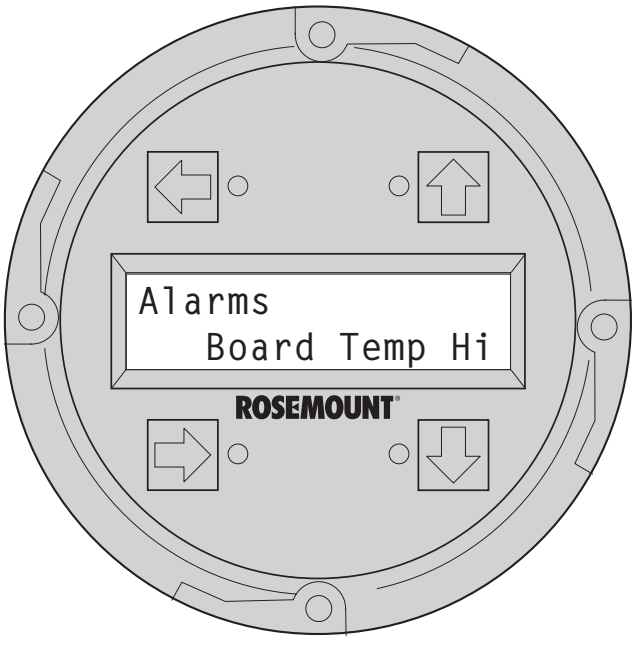
1. The high high heater temp alarm will activate when the thermocouple produces a voltage of 37.1 mV [900°C (1652°F)].
2. The triac and the temperature control may be at fault.
3. Remove power. Allow Hazardous Area Oxymitter 4000 to cool for five minutes. Restore power.
4. If the condition repeats, replace the electronic assembly per paragraph 9-4c.1, Electronic Assembly Replacement.

LOI. When Fault 6 is detected, the LOI displays the “Very Hi O2 Temp” message.

1. The very high O_2 temperature alarm will activate when the thermocouple produces a voltage of 37.1 mV [900°C (1652°F)].
2. The triac and the temperature control may be at fault.
3. Remove power. Allow the Oxymitter 4000 to cool for five minutes. Restore power.
4. If the condition repeats, replace the electronic assembly per paragraph 9-4c, Electronic Assembly Replacement.



KEYPAD



LOI

37260025

Figure 8-9. Fault 7, High Case Temp

g. Fault 7, High Case Temp

Figure 8-9 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

Membrane Keypad. When Fault 7 is detected, The HEATER LED flashes three times, pauses for three seconds, and repeats.

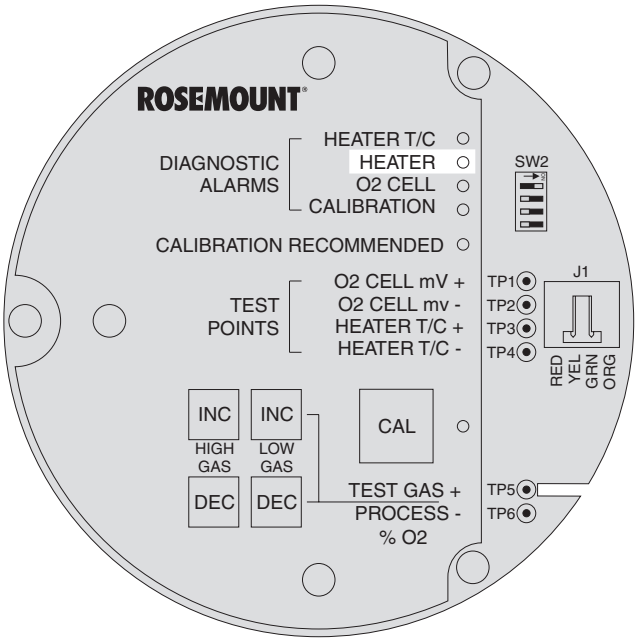
1. If the case temperature exceeds 85°C (185°F), the temperature control will shut off and the 4-20 mA signal output will go to the default value.

2. This signifies that the environment where the Hazardous Area Oxymitter 4000 is installed exceeds the ambient temperature requirements or that heat due to convection is causing case temperature to rise above the limit.

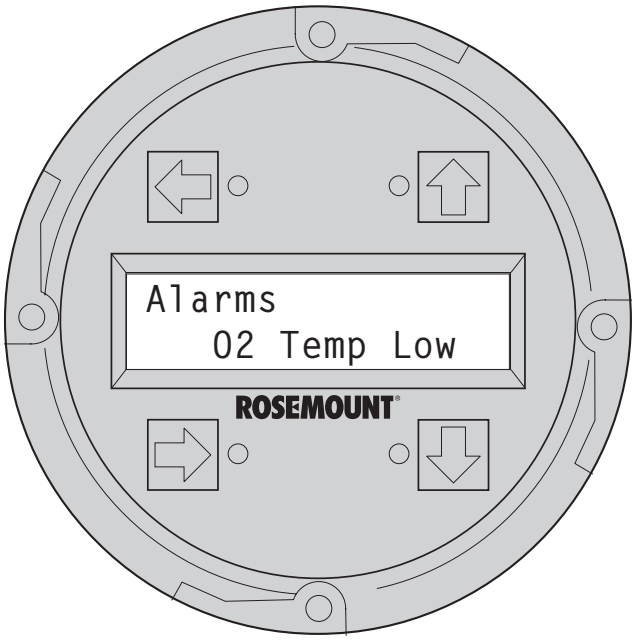
3. Placing a spool piece between the stack flange and the Hazardous Area Oxymitter 4000 flange may eliminate this problem.

4. If a spool piece does not solve the problem, relocation is the only solution.

LOI. When Fault 7 is detected, the LOI displays the “Board Temp Hi” message. Refer to the comments in paragraphs 1 through 4 above.



KEYPAD



LOI

37260026

Figure 8-10. Fault 8, Low Heater Temp

h. Fault 8, Low Heater Temp

Figure 8-10 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

Membrane Keypad. When Fault 8 is detected, the HEATER LED flashes four times, pauses for three seconds, and repeats.

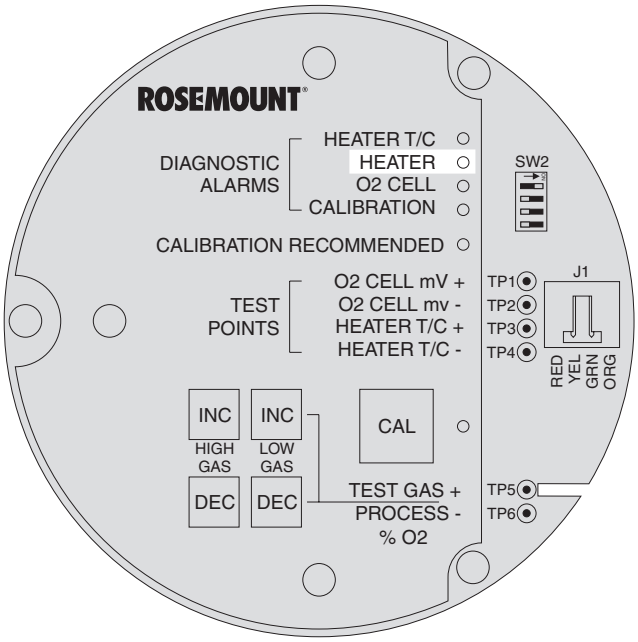
1. The low heater temperature alarm is active when the thermocouple reading has dropped below 28.6 mV.

2. If the thermocouple reading continues to ramp downward for one minute and does not return to the temperature set point of approximately 29.3 mV, then an Open Heater fault will be displayed.

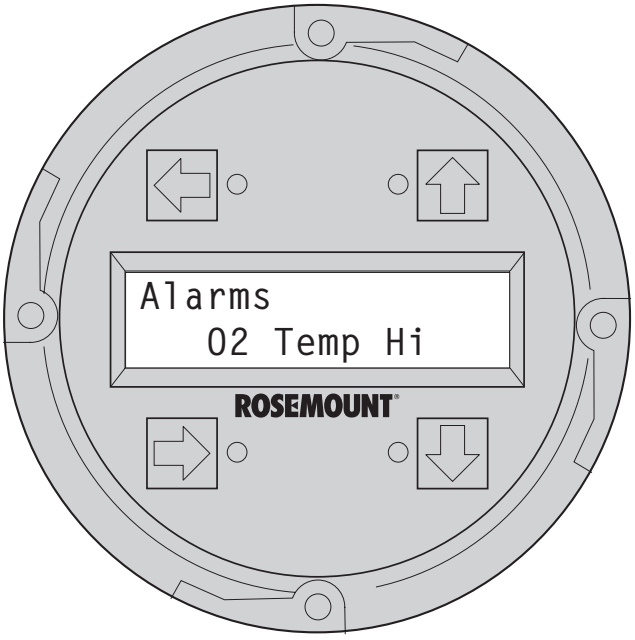
3. Power down the electronics. Remove the electronic assembly per paragraph 9-4c, Electronic Assembly Replacement. Using a multimeter, measure the resistance across the terminals of heater connector, J8.

4. If the heater is good, the reading will be approximately 70 ohms. If the heater is open, see paragraph 9-4g, Heater Strut Replacement.

LOI. When Fault 8 is detected, the LOI displays the “O2 Temp Low” message. Refer to the comments and procedures in paragraphs 1 through 4 above.



KEYPAD



LOI

37260027

Figure 8-11. Fault 9, High Heater Temp

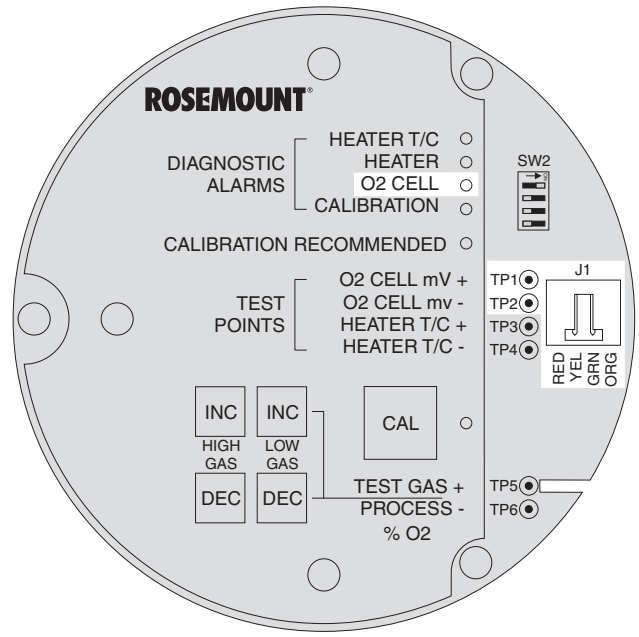
i. Fault 9, High Heater Temp

Figure 8-11 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

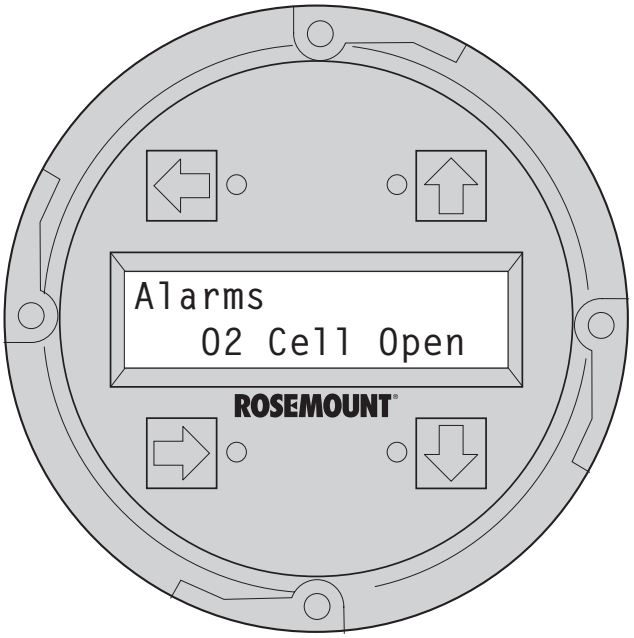
Membrane Keypad. When Fault 9 is detected, the HEATER LED flashes five times, pauses for three seconds, and repeats.

1. If the thermocouple produces a voltage in excess of approximately 30.7 mV, the high heater temp alarm activates.
2. The 4-20 mA signal returns to the default value (4 or 20 mA).
3. This alarm is self-clearing. When temperature control is restored and the thermocouple voltage returns to the normal range, the alarm clears.
4. If the temperature continues to rise, the next alarm will be the high high heater temp alarm.

LOI. When Fault 9 is detected, the LOI displays the “O2 Temp Hi” message. Refer to the comments and procedures in paragraphs 1 through 4 above.



KEYPAD



LOI

37260028

Figure 8-12. Fault 10, High Cell mV

j. Fault 10, High Cell mV

Figure 8-12 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view). The upper view also shows J1 and test points TP1 through TP6, located on the microprocessor board, below the membrane keypad or the LOI module.

Membrane Keypad. When Fault 10 is detected, the O2 CELL flashes once, pauses for three seconds, and repeats.

1. Using a multimeter, measure across TP1+ to TP2-. If you measure 204 mV to 1 volt DC, the cell reading is due to high combustibles. This is a self-clearing alarm, once the combustible conditions go away. If you measure 1.2 VDC, the cell wires, either orange or green, have become detached from the input.

