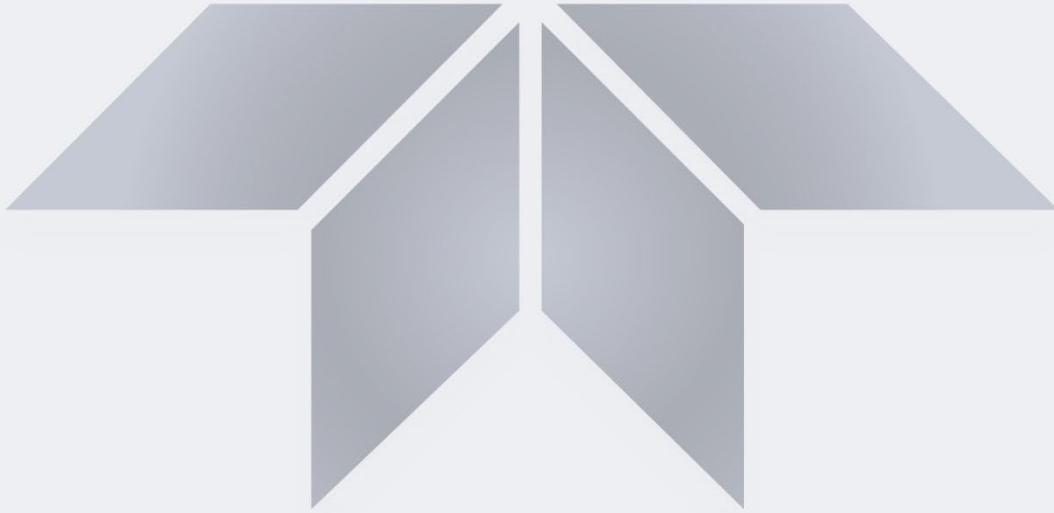




TELEDYNE API
Everywhereyoulook™



User Manual
OPTI-Sense 5200
with
Fault High, Zero Low, Customer-Supplied Power

© TELEDYNE API (TAPI)
9970 CARROLL CANYON ROAD
SAN DIEGO, CALIFORNIA 92131-1106
USA

Toll-free Phone: +1 800-324-5190
Phone: +1 858-657-9800
Fax: +1 858-657-9816
Email: api-sales@teledyne.com
Website: <http://www.teledyne-api.com/>

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TRADEMARKS

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SAFETY MESSAGES

Important safety messages are provided throughout this manual for the purpose of avoiding personal injury or instrument damage. Please read these messages carefully. Each safety message is associated with a safety alert symbol and is placed throughout this manual; the safety symbols are also located inside the instrument. It is imperative that you pay close attention to these messages, the descriptions of which are as follows:



WARNING: Electrical Shock Hazard



HAZARD: Strong oxidizer



GENERAL WARNING/CAUTION: Read the accompanying message for specific information.



CAUTION: Hot Surface Warning



Do Not Touch: Touching some parts of the instrument without protection or proper tools could result in damage to the part(s) and/or the instrument.



Technician Symbol: All operations marked with this symbol are to be performed by qualified maintenance personnel only.



Electrical Ground: This symbol inside the instrument marks the central safety grounding point for the instrument.

CAUTION

This product should only be installed, commissioned, and used strictly for the purpose and in the manner described in this manual. If you improperly install, commission, or use this instrument in any manner other than as instructed in this manual or by our Technical Support team, unpredictable behavior could ensue with possible hazardous consequences.

Such risks, whether during installation and commission or caused by improper installation/commissioning/use, and their possible hazardous outcomes include but are not limited to:



RISK	HAZARD
Liquid or dust/debris ingress	Electrical shock hazard
Improper or worn power cable	Electrical shock or fire hazard
Excessive pressure from improper gas bottle connections	Explosion and projectile hazard
Sampling combustible gas(es)	Explosion and fire hazard
Improper lift & carry techniques	Personal injury

Note that the safety of a system that may incorporate this product is the end user's responsibility.