2. One possible cause is connector J1. The orange or green wire has come loose from the crimped connection.

3. The platinum pad could also be at fault. The pad could have broken free from the back of the cell.

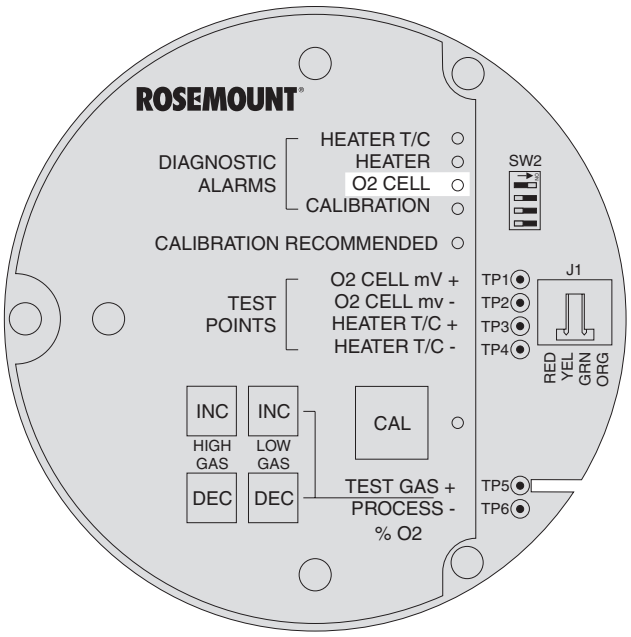
4. Replace heater strut per paragraph 9-4g, Heater Strut Replacement. If necessary, replace the cell and flange assembly per paragraph 9-4h, Cell Replacement.

LOI. When Fault 10 is detected, the LOI displays the “O2 Cell Open” message.

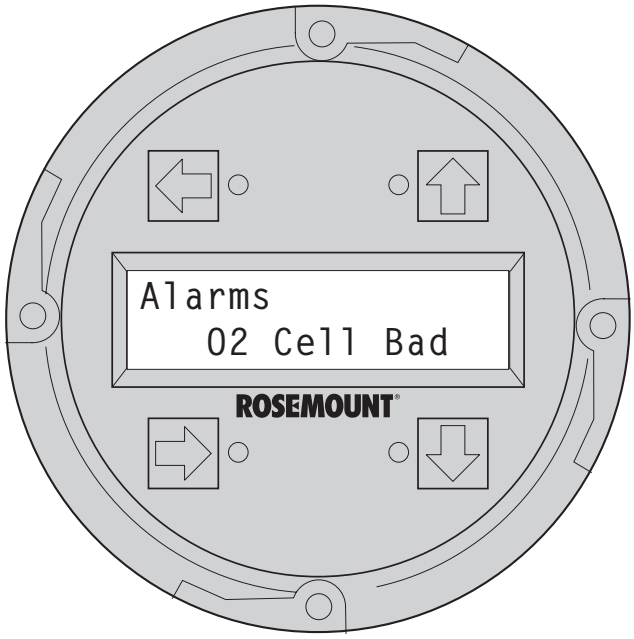
1. Remove power. Unscrew and remove the LOI module from the electronic assembly.

2. Reconnect power to the Oxymitter 4000.

3. Perform the diagnostic steps 1 through 4 shown for the membrane keypad.



KEYPAD



LOI

37260029

Figure 8-13. Fault 11, Bad Cell

k. Fault 11, Bad Cell

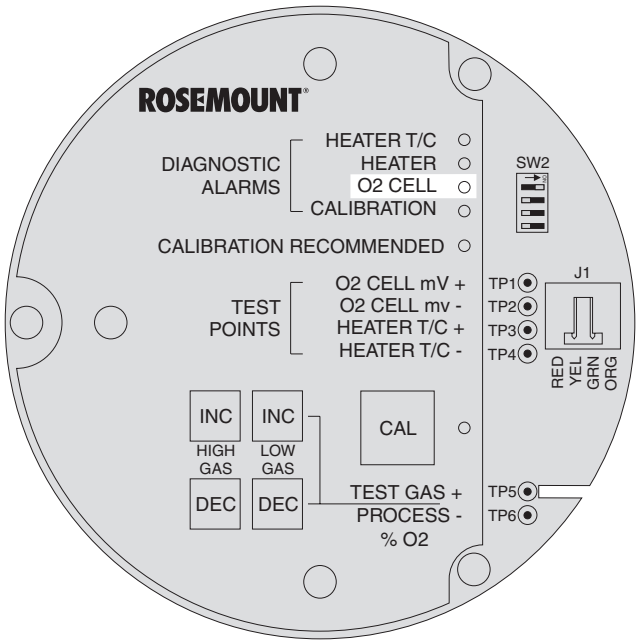
Figure 8-13 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

Membrane Keypad. When Fault 11 is detected, the O2 CELL flashes three times, pauses for three seconds, and repeats.

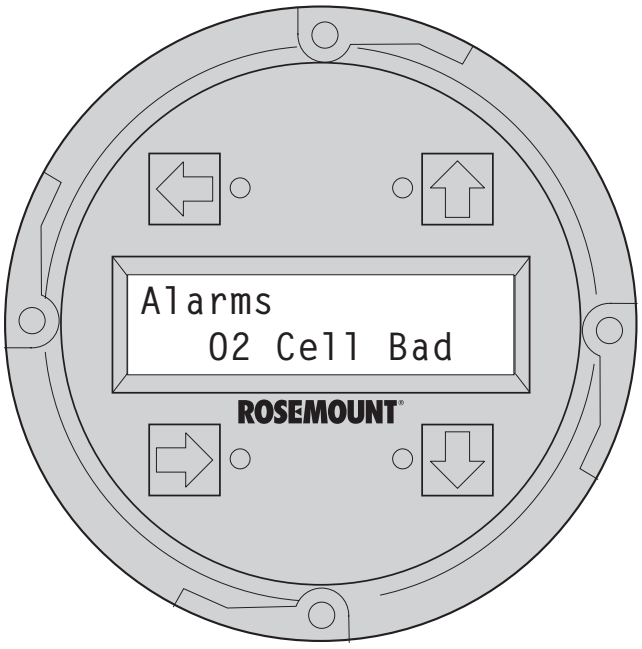
1. The bad cell alarm activates when the cell exceeds the maximum resistance value.

2. The cell should be replaced. See paragraph 9-4h, Cell Replacement, for cell replacement instructions.

LOI. When Fault 11 is detected, the LOI displays the “O2 Cell Bad” message. Refer to the comments and procedures in paragraphs 1 and 2 above.



KEYPAD



LOI

37260029

Figure 8-14. Fault 12, EEprom Corrupt

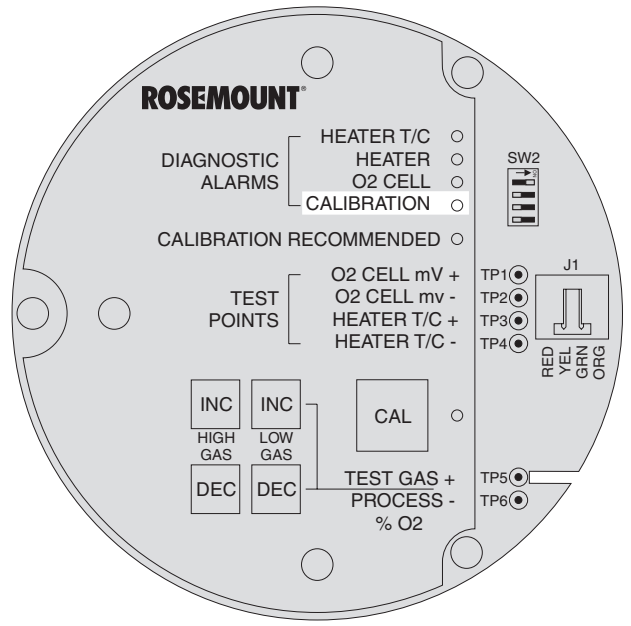
I. Fault 12, EEprom Corrupt

Figure 8-14 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

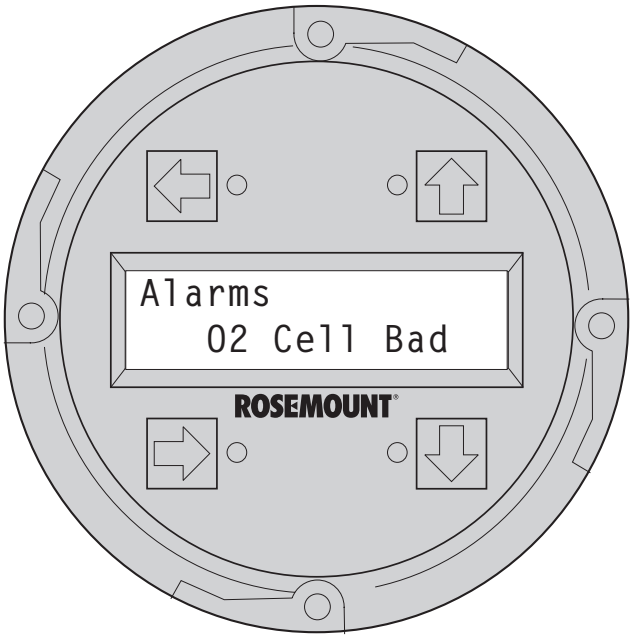
Membrane Keypad. When Fault 12 is detected, the O2 CELL LED flashes four times, pauses for three seconds, and repeats.

1. This alarm can occur if the EEprom is changed for a later version. At power up, the EEprom is not updated.
2. To correct this problem, power down and then restore power. The alarm should clear.
3. If the alarm occurs while the unit is running, there is a hardware problem on the microprocessor board.
4. If cycling the power does not clear the alarm, see paragraph 9-4c, Electronic Assembly Replacement.

LOI. When Fault 12 is detected, the LOI displays the “EEprom Corrupt” message. Refer to the comments and procedures in paragraphs 1 through 4 above.



KEYPAD



LOI

37260031

Figure 8-15. Fault 13, Invalid Slope

m. Fault 13, Invalid Slope

Figure 8-15 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

Membrane Keypad. When Fault 13 is detected, the CALIBRATION LED flashes once, pauses for three seconds, and repeats.

1. During a calibration, the electronics calculates a slope value. If the value of the slope is less than 35 mV/dec or more than 52 mV/dec, the slope alarm will be active until the end of the purge cycle.

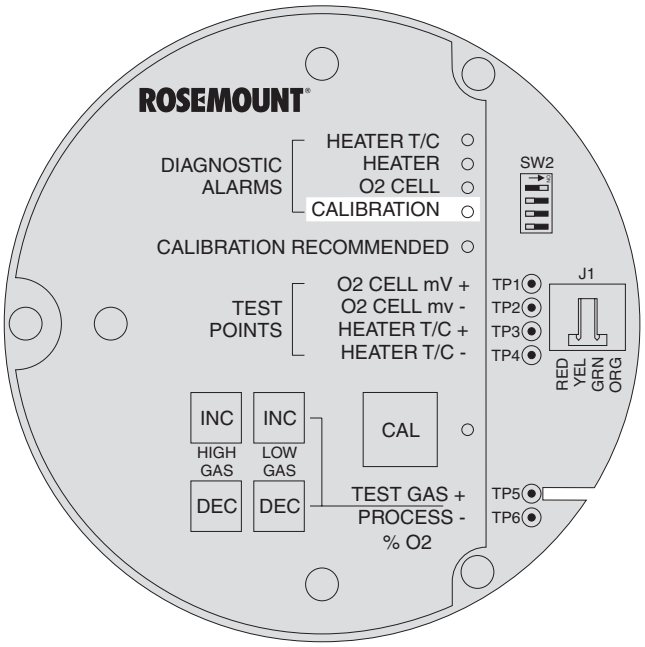
2. See paragraph 9-2, Calibration. Verify the calibration by carefully repeating it. Ensure the calibration gases match the calibration gas parameters. If you attach a multimeter to TP1+ and TP2-, sample gas measurements are:

   8% $O_2 \approx$ 23 mV
   0.4% $O_2 \approx$ 85 mV

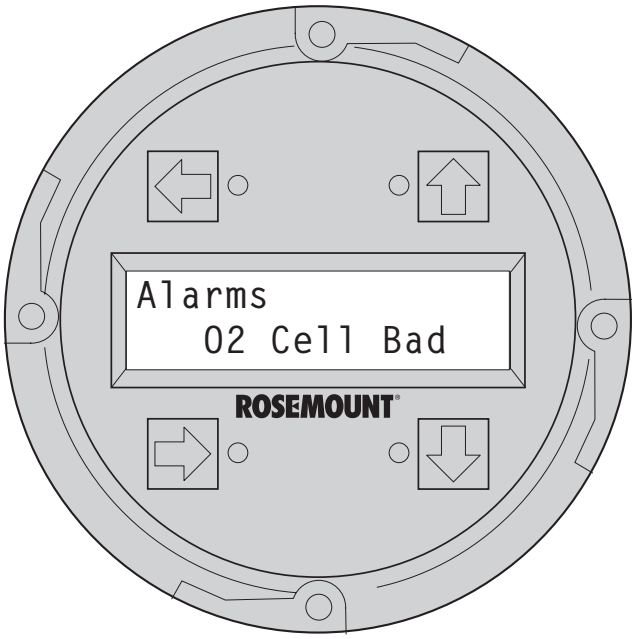
3. Power down the Hazardous Area Oxymitter 4000 and remove it from the stack.

4. Replace the cell per paragraph 9-4h, Cell Replacement.

LOI. When Fault 13 is detected, the LOI displays the “O2 Cell Bad” message. Refer to the comments and procedures in paragraphs 1 through 4 above.