For Technical Assistance regarding the use and maintenance of this instrument or any other Teledyne API product, contact Teledyne API's Technical Support Department:

Telephone: +1 800-324-5190
Email: api-techsupport@teledyne.com

or access any of the service options on our website at <http://www.teledyne-api.com/>

CONSIGNES DE SÉCURITÉ

Des consignes de sécurité importantes sont fournies tout au long du présent manuel dans le but d'éviter des blessures corporelles ou d'endommager les instruments. Veuillez lire attentivement ces consignes. Chaque consigne de sécurité est représentée par un pictogramme d'alerte de sécurité; ces pictogrammes se retrouvent dans ce manuel et à l'intérieur des instruments. Les symboles correspondent aux consignes suivantes :



AVERTISSEMENT : Risque de choc électrique



DANGER : Oxydant puissant



AVERTISSEMENT GÉNÉRAL / MISE EN GARDE : Lire la consigne complémentaire pour des renseignements spécifiques



MISE EN GARDE : Surface chaude



Ne pas toucher : Toucher à certaines parties de l'instrument sans protection ou sans les outils appropriés pourrait entraîner des dommages aux pièces ou à l'instrument.



Pictogramme « technicien » : Toutes les opérations portant ce symbole doivent être effectuées uniquement par du personnel de maintenance qualifié.



Mise à la terre : Ce symbole à l'intérieur de l'instrument détermine le point central de la mise à la terre sécuritaire de l'instrument.

MISE EN GARDE

Ce produit ne doit être installé, mis en service et utilisé qu'aux fins et de la manière décrites dans le présent manuel. Si vous installez, mettez en service ou utilisez cet instrument de manière incorrecte autre que celle indiquée dans ce manuel ou sous la direction de notre équipe de soutien technique, un comportement imprévisible pourrait entraîner des conséquences potentiellement dangereuses.

Ce qui suit est une liste, non exhaustive, des risques et résultats dangereux possibles associés avec une mauvaise utilisation, une mise en service incorrecte, ou causés mauvaise commission.



RISQUE	DANGER
Pénétration de liquide ou de poussière/débris	Risque de choc électrique
Câble d'alimentation incorrect, endommagés ou usé	Choc électrique ou risque d'incendie
Pression excessive due à des connexions de bouteilles de gaz incorrectes	Risque d'explosion et d'émission de projectile
Échantillonnage de gaz combustibles	Risque d'explosion et d'incendie
Techniques de manutention, soulèvement et de transport inappropriées	Blessure corporelle

Notez que la sécurité d'un système qui peut incorporer ce produit est la responsabilité de l'utilisateur final.

WARRANTY

WARRANTY POLICY (02024J)

Teledyne API (TAPI), a business unit of Teledyne Instruments, Inc., provides that:

Prior to shipment, TAPI equipment is thoroughly inspected and tested. Should equipment failure occur, TAPI assures its customers that prompt service and support will be available. (For the instrument-specific warranty period, please refer to the “Limited Warranty” section in the Terms and Conditions of Sale on our website at www.teledyne-api.com.)

COVERAGE

After the warranty period and throughout the equipment lifetime, TAPI stands ready to provide on-site or in-plant service at reasonable rates similar to those of other manufacturers in the industry. All maintenance and the first level of field troubleshooting are to be performed by the customer.

NON-TAPI MANUFACTURED EQUIPMENT

Equipment provided but not manufactured by TAPI is warranted and will be repaired to the extent and according to the current terms and conditions of the respective equipment manufacturer’s warranty.

PRODUCT RETURN

All units or components returned to Teledyne API should be properly packed for handling and returned freight prepaid to the nearest designated Service Center. After the repair, the equipment will be returned, freight prepaid.

The complete Terms and Conditions of Sale can be reviewed on our website.

CAUTION – Avoid Warranty Invalidation



Failure to comply with proper anti-Electro-Static Discharge (ESD) handling and packing instructions and Return Merchandise Authorization (RMA) procedures when returning parts for repair or calibration may void your warranty. For anti-ESD handling and packing instructions please refer to the manual, Fundamentals of ESD, PN 04786, in its “Packing Components for Return to Teledyne API’s Customer Service” section. The manual can be downloaded from our website at <http://www.teledyne-api.com>. RMA procedures can also be found on our website.

ABOUT THIS MANUAL

Note

We recommend that all users read this manual in its entirety before operating the instrument.

CONVENTIONS USED

In addition to the safety symbols as presented in the *Safety Messages* page, this manual provides *special notices* related to the careful and effective use of the instrument and related, pertinent information.

ATTENTION

COULD DAMAGE INSTRUMENT AND VOID WARRANTY

This special notice provides information to avoid damage to your instrument and possibly invalidate the warranty.

Important

IMPACT ON READINGS OR DATA

Provides information about that which could either affect accuracy of instrument readings or cause loss of data.

Note

Provides information pertinent to the proper care, operation or maintenance of the instrument or its parts.

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1. INTRODUCTION, CAUTIONS, AND SPECIFICATIONS

The Teledyne API Opti-Sense 5200 is a state-of-the-art Non Dispersive InfraRed (NDIR)-based sensor that is designed to monitor SIF4 (Silicon Tetrafluoride) concentration, typically at sub-atmospheric pressure.

The OPTI-Sense unit is designed to be mounted vertically. Horizontal mounting is also acceptable. Two KF16 fittings are provided to effectuate the pneumatic connections. Electrical connections are on the rear panel of the instrument. Power and control signals are applied through the DB15 connector. The RS-232 connector should be connected to a laptop computer if the graphical user interface (GUI) will be used.

The OPTI-Sense 5200 can be used qualitatively three minutes after power up. For accurate quantitative results, allow the unit to warm up for thirty minutes. The OPTI-Sense should be allowed to warm up overnight for applications in which low drift is critical. Purge and zero the instrument after the warm-up period is completed.

1.1. CAUTIONS

Please review these instructions carefully to ensure proper installation, operation and care of the system to minimize the risk of personal injury or product damage due to improper handling.



HAZARD: Toxic, Corrosive Gas

- SIF4 (Silicon Tetrafluoride) is a toxic, corrosive, nonflammable gas packaged at pressure up to 1000 psig. It has a sharp suffocating odor. The gas is colorless but fumes white in moist air. Hydrolyzes to very corrosive hydrofluoric acid on contact with moisture. Can cause severe chemical burns if inhaled or upon skin contact. When entering released area, wear self-contained breathing apparatus (SCBA). Fully protective suits are required in large releases.
- Install appropriate safety monitoring equipment wherever SIF4 is used.
- Materials in contact with SIF4 should be suitable for such use. 316L Stainless, Barium Fluoride (BaF₂), Teflon™, Chemraz™ are recommended.



WARNING: Electrical Shock Hazard

When performing any maintenance to the unit, make sure all DC power is disconnected from the unit



CAUTION: Risk of Damage to Instrument

Use only TAPI-recommended spare parts. Substitution parts could result in damage to the equipment, may create hazardous conditions, and will void the warranty.

1.2. SPECIFICATIONS

Table 1-1. Specifications

Parameter	Description
Measuring Principle	Non Dispersive IR absorption
Application	Measurement of SiF4 Absorbance
Dimensions (W x H x D)	4.72" x 8.66" x 3.15" (120 mm x 220 mm x 80 mm)
Light Source	Infrared light source
Response Time (time to respond to step function of SIF4)	< 2 seconds to 90% of step
Reading Update	1 reading/second
Analog scaling/Filter type	1-10 VDC corresponds to (0.0-0.2) units of absorbance, < 10Watts, factory set
Leak Testing	Vacuum Leak-Tight Cell
Gas Connection	KF16-300 Series stainless steel
Pressure Range	200mT-5000mT
Temperature Range	5 – 45 °C
Power Input	15 VDC Customer Supplied, 350 mA max during normal operation 24VDC Customer Supplied
Weight	7 Lbs. (3.17 kg)
Digital Interface	RS-232, with GUI Interface
Software	Embedded (standard) Labview GUI interface
Compliance	CE approved

1.3. FEATURES

- Zero by Voltage Command
- Fault Digital Output (DO) indicates instrument errors.
- 1-10 Volt Analog Output
- Overvoltage Protection

2. MECHANICAL INSTALLATION

ATTENTION

Ensure adequate space to access connectors and to remove cover when necessary for servicing.
 Ensure adequate clearance to allow free air flow for cooling, and to avoid high heat-generating equipment.

Sensor dimensions are shown in Figure 2-1.