KEYPAD



LOI

37260032

Figure 8-16. Fault 14, Invalid Constant

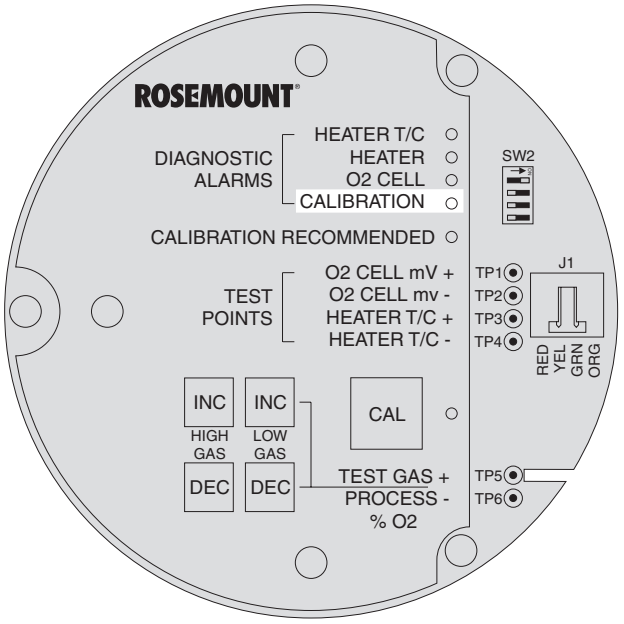
n. Fault 14, Invalid Constant

Figure 8-16 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

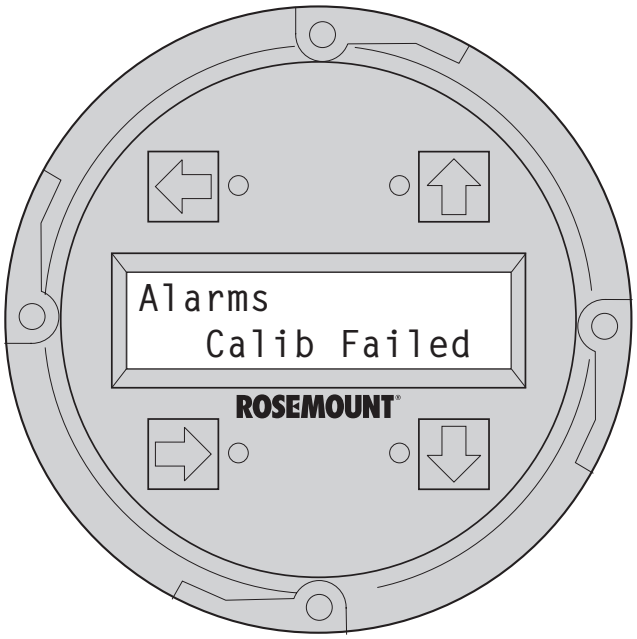
Membrane Keypad. When Fault 14 is detected, the CALIBRATION LED flashes twice, pauses for three seconds, and repeats.

1. After a calibration has been performed, the electronics calculates a cell constant value.
2. If the cell constant value is outside of the range, -4 mV to 10 mV, the alarm will activate. See paragraph 9-2, Calibration, and verify the last calibration was performed correctly.
3. Power down the Hazardous Area Oxymitter 4000 and remove it from the stack.
4. Replace the cell per paragraph 9-4h, Cell Replacement.

LOI. When Fault 14 is detected, the LOI displays the “O2 Cell Bad” message. Refer to the comments and procedures in paragraphs 1 through 4 above.



KEYPAD



LOI

37260033

Figure 8-17. Fault 15, Last Calibration Failed

o. Fault 15, Last Calibration Failed

Figure 8-17 shows the electronic assembly for a Hazardous Area Oxymitter 4000 with a membrane keypad (upper view) and a Hazardous Area Oxymitter 4000 with an LOI (lower view).

Membrane Keypad. When Fault 15 is detected, the CALIBRATION LED flashes three times, pauses for three seconds, and repeats.

1. The last calibration failed alarm activates when the slope and constant values calculated are out of range and the unit reverts to using the previous calibration values.

2. The cell should be replaced. See paragraph 9-4h, Cell Replacement, for cell replacement instructions.

LOI. When Fault 15 is detected, the LOI displays the “Calib Failed” message. Refer to the comments in paragraphs 1 and 2 above.

8-6 HAZARDOUS AREA OXYMITTER 4000 PASSES CALIBRATION, BUT STILL READS INCORRECTLY

There are a few fault conditions where no alarm indication is present and the probe passes calibration, but the O_2 reading may still be incorrect:

a. Probe passes calibration, but still appears to read high.

1. There may be a leak that is permitting ambient air to mix with the process gases. Since many combustion processes are slightly negative in pressure, ambient air can be sucked into the cell area, biasing the O_2 reading upward.

   (a) Make sure that the calibration gas line is capped tightly between calibrations. If autocal is used, make sure the check valve is seating properly.

   (b) If an abrasive shield is installed to protect the entire probe from particulate erosion, a leak in the probe flange gasket can allow ambient air to migrate down the annular space between the probe and shield, and then into the cell. Always install a new probe flange gasket when re-installing a probe.

2. There may be a leak inside the probe itself, permitting the reference air (20.95% O_2) to mix with the process gases at the cell. To confirm this leak condition, instrument air will need to be connected for reference. Pressurize the inside (reference side) of the probe by plugging the reference air exhaust port with your finger for 1 minute. The O_2 reading should decrease slightly. If the O_2 reading increases during this test, there is a leak inside the probe.

   (a) Acid condensation inside the probe can degrade the red silicon tube (item 38, Figure 9-3) that carries the cal gas to the cell. Remove the housing (11) to inspect this hose. (See Section 9, MAINTENANCE AND SERVICE).

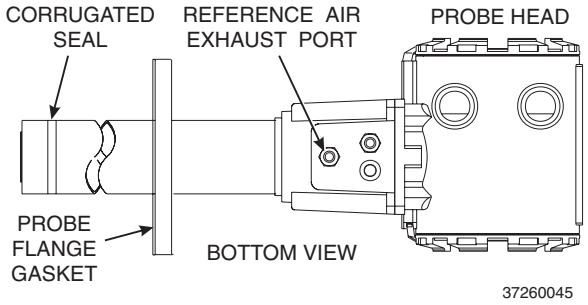


Figure 8-18. Probe Leakage Paths

   (b) The sensing cell is bolted to the end of the probe, and uses a corrugated metallicseal (item 25, Figure 9-3) to separate the process gases from the ambient reference air. This seal can be used only one time, so always replace this seal when a cell is replaced. Always apply anti-seize compound on both sides of the corrugations.

b. Probe passes calibration, but still appears to read low.

The diffusion element at the end of the probe is a passive filter. It plugs very slowly, since there is no active flow being drawn across it. In applications that have a heavy particulate loading (coal or wood fired boilers, cement and lime kilns, catalyst regeneration, recovery boilers, etc.), this diffusion element will eventually plug.

It is important not to pressurize the sensing cell during calibrations by flowing excessive cal gas against a plugged diffuser. Calibration flow rates should be set only when a new diffuser is installed. As the diffuser plugs, do not adjust the flow rates upward.

How do I detect a plugged diffuser?

1. The O_2 signal's speed of response will degrade. The O_2 trend in the control room will become smoother.

2. When calibrating, the calibration gas flow rate will be noted to be lower. Never readjust this flow upwards. Adjust this flow only when a new diffuser is installed.

3. Always note the time it takes for the cell to recover to the normal process value after the cal gas is removed. As the diffuser plugs, this recovery time will get longer and longer. Use the Calibration Record form provided in this manual.

Can I calibrate a badly plugged diffuser?

1. It may not be possible to immediately replace a plugged diffuser while the process is on line.
2. One can calibrate the probe without pressurizing the cell by adjusting the calibration gas flow rate downward before calibration. For instance, say the process is at 3%, and the first calibration gas is 8%. Adjust the flow of cal gas downward until the reading begins to migrate from 8% to lower values, indicating that process gases are now mixing in with the calibration gases.
3. Adjust the flow rate back up until this mixing is just eliminated. Calibrate at this flow rate. Replace the diffuser at the first opportunity.

Calibration Record For Rosemount Analytical In Situ O_2 Probe

Probe Serial Number: _____

Probe Tag Number: _____

Probe Location: _____

Date Placed Into Service: _____

Date	Slope	Constant	Impedance	$Response_{initial}$	$Response_{final}$

Notes: $Response_{initial}$ When the second calibration gas is turned off, note the number of seconds required for the O_2 value to begin migrating back to the process value.

$Response_{final}$ When the second calibration gas is turned off, note the number of seconds required for the O_2 value to settle out at the process value.

SECTION 9
MAINTENANCE AND SERVICE

9-1 OVERVIEW

This section identifies the calibration methods available and provides the procedures to maintain and service the Hazardous Area Oxymitter 4000.

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrestor hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

WARNING

Install all protective equipment covers and safety ground leads after equipment repair or service. Failure to install covers and ground leads could result in serious injury or death.

9-2 CALIBRATION – HAZARDOUS AREA OXYMITTER 4000 WITH KEYPAD

a. During a calibration, two calibration gases with known O_2 concentrations are applied to the Hazardous Area Oxymitter 4000. Slope and constant values calculated from the two calibration gases determine if the Hazardous Area Oxymitter 4000 is correctly measuring the net concentration of O_2 in the industrial process. A calibration record sheet is provided on the previous page. Use photocopies of the calibration record sheet to track transmitter performance.

Before calibrating the Hazardous Area Oxymitter 4000, verify that the calibration gas parameters are correct by setting the gas concentrations (See paragraph 5-2a.5 or 6-5.) used when calibrating the unit and by setting the calibration gas flowmeter.

The calibration gas flowmeter regulates the calibration gas flow and must be set to 5 scfh. However, only adjust the flowmeter to 5 scfh after placing a new diffuser on the end of the probe. Adjusting the flowmeter at any other time can pressurize the cell and bias the calibration.

In applications with a heavy dust loading, the O_2 probe diffusion element may become plugged over time, causing a slower speed of response. The best way to detect a plugged diffusion element is to note the time it takes the Hazardous Area Oxymitter 4000 to return to the normal process reading after the last calibration gas is removed and the calibration gas line is blocked off. A plugged diffusion element also can be indicated by a slightly lower reading on the flowmeter.

Change the diffusion element when the calibration gas flowmeter reads slightly lower during calibration or when response to the process flue gases becomes very slow. Each time the diffusion element is changed, reset the calibration gas flowmeter to 5 scfh and calibrate the Hazardous Area Oxymitter 4000. To change the diffusion element, refer to paragraph 9-4i.

b. Three types of calibration methods are available: automatic, semi-automatic, and manual.

NOTE

A calibration can be aborted any time during the process. Press the CAL key (Figure 9-1) on the Hazardous Area Oxymitter 4000 keypad three times within three seconds, or abort via the LOI, HART/AMS, or an IMPS 4000. An aborted calibration will retain the values of the previous good calibration.

WARNING

The HART option is not protected by energy limiting barriers. It must not be interfaced from within the hazardous area. The 4-20 mA cables should be routed and the connections made outside the hazardous area. Note that this is the case even when using the intrinsically safe version of the handheld communicator.

WARNING

Do not install an IMPS 4000 or SPS 4000 within the hazardous area. Installing the unit in a potentially explosive environment could cause serious injury or death and equipment damage. Ensure the sequencer is installed in a safe area.

1. Automatic Calibration. Automatic calibrations require no operator action. However, the calibration gases must be permanently piped to the Hazardous Area Oxymitter 4000, an SPS 4000 or IMPS 4000 must be installed to sequence the gases, and the logic I/O must be set to mode 8 via HART/AMS so the sequencer and Hazardous Area Oxymitter 4000 can communicate.

   Depending on your system setup, an automatic calibration can be initiated by the following methods:

   (a) The Hazardous Area Oxymitter 4000's CALIBRATION RECOMMENDED alarm signals that a calibration is required.

   (b) Use the HART/AMS or the LOI to enter a "time since last cal" (CAL INTRVL) parameter that will initiate an automatic calibration at a scheduled time interval (in hours). To configure the CAL INTRVL parameter, refer to paragraph 7-8 for the HART/AMS, or paragraph 6-5 for the LOI.

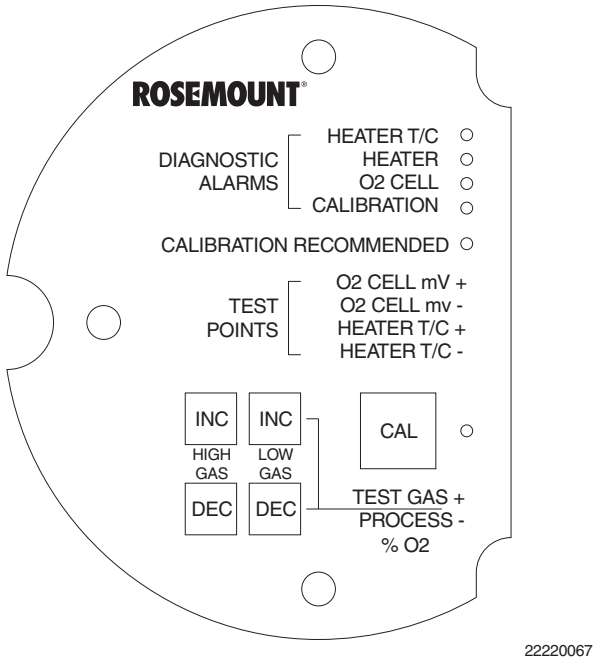


Figure 9-1. Membrane Keypad

   (c) If using an IMPS 4000, enter a time interval via the IMPS 4000 keypad that will initiate an automatic calibration at a scheduled time interval (in hours). To set the CalIntvX parameter of the CHANGE PRESETS display mode, refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin for more information.

   Once an automatic calibration is initiated, by any of the methods previously described, the Hazardous Area Oxymitter 4000's CALIBRATION RECOMMENDED alarm signals an IMPS 4000 or SPS 4000 to initiate a calibration. The sequencer sends an "in cal" signal to the control room so that any automatic control loops can be placed in manual. Then, the sequencer begins to sequence the calibration gases.

2. Semi-Automatic Calibration. Semi-automatic calibrations only require operator initiation. However, the calibration gases must be permanently piped to the Hazardous Area Oxymitter 4000, an SPS 4000 or IMPS 4000 must be installed to sequence the gases, and the logic I/O must be set to mode 8 or 9 via HART/AMS to allow the sequencer and the Hazardous Area Oxymitter 4000 to communicate.

   Depending on your system setup, a semi-automatic calibration can be initiated by the following methods:

   (a) Hazardous Area Oxymitter 4000 with membrane keypad. Press the CAL key on the Hazardous Area Oxymitter 4000 keypad.

   (b) Hazardous Area Oxymitter 4000 with LOI. Select “Start Calib” from the CALIBRATION menu.

   (c) IMPS 4000. Use the IMPS 4000 keypad to change the InitCalX parameter of the CHANGE PRESETS display mode from 0000 to 0001. Refer to the IMPS 4000 Intelligent Multiprobe Test Gas Sequencer Instruction Bulletin for more information.

   (d) HART. Use the HART Communicator to access the O_2 CALIBRATE menu and perform the O_2 CAL method. Refer to paragraph 7-7 for the complete calibration procedure.

   (e) AMS. Refer to AMS documentation for more information.

   (f) Remote Contact. Initiate a calibration from a remote location via the remote contact input connection provided by an IMPS 4000 or SPS 4000. Refer to the documentation available for the control system in use for more information.

   Once a semi-automatic calibration is initiated by any of the methods previously described, the Hazardous Area Oxymitter 4000’s CALIBRATION RECOMMENDED alarm signals an IMPS 4000 or SPS 4000 to initiate a calibration. The sequencer sends an “in cal” signal to the control room so that any automatic control loops can be placed in manual. Then, the sequencer begins to sequence the calibration gases.

3. Manual Calibration with Membrane Keypad. Manual calibrations must be performed at the Hazardous Area Oxymitter 4000 site and will require operator intervention throughout the process. Manual calibration instructions, in condensed form, can also be found on the inside of the right electronics housing cover. See Figure 9-2.

   Use the following procedure to perform a manual calibration:

   (a) Place control loop in manual.

   (b) Verify the calibration gas parameters are correct per paragraph 9-2a.

   (c) If performing a manual calibration with the CALIBRATION RECOMMENDED LED off and the CAL LED off, start at step 1.

   (d) If performing a manual calibration with the CALIBRATION RECOMMENDED LED on and the CAL LED on, start at step 2.

      1 Push the CAL key. The CALIBRATION RECOMMENDED LED will come on and the CAL LED will be on solid. If a multimeter is attached across TP5 and TP6, the reading will display the percentage of oxygen seen by the cell.

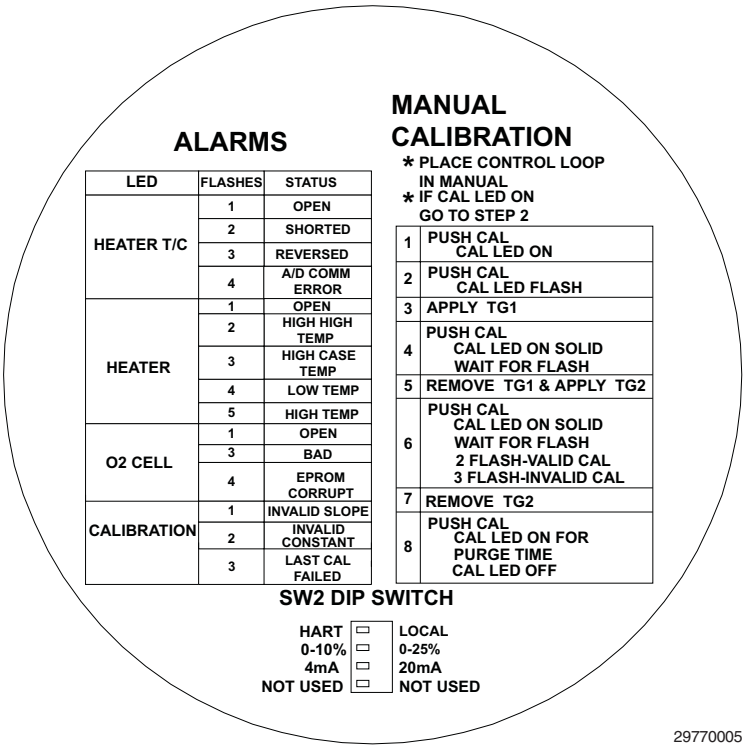


Figure 9-2. Inside Right Cover

2 Push the CAL key. The CALIBRATION RECOMMENDED LED will turn off and the CAL LED will flash continuously. The Hazardous Area Oxymitter 4000 can be configured so that the 4-20 mA signal will hold the last value. The default condition is for the output to track. A flashing LED indicates that the Hazardous Area Oxymitter 4000 is ready to accept the first calibration gas.

3 Apply the first calibration gas. (Electronics will abort the calibration if step 4 is not done within 30 minutes).

4 Push the CAL key; the CAL LED will be on solid. A timer is activated to allow the calibration gas adequate time to flow (default time of five minutes). When the timer times out, the Hazardous Area Oxymitter 4000 has taken the readings using the first calibration gas and the CAL LED will flash continuously. The flashing indicates the Hazardous Area Oxymitter 4000 is ready to take readings using the second calibration gas.

5 Remove the first calibration gas and apply the second calibration gas. (Electronics will abort the calibration if step 6 is not done within 30 minutes).

6 Push the CAL key; the CAL LED will be on solid. The timer is activated for the second calibration gas flow. When the timer times out, the CAL LED will flash a 2 pattern flash or a 3 pattern flash (2 pattern flash equals a valid calibration, 3 pattern flash equals an invalid

calibration). If the slope or the constant is out of specification, a diagnostic alarm LED will be flashing. The diagnostic alarm will remain active until the purge cycle is over. If the three pattern flash occurs without a diagnostic alarm, the calibration gases could be the same or the calibration gas was not turned on.

A flashing CAL LED indicates the calibration is done. (See Section 8, TROUBLESHOOTING, for an explanation of the 2 pattern and 3 pattern flashes).

7 Remove the second calibration gas and cap off the calibration gas port.

8 Push the CAL key; the CAL LED will be on solid as the unit purges. (Default purge time is three minutes). When the purge is complete, the CAL LED will turn off and the Hazardous Area Oxymitter 4000 output unlocks from its held value and begins to read the process O_2.

If the calibration was valid, the DIAGNOSTIC ALARMS LEDs will indicate normal operation. If either new calibration value (slope or constant) is not within parameters, the DIAGNOSTIC ALARMS LED will indicate an alarm. (See Section 8, TROUBLESHOOTING, for alarm codes). If the calibration was invalid, the Hazardous Area Oxymitter 4000 will return to normal operation, as it was before a calibration was initiated, and the parameters will not be updated.

(e) Place control loop in automatic.

9-3 CALIBRATION – HAZARDOUS AREA OXYMITTER 4000 WITH LOI

Refer to Figure 6-4 for a view of the LOI menu tree. To calibrate the Hazardous Area Oxymitter 4000 from the LOI, access the CALIBRATION/ Start Calibration menu.

a. CALIBRATION/ Start Calibration

This is the starting point for calibrations. The LOI will instruct the user through this entire procedure. You can select “Abort Calib” at any time to abort the calibration.

1. The LOI displays the following:
   Apply Gas 1
   Hit E when ready

   The Oxymitter 4000 is ready to accept the first calibration gas. Apply the first calibration gas. (Electronics will abort the calibration if this step is not done within 30 minutes).

2. Touch the Enter key to start the Gas 1 flow. A timer is activated to allow the calibration gas adequate time to flow (default time of five minutes). The LOI displays:
   Flow Gas 1xxxxs
   Read Gas 1xxxxs
   Done Gas 1

   The display counts down the seconds remaining to flow Gas 1, then the time remaining for sensing the O_2 concentration of Gas 1. Done Gas 1 indicates completion.

3. Remove the first calibration gas and apply the second calibration gas. (Electronics will abort the calibration if this step is not done within 30 minutes). The LOI displays the following:
   Apply Gas 2
   Hit E when ready

4. Touch the Enter arrow to start the Gas 2 flow. The timer is activated and the LOI displays:
   Flow Gas 2xxxxs
   Read Gas 2xxxxs
   Done Gas 2
   Stop Gas
   Hit E when ready

5. Remove the second calibration gas and cap off the calibration gas port. Then, touch the Enter arrow to indicate completion. The timer is activated and the LOI displays:
   Purgexxxxs

   The default purge time is three minutes. When the gas purge timer times out, the Oxymitter 4000 begins to read the process O_2.

b. Abort Calibration

Exits the calibration. After calibration gases are removed, and the purge times out, the instrument goes back to normal operational mode.

c. Cal Constants – Results of the Calibration

1. Current calibration – If the calibration passed these values will be updated. Log these values onto the calibration log sheet supplied. If the process has high levels of particulate, the response back to the process after cal gas is also removed.

2. Previous Calibration – Values from the prior good calibration.

3. Failed Calibration – Bad calibration values are not loaded into the electronics.

d. Calibration Status

1. Calibration Step – The current step in an active calibration procedure.

2. Calibration Time – Time until the next scheduled calibration.

3. Next O2 Cal – Time until the next O_2 calibration, if different than the next scheduled calibration.

9-4 HAZARDOUS AREA OXYMITTER 4000 REPAIR

Each of the following procedures details how to remove and replace a specific component of the Hazardous Area Oxymitter 4000.

WARNING

It is recommended that the Hazardous Area Oxymitter 4000 be removed from the stack for all service activities. The unit should be allowed to cool and be taken to a clean work area. Failure to comply may cause severe burns.

WARNING

Disconnect and lock out power before working on any electrical components. There is voltage up to 115 VAC.

a. Removal and Replacement of Hazardous Area Oxymitter 4000 Probe

1. Remove.

   (a) Turn off power to the system.

   (b) Shut off the calibration gases at the cylinders and the instrument air.

   (c) Disconnect the calibration gas and instrument air lines from the Hazardous Area Oxymitter 4000.

   (d) While facing the Hazardous Area Oxymitter 4000 and looking at the Rosemount label, remove screw (18, Figure 9-3 or Figure 9-4), cover lock (19), and captive washer (20) securing cover (17) on left side of housing (11). Remove the cover to expose the terminal block (15).

   (e) Remove all signal and power wiring to the probe.

   (f) Remove insulation to access the mounting bolts.

   (g) Unbolt the Hazardous Area Oxymitter 4000 from the stack and take it to a clean work area.

   (h) Allow the unit to cool to a comfortable working temperature.

2. Replace.

   (a) Bolt the Hazardous Area Oxymitter 4000 to the stack and install the insulation.

   (b) Connect all signal and power leads at the probe. Refer to Section 2, INSTALLATION, for detailed wiring instructions.

   (c) Install left side cover (17, Figure 9-3 or Figure 9-4) and ensure it is tight. Secure the cover using captive washer (20), cover lock (19), and screw (18).

   (d) Connect the calibration gas and instrument air lines to probe.

   (e) Turn on the calibration gases at the cylinders and turn on instrument air.