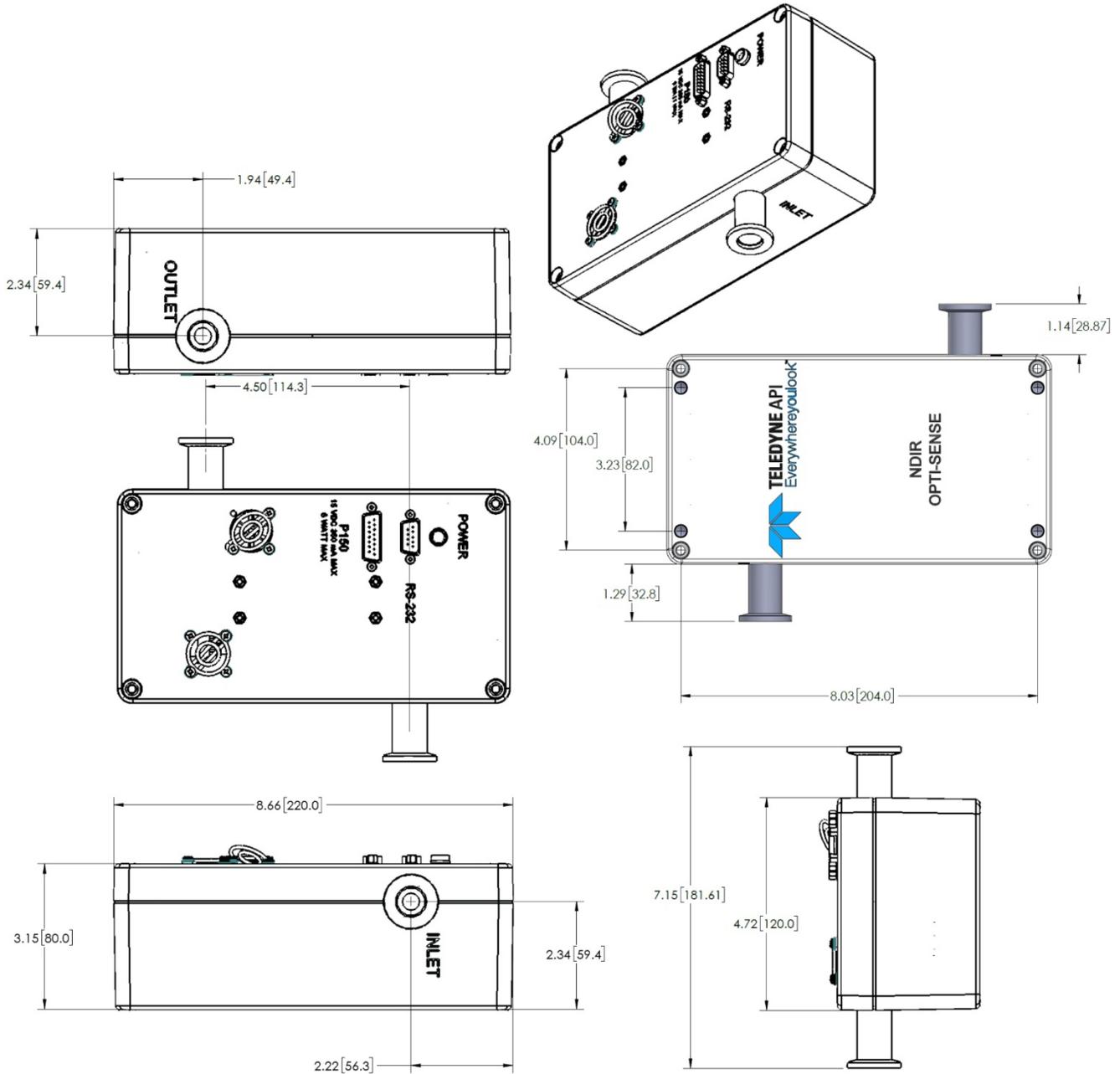


Figure 2-1. Mechanical Dimensions

The OPTI-Sense unit is designed to be mounted vertically. Figure 2-2 below shows the front view of the OPTI-Sense unit, with KF16 inlet connector on the upper right and outlet connector on the lower left. Horizontal mounting is also acceptable.

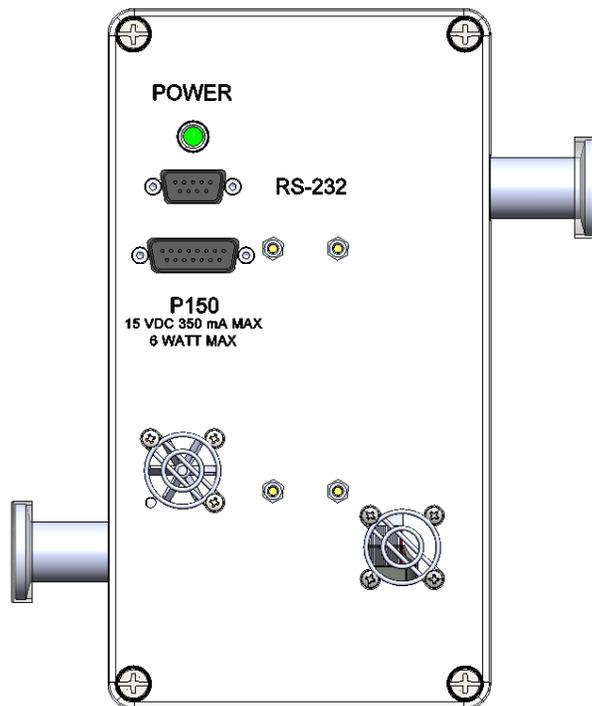


Figure 2-2. Inlet (right) and Outlet (left) Connectors

The flow of gas through the unit should be interrupted when there is a possibility of particulate matter soiling the windows or lodging onto the cell surfaces. Particulate matter or films deposited onto the cell surfaces will render the measurement inaccurate and the unit inoperable.