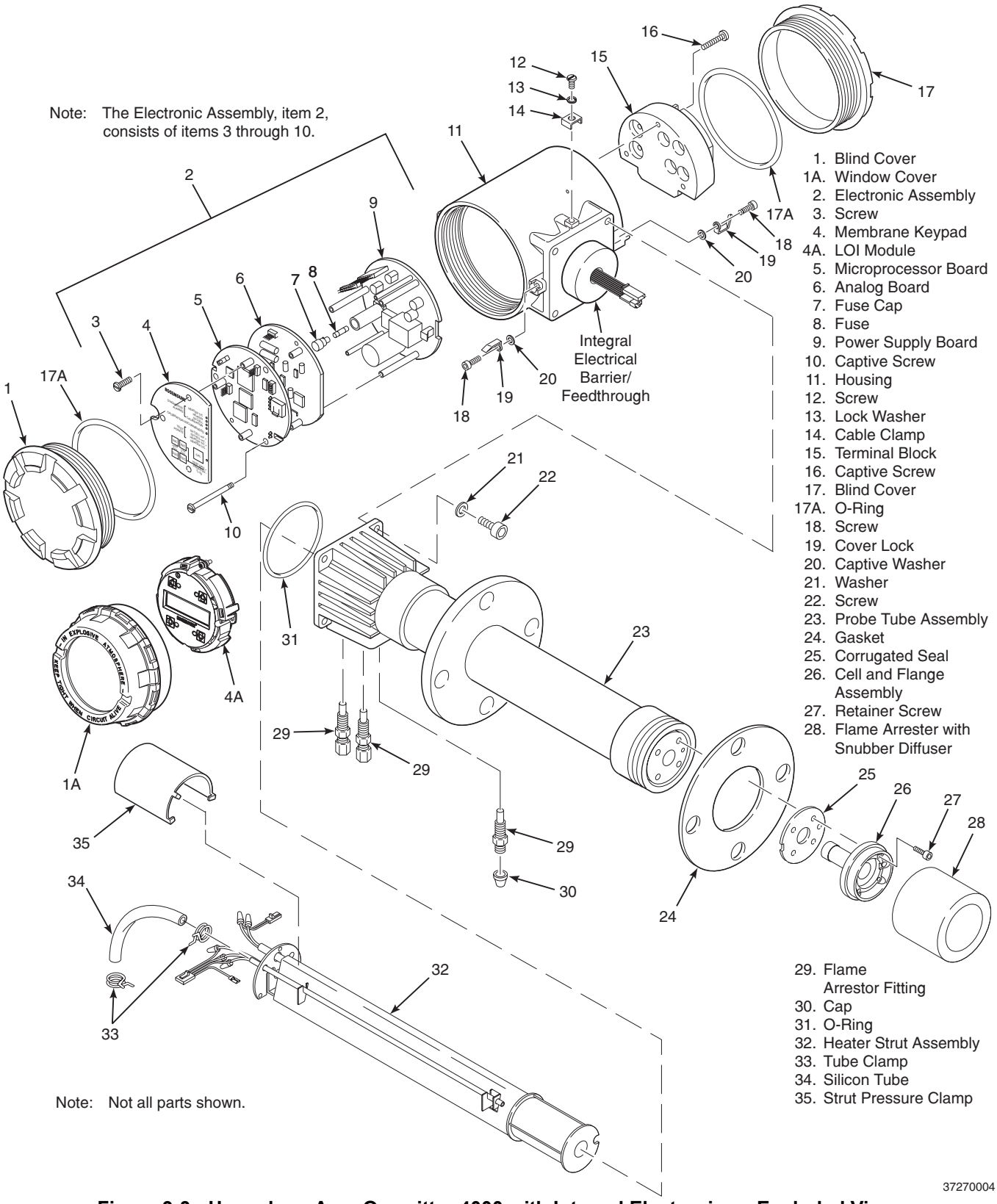
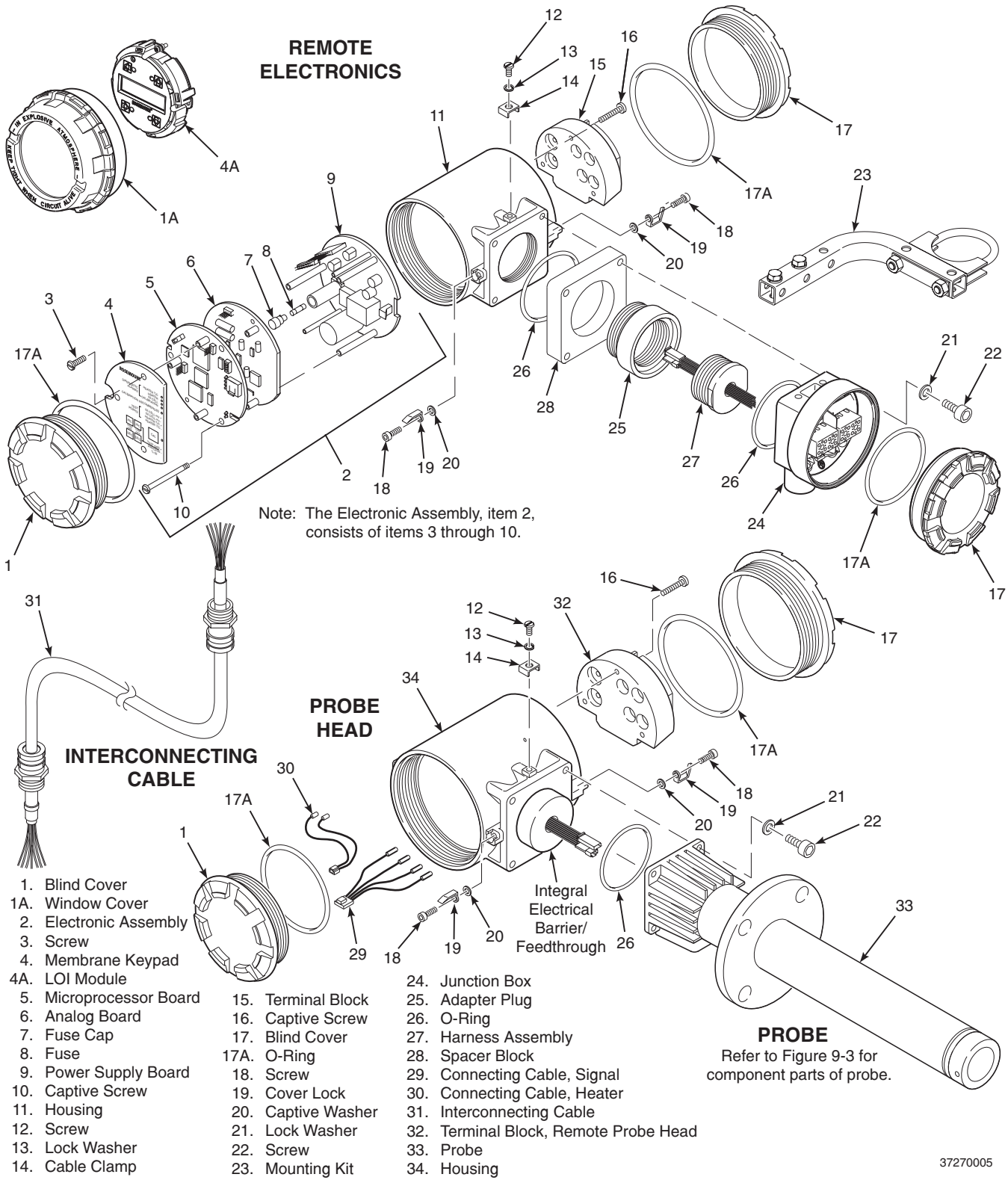


Figure 9-3. Hazardous Area Oxymitter 4000 with Integral Electronics – Exploded View



1. Blind Cover
1A. Window Cover
2. Electronic Assembly
3. Screw
4. Membrane Keypad
4A. LOI Module
5. Microprocessor Board
6. Analog Board
7. Fuse Cap
8. Fuse
9. Power Supply Board
10. Captive Screw
11. Housing
12. Screw
13. Lock Washer
14. Cable Clamp
15. Terminal Block
16. Captive Screw
17. Blind Cover
17A. O-Ring
18. Screw
19. Cover Lock
20. Captive Washer
21. Lock Washer
22. Screw
23. Mounting Kit
24. Junction Box
25. Adapter Plug
26. O-Ring
27. Harness Assembly
28. Spacer Block
29. Connecting Cable, Signal
30. Connecting Cable, Heater
31. Interconnecting Cable
32. Terminal Block, Remote Probe Head
33. Probe
34. Housing

Figure 9-4. Hazardous Area Oxymitter 4000 with Remote Electronics – Exploded View

(f) Restore power to the system; refer to paragraph 5-1 or 6-1. When the probe is at operating temperature, calibrate the probe per paragraph 9-2.

NOTE

Recalibration is required whenever electronic cards or sensing cell is replaced.

b. Replacement of Entire Electronics (with Housing) – Hazardous Area Oxymitter 4000 with Integral Electronics.

1. Follow the instructions in paragraph 9-4a to remove the Hazardous Area Oxymitter 4000 probe from the stack or duct.

CAUTION

Do not force the probe housing when installing or removing from the integral electrical barrier/feedthrough (Figure 9-3). Damage to the aluminum probe housing can occur.

2. Remove four screws (22, Figure 9-3) and washers (21) from the probe tube assembly (23). Remove the probe tube assembly from the housing (11).
3. Disconnect the heater and signal wire connectors from the mating connectors on the heater strut assembly (32).

NOTE

The integral electrical barrier/feedthrough is thread-locked into the electrical housing and cannot be removed.

4. Make sure the O-ring (31) is in good condition. Replace O-ring if damaged.
5. Make sure that the conduit port of the electronic housing is on the same side as the CAL and REF gas ports. Install four washers (21) and screws (22). Tighten screws.
6. Follow the instructions in paragraph 2-1b to install the Hazardous Area Oxymitter 4000 into the stack or duct.

CAUTION

Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in hazardous areas may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

c. Electronic Assembly Replacement

Remove and replace the electronic assembly according to the following procedure.

1. Remove screw (18, Figure 9-3 or Figure 9-4), cover lock (19), and captive washer (20) securing cover (1). Remove the cover.
2. See Figure 9-5. Depress and remove the J1 (cell and T/C) connector from the J1 socket.

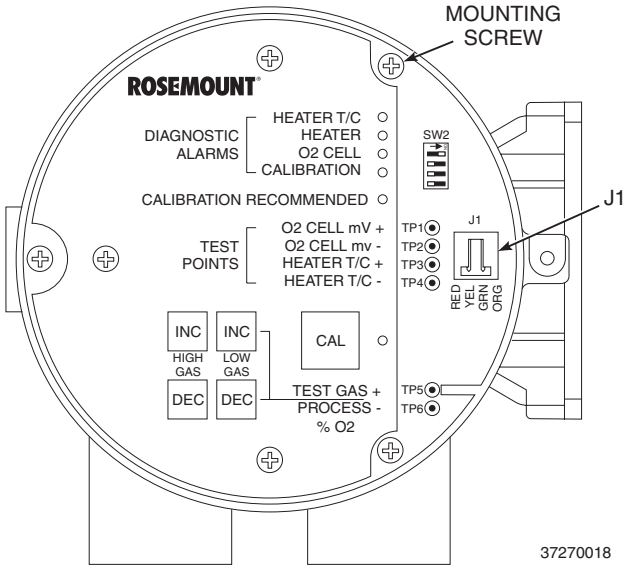


Figure 9-5. Electronic Assembly

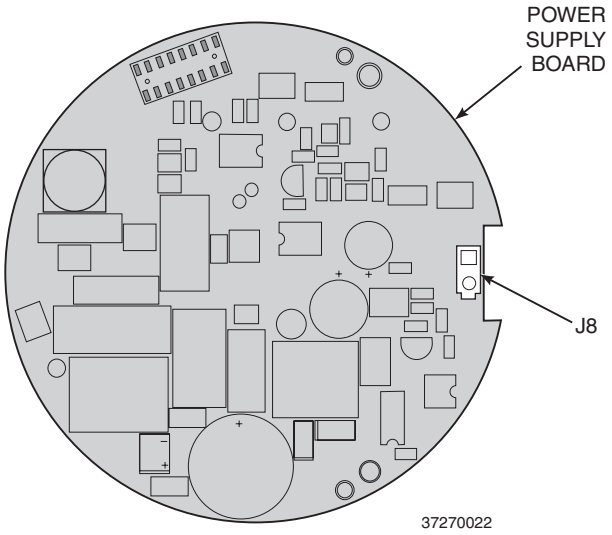


Figure 9-6. J8 Connector

3. Loosen the three captive screws (9, Figure 9-3 or Figure 9-4). Slide electronic assembly (2) partially out of housing (11).
4. See Figure 9-6. Squeeze the sides of the J8 connector, and carefully remove the J8 connector (heater leads) from the power supply board.
5. Remove the electronic assembly (2, Figure 9-3 or Figure 9-4) from the housing(11).
6. Slide the new electronic assembly (2) partially into the housing (11).
7. Reconnect the J8 connector to the power supply board. Make sure the connector is secure.
8. Holding the J1 connector leads, slide the electronic assembly the rest of the way into the housing. Seat the electronic assembly on the mating connector pins.
9. Gently try to rotate the electronic assembly to check for full seating. If the electronic assembly rotates, remove the assembly and repeat step 8.
10. Reconnect the J1 connector to the microprocessor board (Figure 9-5). Ensure the connector is secure.
11. Tighten the three captive screws (9, Figure 9-3 or Figure 9-4) in the top of the microprocessor board (5).
12. Install and tighten cover (1); make sure it is tight. Secure the cover using captive washer (20), cover lock (19), and screw (18).

CAUTION

Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in a hazardous area may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

d. Terminal Block Replacement

See Figure 9-3 or Figure 9-4.

1. Remove the left side cover (17) from the housing (11).
2. Loosen the three captive screws (16) in the terminal block (15). Carefully lift the terminal block out of the housing.
3. Carefully align the new terminal block on the pins so that it sits flat in the housing. The round end of the terminal block should be on the opposite side of the housing conduit ports and should not be able to rotate.
4. Tighten the three mounting screws and ensure the terminal block is secure in the housing.

WARNING

Opening the electronic housing will cause the loss of ALL hazardous permits. Opening the electronics housing in a hazardous area may cause an explosion resulting in loss of property, severe personal injury, or death. It may be required to get a hot work permit from your company safety officer before opening the electronic housing.

e. Fuse Replacement

See Figure 9-7.

1. Remove screw (18, Figure 9-3 or Figure 9-4), cover lock (19), and captive washer (20) securing cover (1). Remove the cover.
2. See Figure 9-5. Depress and remove the J1 (cell and T/C) connector from the J1 socket.
3. Loosen the three captive screws (10, Figure 9-3 or Figure 9-4). Slide electronic assembly (2) partially out of housing (11).
4. See Figure 9-6. Squeeze the sides of the J8 connector, and carefully remove the J8 connector (heater leads) from the power supply board.
5. Remove the electronic assembly (2, Figure 9-3 or Figure 9-4) from the housing (11).
6. Turn the electronic assembly over so that you are looking at the bottom of the power supply board (Figure 9-7).
7. Gently depress the two white posts one at a time. Carefully separate the power supply board from the analog board.
8. Remove the fuse and replace it with a new one.

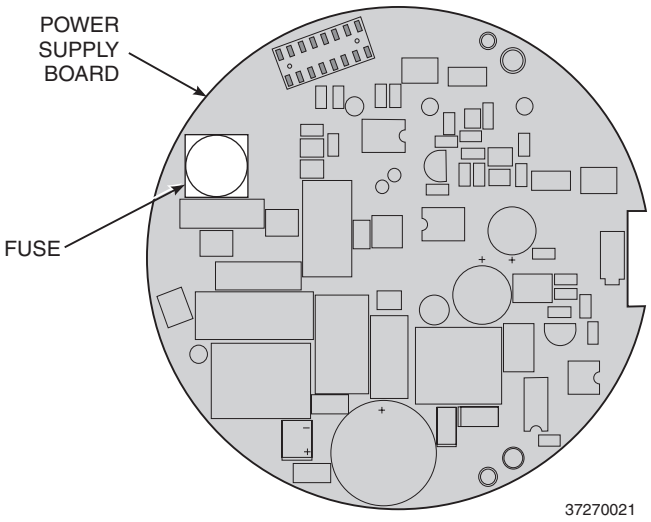


Figure 9-7. Fuse Location

9. Align the white posts with the post holes on the power supply board and the pin connector on the power supply board with the connector port on the back of the analog board. Gently push the boards together until the white posts snap in place. Ensure the assembly is secure by gently trying to separate the boards.
10. Reconnect the J8 connector to the power supply board. Make sure the connector is secure.
11. Holding the J1 connector leads, slide the electronic assembly the rest of the way into the housing. Seat the electronic assembly on the mating connector pins.
12. Gently try to rotate the electronic assembly to check for full seating. If the electronic assembly rotates, remove the assembly and repeat step 11.
13. Reconnect the J1 connector to the microprocessor board (Figure 9-5). Ensure the connector is secure.
14. Tighten the three captive screws (10, Figure 9-3 or Figure 9-4) in the top of the microprocessor board (5).

15. Replace right housing cover (1, Figure 9-3); make sure it is tight. Secure the cover using captive washer (20), cover lock (19), and screw (18).

16. Install and tighten cover (1); make sure it is tight. Secure the cover using captive washer (20), cover lock (19), and screw (18).

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrestor hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

f. Entire Probe Replacement (Excluding Electronics)

Do not attempt to replace the probe until all other possibilities for poor performance have been considered. If probe replacement is needed, see Table 11-1 for part numbers.

1. Follow the instructions in paragraph 9-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.
2. Separate the probe and the electronics housing per paragraph 9-4b, step 2.
3. Reinstall electronics on the new probe per paragraph 9-4b, steps 4 and 5.
4. Follow the instructions in paragraph 2-1b to install the Hazardous Area Oxymitter 4000 into the stack or duct.

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrestor hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

g. Heater Strut Replacement

This paragraph covers heater strut replacement. Do not attempt to replace the heater strut until all other possibilities for poor performance have been considered. If heater strut replacement is needed, order a replacement heater strut. See Table 11-1.

WARNING

Use heat resistant gloves and clothing when removing probe. Do not attempt to work on the probe until it has cooled to room temperature. The probe can be as hot as 300°C (572°F). This can cause severe burns.

1. Follow the instructions in paragraph 9-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.
2. Remove oxygen sensing cell per paragraph 9-4h, steps 1 through 5.

CAUTION

Do not force the probe housing when installing or removing from the integral electrical barrier/feedthrough (Figure 9-3). Damage to the aluminum probe housing can occur.

3. Remove four screws (22, Figure 9-3) and washers (21) from the probe tube assembly (23). Remove the probe tube assembly from the housing (11).
4. Once the probe and housing are separated, spring tension releases, and the heater strut assembly (32) moves up. Remove strut pressure clamp (35).
5. Disconnect the heater and signal wire connectors from the mating connectors on the heater strut assembly (32).

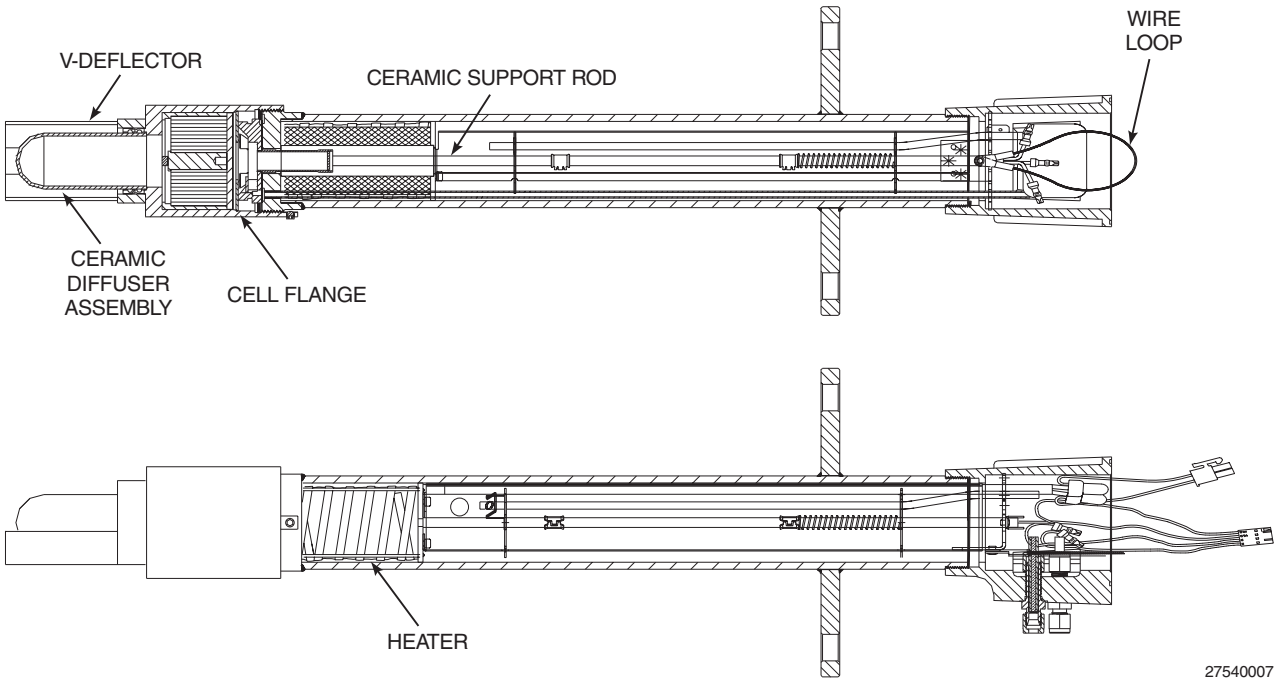


Figure 9-8. Heater Strut Assembly

6. Remove tube clamps (33). Carefully pull the CAL and REF gas silicon tubes (34) from the CAL and REF gas ports.

7. Remove gas port fittings (29) from the CAL, REF, and VENT ports.

8. See Figure 9-8. Grasp the wire loop and carefully slide the heater strut assembly (32, Figure 9-3) out of the probe tube.

9. When replacing the strut, orient the probe so that the small calibration gas tube lays at the 6 o'clock position of the probe tube. Align the slot on the heater plate with the calibration gas line in the probe tube. Slide the strut into the probe tube. It will turn to align the hole on the back plate of the strut with the calibration gas line. When the hole and the calibration gas line are aligned correctly, the strut will slide in the rest of the way.

10. As the strut installation nears completion, install the guide rod into the calibration gas tube to assist in guiding the calibration gas tube through the hole in the end of the strut.

11. Push down on the back plate of the strut to make sure you have spring tension and then install the strut pressure clamp (34) on the back plate.

12. Install gas port fittings (29) in the CAL, REF, and VENT ports.

13. Replace the CAL and REF gas silicon tubes (34) and tube clamps (33).

14. Install the entire electronics per paragraph 9-4b, steps 4 and 5.

15. Follow the instructions in paragraph 2-1b to install the Hazardous Area Oxymitter 4000 into the stack or duct.

WARNING

When working on this equipment on the laboratory bench, be aware that the Hazardous Area Oxymitter 4000, probe tube, and flame arrestor hub can be hot [up to 300°C (572°F)] in the region of the probe heater.

h. Cell Replacement

This paragraph covers O_2 cell replacement. Do not attempt to replace the cell until all other possibilities for poor performance have been considered. If cell replacement is needed, order the cell replacement kit. See Table 11-1.

The cell replacement kit (Figure 9-9) contains a cell and flange assembly, corrugated seal, setscrews, socket head cap screws, and anti-seize compound. The items are carefully packaged to preserve precise surface finishes. Do not remove items from the packaging until they are ready to be used. Spanner and hex wrenches needed for this procedure are part of an available special tools kit. See Table 11-1.

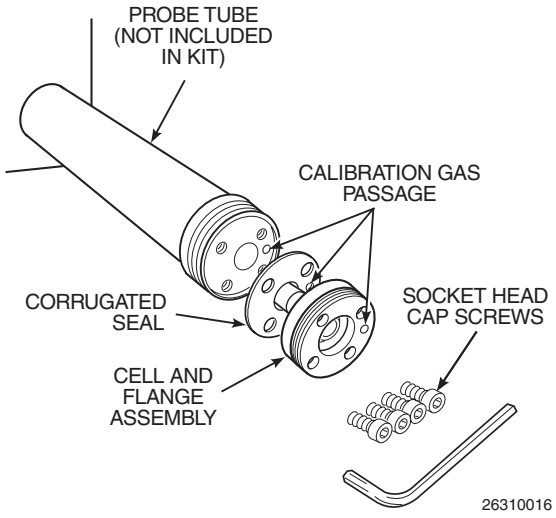


Figure 9-9. Cell Replacement Kit

Spanner and hex wrenches needed for this procedure are part of an available special tools kit. See Table 11-1.

WARNING

Use heat-resistant gloves and clothing when removing the probe. Do not attempt to work on these components until they have cooled to room temperature. Probe components can be as hot as 300°C (572°F). This can cause severe burns.

Disconnect and lock out power before working on any electrical components. There is voltage of up to 115 VAC.

CAUTION

Do not remove the cell unless certain it needs to be replaced. Removal may damage the cell and platinum pad. Go through the complete troubleshooting procedure to make sure the cell needs to be replaced before removing it.

1. Follow the instructions in paragraph 9-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.

WARNING

The flame arrestor and flame arrestor hub are among the critical components of this type of protection. See Safety Data Sheet 1A99078.

2. If the probe uses a snubber diffuser, use a spanner wrench to remove the flame arrestor/snubber diffuser assembly.

NOTE

To determine if the diffuser needs to be replaced, refer to paragraph 9-2.

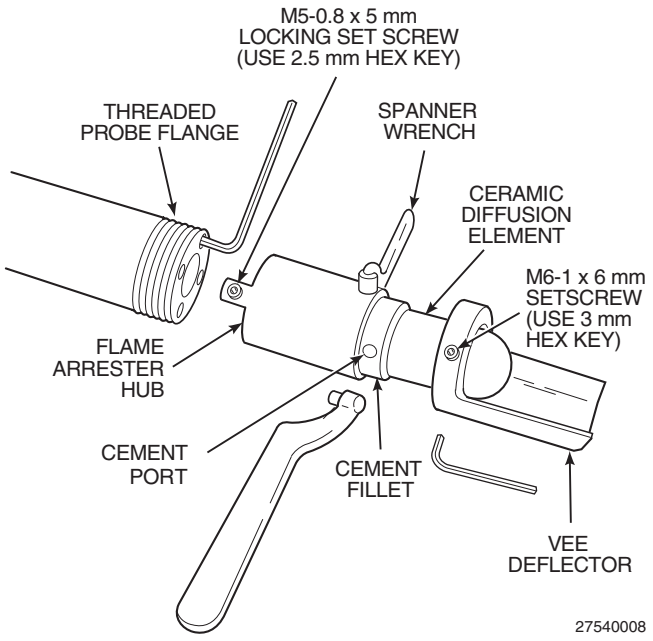


Figure 9-10. Ceramic Diffuser Element Replacement

3. Remove the locking set screw from the flame arrestor. Use spanner wrenches from the probe disassembly kit (Table 11-1) to turn the flame arrestor hub free from the probe flange. If equipped with the flame arrestor with ceramic diffuser, remove and discard the setscrews and remove the vee deflector (Figure 9-10). Inspect the ceramic diffuser. If damaged, replace using paragraph 9-4i.

4. Loosen the four socket head cap screws from the cell and flange assembly. Remove the assembly and the corrugated seal. The cell flange has a notch that may be used to gently pry the flange away from the probe. Note that the contact pad inside of the probe will sometimes fuse to the oxygen sensing cell. If the cell is fused to the contact pad, push the cell assembly back into the probe (against spring pressure) and quickly twist the cell assembly. The cell and contact pad should separate. **If the contact pad stays fused to the cell**, a new contact/thermocouple assembly must be installed. Disconnect the orange cell wire at the probe electronics end of the strut by cutting the wire. Withdraw the cell with the wire still attached.

5. Remove entire electronics per paragraph 9-4b, steps 2 and 3.

6. If the contact and thermocouple assembly is damaged, replace the assembly or the contact pad. Refer to paragraph 9-4j to replace the contact and thermocouple assembly. Instructions for replacing the contact pad are in the cell replacement kit.

7. Remove and discard the corrugated seal. Clean the mating faces of the probe tube and cell. Remove burrs and raised surfaces with a block of wood and crocus cloth. Clean the threads on the probe flange and flame arrestor hub.

8. Apply a light coating of anti-seize compound to both sides of the new corrugated seal.

9. Assemble the cell and flange assembly and corrugated seal to the probe tube. Make sure the calibration tube lines up with the calibration gas passage in each component. Apply a small amount of anti-seize compound to the screw threads and use the screws to secure the assembly. Torque to 4 N·m (35 in-lbs).

10. Apply anti-seize compound to the probe threads, flame arrestor hub, and setscrews. Reinstall the flame arrestor on the probe. Using pin spanner wrenches, torque to 14 N·m (10 ft-lbs). Secure the flame arrestor with the locking setscrew. Torque to 2.8 N·m (25 in-lbs). If applicable, reinstall the vee deflector, orienting apex toward gas flow. Secure with the setscrew and anti-seize compound. Torque to 2.8 N·m (25 in-lbs).

11. On systems equipped with an abrasive shield, install the dust seal gaskets, with joints 180° apart.

12. If previously removed, install the entire electronics per paragraph 9-4b, steps 4 and 5.

13. Follow the instructions in paragraph 2-1b to install the Hazardous Area Oxymitter 4000 into the stack or duct. If there is an abrasive shield in the stack, make sure the dust seal gaskets are in place as they enter the 15° reducing cone.

i. Ceramic Diffusion Element Replacement

NOTE

This procedure applies to the ceramic diffuser element only.

1. General

   The diffusion element protects the O_2 cell from particles in process gases. The element does not normally need to be replaced, because the vee deflector protects it from particulate erosion. In severe environments, the filter may be broken or subject to excessive erosion. Examine the ceramic diffusion element whenever removing the probe for any purpose. Replace if damaged.

   Damage to the diffusion element may become apparent during calibration. Compare probe response with previous response. A broken diffusion element will cause a slower response to calibration gas.

   Hex wrenches needed to remove setscrews and socket head screws in the following procedure are available as part of a Probe Disassembly Kit, Table 11-1.

2. Replacement Procedure

   (a) Follow the instructions given in paragraph 9-4a to remove the Hazardous Area Oxymitter 4000 from the stack or duct.

   (b) Loosen setscrews, Figure 9-10, using hex wrench from Probe Disassembly Kit, Table 11-1 and remove vee deflector. Inspect setscrews. If damaged, replace with stainless setscrews coated with anti-seize compound.

   (c) On systems equipped with abrasive shield, remove dual dust seal gaskets.

   (d) Use spanner wrenches from the Probe Disassembly Kit, Table 11-1, to turn hub free from retainer.

   (e) Put the hub in vise. Break out old ceramic diffusion element with chisel along cement line and 9.5 mm (3/8 in.) pin punch through cement port.

   (f) Break out remaining ceramic diffusion element by tapping lightly around hub with hammer. Clean grooves with pointed tool if necessary.

   (g) Replace ceramic diffusion element using the ceramic diffusion element replacement kit in Table 11-1. This consists of a diffusion element, cement, setscrews, anti-seize compound and instructions.

   (h) Test fit replacement ceramic diffusion element to be sure seat is clean.

CAUTION

Do not get cement on ceramic diffusion element except where it touches the hub. Any cement on ceramic diffusion element blocks airflow through element. Wiping wet cement off of the ceramic only forces cement into pores. Also do not get any cement onto the flame arrestor element.

   (i) Thoroughly mix cement and insert tip of squeeze bottle into cement port. Tilt bottle and squeeze while simultaneously turning ceramic

diffusion element into seat. Do not get any cement on upper part of ceramic diffusion element. Ensure complete penetration of cement around 3 grooves in hub. Cement should extrude from opposite hole. Wipe excess material back into holes and wipe top fillet of cement to form a uniform fillet. (A Q-Tip is useful for this.) Clean any excess cement from hub with water.

(j) Allow filter to dry at room temperature overnight or 1 to 2 hours at 93°C (200°F).

(k) Wipe a heavy layer of anti-seize compound onto the threads and mating surfaces of the flame arrestor, diffusion hub, and probe tube.

(l) Assemble flame arrestor and diffusion hub with two pin spanner wrenches. Torque to 14 N·m (10 ft-lbs). Secure with hub retaining setscrew.

(m) On systems equipped with abrasive shield, install dust seal gaskets with joints 180° apart.

(n) Reinstall vee deflector, orienting apex toward gas flow. Apply anti-seize compound to setscrews and tighten with hex wrench.

(o) Reinstall probe on stack flange.

j. Contact and Thermocouple Assembly Replacement

See Figure 9-11.

1. Remove the cell per paragraph 9-4h, steps 1 through 5.
2. Remove the heater strut assembly per paragraph 9-4g, steps 3 through 8.
3. Use a pencil to mark locations of the spring clips on the ceramic rod of the contact and thermocouple assembly.
4. Squeeze the tabs on the spring clips and pull the contact and thermocouple assembly out of the heater strut. Retain the spring clips and spring; replace if damaged.
5. While very carefully handling the new contact and thermocouple assembly, lay the old assembly next to the new one. Transfer the pencil marks to the new rod. Throw away the old contact and thermocouple assembly.
6. Carefully guide the new contact and thermocouple assembly through the spring, spring clips (held open by squeezing the tabs), tube supports, and heater support of the heater strut assembly until the spring clip reaches the pencil mark.
7. Install the cell per the instructions in paragraph 9-4h, steps 7 through 12.
8. Slide the heater strut assembly into the probe per the instructions in paragraph 9-4g, steps 9 through 14.
9. On systems equipped with an abrasive shield, install the dust seal gaskets, with joints 180° apart.
10. Follow instructions in paragraph 2-1b to install the Hazardous Area Oxymitter 4000 into the stack or duct. If there is an abrasive shield in the stack, make sure the dust seal gaskets are in place as they enter the 15° reducing cone.

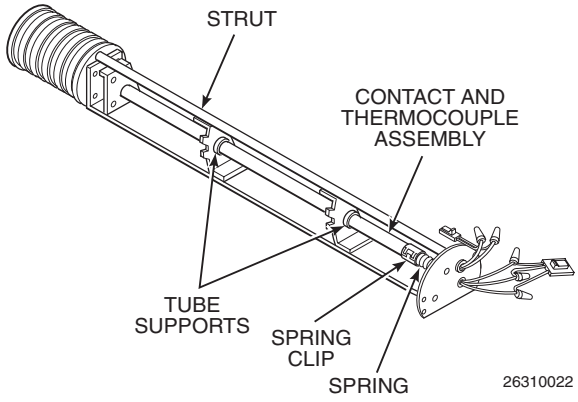


Figure 9-11. Contact and Thermocouple Assembly Replacement

SECTION 10
RETURN OF MATERIAL

10-1 If factory repair of defective equipment is required, proceed as follows:

a. Secure a return authorization number from a Rosemount Analytical Sales Office or representative before returning the equipment. Equipment must be returned with complete identification in accordance with Rosemount instructions or it will not be accepted.

In no event will Rosemount be responsible for equipment returned without proper authorization and identification.

b. Carefully pack defective unit in a sturdy box with sufficient shock absorbing material to ensure that no additional damage will occur during shipping.

c. In a cover letter, describe completely:

1. The symptoms from which it was determined that the equipment is faulty.
2. The environment in which the equipment has been operating (housing, weather, vibration, dust, etc.).
3. Site from which equipment was removed.
4. Whether warranty or nonwarranty service is requested.
5. Complete shipping instructions for return of equipment.
6. Reference the return authorization number.

d. Enclose a cover letter and purchase order and ship the defective equipment according to instructions provided in Rosemount Return Authorization, prepaid, to:

Rosemount Analytical Inc.
RMR Department
1201 N. Main Street
Orrville, Ohio 44667

If warranty service is requested, the defective unit will be carefully inspected and tested at the factory. If failure was due to conditions listed in the standard Rosemount warranty, the defective unit will be repaired or replaced at Rosemount's option, and an operating unit will be returned to the customer in accordance with shipping instructions furnished in the cover letter.

For equipment no longer under warranty, the equipment will be repaired at the factory and returned as directed by the purchase order and shipping instructions.

SECTION 11
REPLACEMENT PARTS

Table 11-1. Replacement Parts for Probe

Figure and Index No.	Part Number		Description
	(Dust Seal)	(No Dust Seal)	
9-4, 33	3D39746G01	3D39745G01	18" ANSI Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G02	3D39745G02	3' ANSI Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G03	3D39745G03	6' ANSI Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G04	3D39745G04	18" JIS Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G05	3D39745G05	3' JIS Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G06	3D39745G06	6' JIS Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G07	3D39745G07	18" DIN Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G08	3D39745G08	3' DIN Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G09	3D39745G09	6' DIN Flame Arrestor with Ceramic Diffuser Probe
9-4, 33	3D39746G10	3D39745G10	18" ANSI Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G11	3D39745G11	3' ANSI Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G12	3D39745G12	6' ANSI Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G13	3D39745G13	18" JIS Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G14	3D39745G14	3' JIS Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G15	3D39745G15	6' JIS Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G16	3D39745G16	18" DIN Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G17	3D39745G17	3' DIN Flame Arrestor with Snubber Diffuser Probe
9-4, 33	3D39746G18	3D39745G18	6' DIN Flame Arrestor with Snubber Diffuser Probe
9-3, 32	3D39744G01		18" Heater Strut Assy.
9-3, 32	3D39744G02		3' Heater Strut Assy.
9-3, 32	3D39744G03		6' Heater Strut Assy.
11-1	4847B61G20		DIN 3' Cell Replacement Kit*
11-1	4847B61G21		DIN 6' Cell Replacement Kit*
11-1	4847B61G25		DIN 18" Cell Replacement Kit*
11-1	4847B61G26		ANSI 18" Cell Replacement Kit*
11-1	4847B61G27		ANSI 3' Cell Replacement Kit*
11-1	4847B61G28		ANSI 6' Cell Replacement Kit*
11-1	4847B61G29		JIS 18" Cell Replacement Kit*
11-1	4847B61G30		JIS 3' Cell Replacement Kit*
11-1	4847B61G31		JIS 6' Cell Replacement Kit*
	4849B94G01		ANSI High Sulfur/HCl Resistant Cell Only
11-1	4849B94G02		ANSI 18" Cell Replacement Kit, High Sulfur/HCl Resistant*
11-1	4849B94G03		ANSI 3' Cell Replacement Kit, High Sulfur/HCl Resistant*
11-1	4849B94G04		ANSI 6' Cell Replacement Kit, High Sulfur/HCl Resistant*

*Includes pad and wire.

Table 11-1. Replacement Parts for Probe (Continued)

Figure and Index No.	Part Number	Description
	4849B94G07	JIS High Sulfur/HCl Resistant Cell Only
11-1	4849B94G08	JIS 18" Cell Replacement Kit, High Sulfur/HCl Resistant*
11-1	4849B94G09	JIS 3' Cell Replacement Kit, High Sulfur/HCl Resistant*
11-1	4849B94G10	JIS 6' Cell Replacement Kit, High Sulfur/HCl Resistant*
	4849B94G13	DIN High Sulfur/HCl Resistant Cell Only
11-1	4849B94G15	DIN 3' Cell Replacement Kit, High Sulfur/HCl Resistant*
11-1	4849B94G16	DIN 6' Cell Replacement Kit, High Sulfur/HCl Resistant*
1-11	3D39003G16	ANSI 18" Abrasive Shield Assy.
1-11	3D39003G17	ANSI 3' Abrasive Shield Assy.
1-11	3D39003G18	ANSI 6' Abrasive Shield Assy.
1-11	3D39003G19	DIN 18" Abrasive Shield Assy.
1-11	3D39003G20	DIN 3' Abrasive Shield Assy.
1-11	3D39003G21	DIN 6' Abrasive Shield Assy.
1-11	3D39003G22	JIS 18" Abrasive Shield Assy.
1-11	3D39003G23	JIS 3' Abrasive Shield Assy.
1-11	3D39003G24	JIS 6' Abrasive Shield Assy.
	4513C61G03	18" Contact and Thermocouple Replacement Assy.
	4513C61G04	3' Contact and Thermocouple Replacement Assy.
	4513C61G05	6' Contact and Thermocouple Replacement Assy.

*Includes pad and wire.

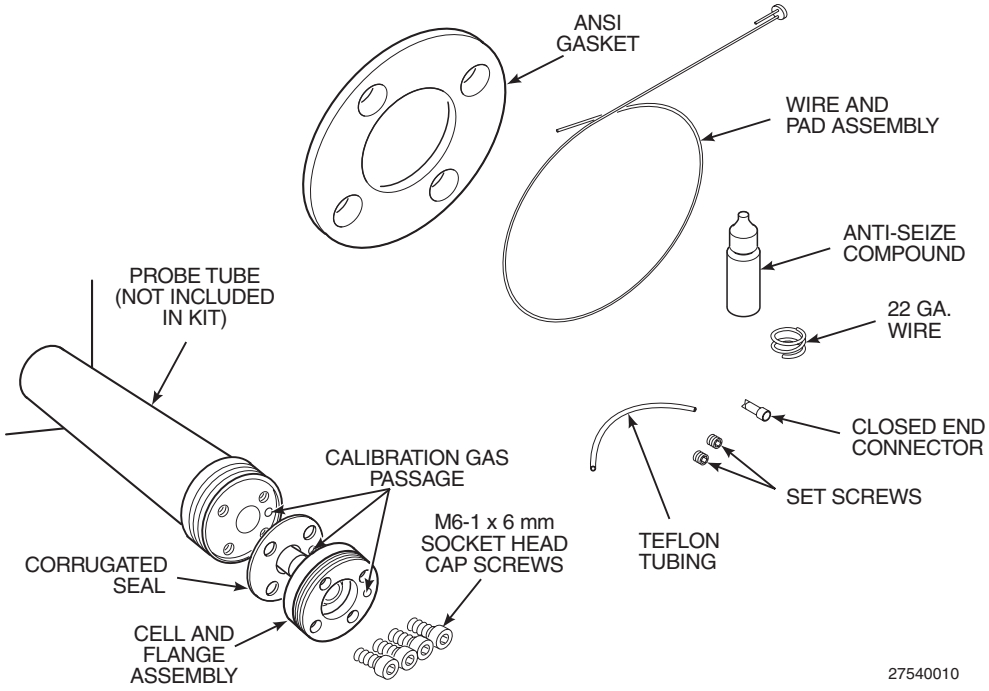


Figure 11-1. Cell Replacement Kit

Table 11-1. Replacement Parts for Probe (Continued)

Figure and Index No.	Part Number	Description
	4507C26G07	Bypass Gas Pickup Tube (3')
	4507C26G08	Bypass Gas Pickup Tube (6')
	4507C26G09	Bypass Gas Pickup Tube (9')
2-1	1U05677G01	Flame Arrestor with Ceramic Diffuser
2-2	1U05677G02	Flame Arrestor with Ceramic Diffuser and Dust Seal
2-2	1U05677G03	Flame Arrestor with Ceramic Diffuser and Spare Dust Seal
2-1	1U05677G04	Flame Arrestor with Snubber Diffuser
2-2	1U05677G05	Flame Arrestor with Snubber Diffuser and Dust Seal
2-2	1U05677G06	Flame Arrestor with Snubber Diffuser and Spare Dust Seal
9-10	1L03650H01	Flame Arrestor Diffusion Hub Setscrew (M5-0.8 x 5 mm)
2-8	263C152G01	Reference Gas Air Set
	771B635H01	Calibration Gas Flowmeter
11-2	3535B42G03	Probe Disassembly Kit
9-3, 35	5R10130H01	Strut Pressure Clamp
9-10	6292A74G02	Ceramic Diffusion Element Replacement Kit

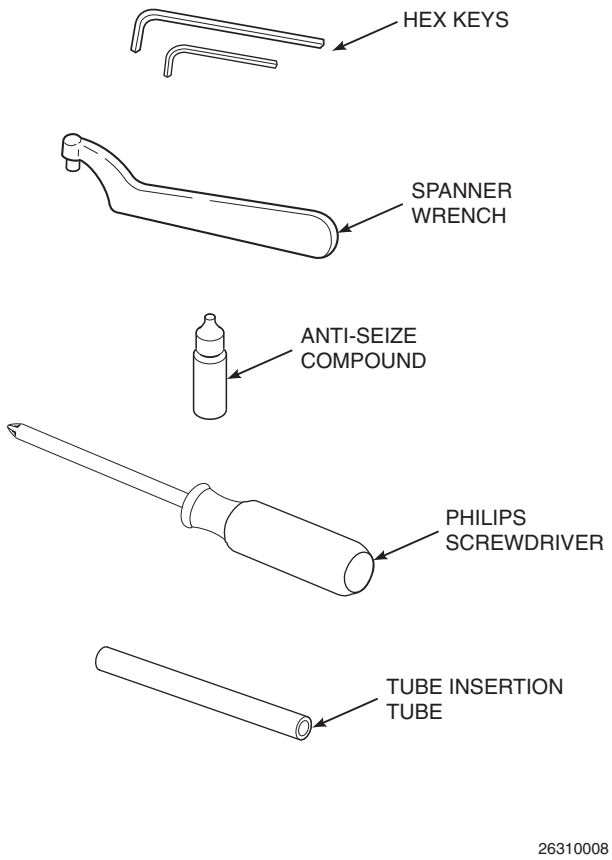


Figure 11-2. Probe Disassembly Kit

Table 11-2. Replacement Parts for Electronics

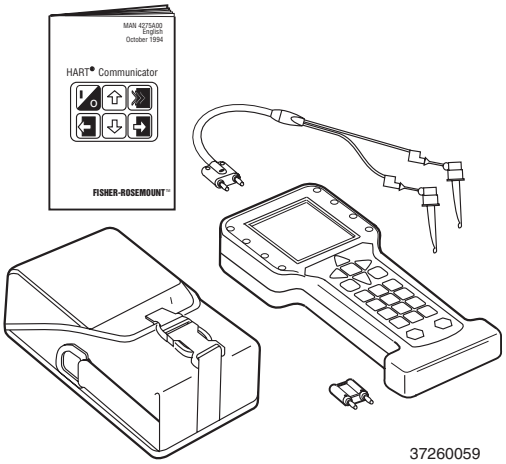
Figure and Index No.	Part Number	Description
9-3, 1, 17	5R10145G01	Cover, Blind
9-3, 1A	08732-0007-0002	Cover, with Window
9-3, 2	3D39861G01	Electronic Assembly
9-3, 4	4849B72H01	Membrane Keypad English
9-3, 4	4849B72H02	Membrane Keypad German
9-3, 4	4849B72H03	Membrane Keypad French
9-3, 4	4849B72H04	Membrane Keypad Spanish
9-3, 4	4849B72H05	Membrane Keypad Italian
9-3, 4A	6A00115G01	LOI Module (Local Operator Interface)
9-3, 11	4850B86G01	Housing
9-3, 15	08732-0002-0001	Termination Block Standard
9-3, 15	08732-0002-0002	Termination Block Transient Protected
9-3, 17A	120039078	O-Ring
9-3, 31	120039076	O-Ring
9-4, 2	3D39861G01	Electronic Assembly
9-4, 4	4849B72H01	Membrane Keypad English
9-4, 4	4849B72H02	Membrane Keypad German
9-4, 4	4849B72H03	Membrane Keypad French
9-4, 4	4849B72H04	Membrane Keypad Spanish
9-4, 4	4849B72H05	Membrane Keypad Italian
9-4, 4A	6A00115G01	LOI Module (Local Operator Interface)
9-4, 11	5R10146G04	Housing
9-4, 15	08732-0002-0001	Termination Block Standard
9-4, 15	08732-0002-0002	Termination Block Transient Protected
9-4, 17A	120039078	O-Ring
9-4, 24	6A00091G02	Junction Box
9-4, 26	120039076	O-Ring
9-4, 29	4849B92G20	Connecting Cable, Signal
9-4, 30	4849B92G21	Connecting Cable, Heater
9-4, 31	6A00122G01	Cable Assembly, 20 ft. (6 m)
9-4, 31	6A00122G02	Cable Assembly, 40 ft. (12 m)
9-4, 31	6A00122G03	Cable Assembly, 60 ft. (18 m)
9-4, 31	6A00122G04	Cable Assembly, 80 ft. (24 m)
9-4, 31	6A00122G05	Cable Assembly, 100 ft. (30 m)
9-4, 31	6A00122G06	Cable Assembly, 150 ft. (46 m)
9-4, 31	6A00122G07	Cable Assembly, 200 ft. (61 m)
9-4, 32	3D39866G01	Termination Block, Standard, Remote Probe Head
9-4, 32	3D39866G02	Termination Block, Transient Protected, Remote Probe Head
9-4, 34	4850B86G01	Housing

SECTION 12
OPTIONAL ACCESSORIES

HART HANDHELD 375 COMMUNICATOR

The HART Handheld 375 Communicator is an interface device that provides a common communication link to HART-compatible instruments, such as the Oxymitter 4000. HART Communications Protocol permits all the information available from the Oxymitter 4000's electronics to be transmitted over standard 4-20 mA signal wires. By attaching the HART handheld communicator at a termination point along the 4-20 mA signal line, a technician can diagnose problems and configure and calibrate the Hazardous Area Oxymitter 4000 as if he or she were standing in front of the instrument.

For more information, call Rosemount Analytical at 1-800-433-6076.



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ASSET MANAGEMENT SOLUTIONS (AMS)

Asset Management Solutions (AMS) software works in conjunction with the HART Communication Protocol and offers the capability to communicate with all HART plant devices from a single computer terminal.

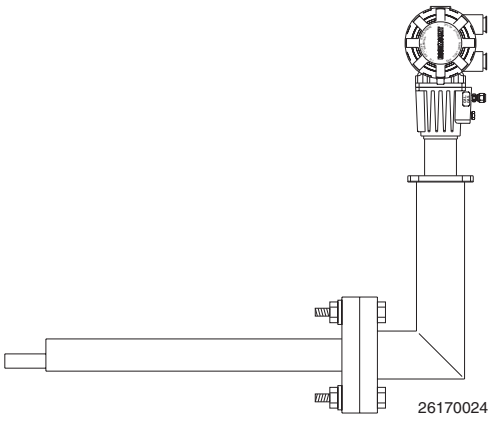
For more information, call Rosemount Analytical at 1-800-433-6076.

26170010

BY-PASS PACKAGES

The specially designed Rosemount Analytical By-Pass Package for oxygen analyzers has proven to withstand the high temperatures in process heaters while providing the same advantages offered by the in situ sensor. Inconel or Kanthal steel tubes provide effective resistance to corrosion, and the package uses no moving parts, air pumps, or other components common to other sampling systems.

For more information, call Rosemount Analytical at 1-800-433-6076.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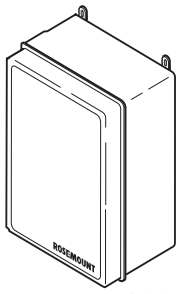
IMPS 4000 INTELLIGENT MULTIPROBE TEST GAS SEQUENCER

The IMPS 4000 Intelligent Multiprobe Test Gas Sequencer is housed within an IP56 (NEMA 4X) enclosure and has the intelligence to provide calibration gas sequencing of up to four Hazardous Area Oxymitter 4000 units to accommodate automatic and semi-automatic calibration routines.

This sequencer works in conjunction with the Hazardous Area Oxymitter 4000 CALIBRATION RECOMMENDED feature, eliminating out-of-calibration occurrences and the need to send a technician to the installation site. In addition, the SPS 4000 provides a remote contact input to initiate a calibration from a remote location and relay outputs to alert when a calibration is in progress, a Hazardous Area Oxymitter 4000 is out of calibration, calibration gases are on, or calibration gas pressure is low.

For more information, call Rosemount Analytical at 1-800-433-6076.



26170006

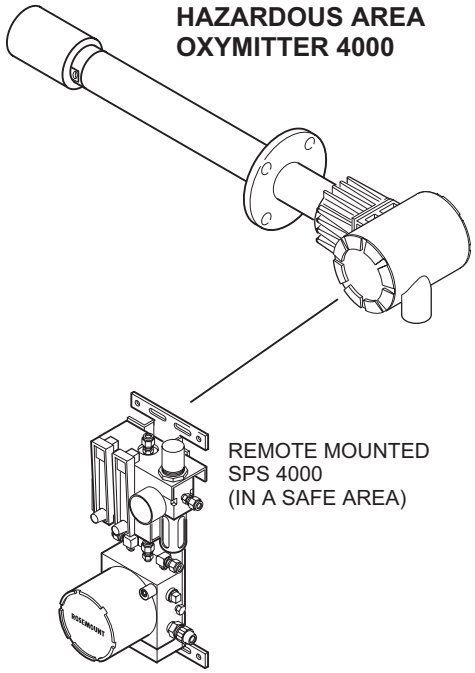
SPS 4000 SINGLE PROBE AUTOCALIBRATION SEQUENCER

Rosemount Analytical specifically designed the SPS 4000 Single Probe Autocalibration Sequencer to provide the capability to perform automatic or on-demand Oxymitter 4000 calibrations. The SPS 4000 system must be installed a remote, safe area if the Hazardous Area Oxymitter 4000 probe is installed in a hazardous area.

The SPS 4000 works in conjunction with the Oxymitter 4000's CALIBRATION RECOMMENDED feature, eliminating out-of-calibration occurrences and the need to send a technician to the installation site. In addition, the SPS 4000 provides a remote contact input to initiate a calibration from a remote location and relay outputs to indicate when a calibration is in progress or the Hazardous Area Oxymitter 4000 is out of calibration.

For more information, call Rosemount Analytical at 1-800-433-6076.

HAZARDOUS AREA OXYMITTER 4000



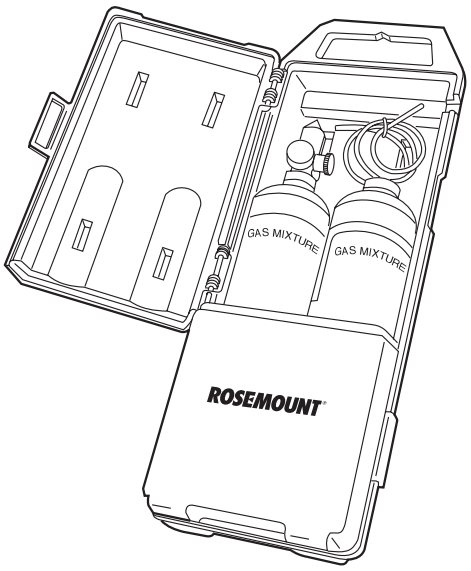
REMOTE MOUNTED SPS 4000 (IN A SAFE AREA)

26310009

O_2 CALIBRATION GAS

Rosemount Analytical's O_2 Calibration Gas and Service Kits have been carefully designed to provide a more convenient and fully portable means of testing, calibrating, and servicing Rosemount Analytical's oxygen analyzers. These lightweight, disposable gas cylinders eliminate the need to rent gas bottles.

For more information, call Rosemount Analytical at 1-800-433-6076.



26170021

SECTION 13
INDEX

This index is an alphabetized listing of parts, terms, and procedures having to do with the Hazardous Area Oxymitter. Every item listed in this index refers to a location in the manual by one or more page numbers.

WARRANTY

Rosemount warrants that the equipment manufactured and sold by it will, upon shipment, be free of defects in workmanship or material. Should any failure to conform to this warranty become apparent during a period of one year after the date of shipment, Rosemount shall, upon prompt written notice from the purchaser, correct such nonconformity by repair or replacement, F.O.B. factory of the defective part or parts. Correction in the manner provided above shall constitute a fulfillment of all liabilities of Rosemount with respect to the quality of the equipment.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY WHETHER WRITTEN, ORAL, OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OF FITNESS FOR PURPOSE).

The remedy(ies) provided above shall be purchaser's sole remedy(ies) for any failure of Rosemount to comply with the warranty provisions, whether claims by the purchaser are based in contract or in tort (including negligence).

Rosemount does not warrant equipment against normal deterioration due to environment. Factors such as corrosive gases and solid particulates can be detrimental and can create the need for repair or replacement as part of normal wear and tear during the warranty period.

Equipment supplied by Rosemount Analytical Inc. but not manufactured by it will be subject to the same warranty as is extended to Rosemount by the original manufacturer.

At the time of installation it is important that the required services are supplied to the system and that the electronic controller is set up at least to the point where it is controlling the sensor heater. This will ensure, that should there be a delay between installation and full commissioning that the sensor being supplied with ac power and reference air will not be subjected to component deterioration.

Instruction Manual
IB-106-340C Rev. 4.1
July 2004

Hazardous Area Oxymitter 4000

Hazardous Area
Oxymitter 4000

Part no. _____

Serial no._____

Order no._____

Emerson Process Management

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