It is strongly recommended that the OPTI-sense unit be periodically purged and zeroed using reference gas (see Section 4).

3. ELECTRICAL CONNECTIONS

Refer to Figure 2-2 for this section. The status light is a steady green when instrument power is on. DB9 connector is for RS-232 communications and the DB15 connector is for the input/outputs (I/O).

Opti-Sense is marked with the appropriate power rating required for the unit to work and function as designed. Note the supply voltage and current, which are shown on the label.

3.1. RS-232 CONNECTOR

If the OPTI-Sense Graphical User Interface (GUI) software is used, the RS-232 output should be connected to the COM1 port of the computer running the GUI software.

3.2. I/O CONNECTOR

Table 3-1, below, shows the I/O connector pinout.

Table 3-1. I/O Connector Pinout

Pin	Connection	Notes
1	N/C	
2	Analog Signal Out	1-10 Volt Range Scale is factory programmable.
3	Digital Return (24 VDC)	See note below.
4	Digital Input (DI) for Zero Command	Normally high. Pull low for 200 ms to zero.
5	N/C	
6	N/C	
7	15 VDC Power Input	350 mA max during normal operation.
8	24 VDC Power Input	
9	Analog Return (15 VDC)	See note below.
10	Fault Digital Output (DO)	HIGH indicates fault. LOW indicates no fault.
11	Digital Return (24 VDC)	See note below.
12	N/C	
13	Analog Return (15 VDC)	See note below.
14	Analog Return (15 VDC)	See note below.
15	Digital Return (24 VDC)	See note below.

Note: Pins 3,11,15 are internally shorted together for the Digital/24VDC return.
Pins 9,13,14 are internally shorted together for the Analog/15VDC return.
For proper grounding, please connect a ground/return to at least one pin from each group.

3.2.1. FAULT DO SPECIFICATIONS

The Fault DO is configured normally low; the output is high when an error has been detected.

For most error conditions, the Fault DO will continue to indicate a fault until the unit is successfully re-zeroed or rebooted. However, some errors are inherently intermittent in nature, and are cleared automatically when they no longer affect instrument data. For example, the three minute instrument warm-up period is indicated as an error to allow detection of accidental power disruption; the Fault DO will indicate no fault when the warm-up period is over.

- Operating Voltage (Power, pin 8): 24VDC \pm 10%
- Output circuit:
 - Output HIGH Voltage: 24 VDC \pm 10%, 203 Ω output resistance.
 - Output LOW Voltage: 4.9 \pm 0.1 VDC, 203 Ω output resistance.

3.2.2. OVER-VOLTAGE PROTECTION

Maximum Ratings For DB15 Input Lines

- Forward voltage: 30V
- Reverse voltage: 50V

DB15 output lines are short-circuit protected.

4. SYSTEM OPERATION

The unit is designed to be left powered on at all times. Refer to the zeroing instructions presented next in Section 4.1.

4.1. ZEROING THE OPTI-SENSE

The unit should be fully warmed up and purged of SiF₄ before zeroing. Nitrogen, Argon, Oxygen or vacuum purge are acceptable. Note that the unit will not zero during the three-minute warm-up time and will report an error if a zeroing request is received during the warm-up period. (This error can be cleared by zeroing the unit once the warm-up period is over.) The zero signal command is configured active low; the line must be held low for at least 200 ms.

- Operating Voltage (HIGH): 24VDC \pm 10%
- Operating Voltage (LOW): 0VDC Nominal, 4VDC Max.

Zeroing will take approximately five seconds during normal operation.

Zeroing the OPTI-sense unit is essential to establish a stable baseline reading. TAPI recommends zeroing the unit as often as possible. In applications where baseline drift is critical, zeroing before every measurement cycle might be required.

Internal volume of the unit is approximately 40 cc, a minimum of 10 volumes exchanges is recommended before zeroing the OPTI-sense. Please note that internal volume of tubing connected to the unit should be considered when calculating purge time and flow rate.

Note that the OPTI-Sense has analog output range 1-10 volt. After the sensor is zeroed, the analog output will read one volt.

5. INSTRUMENT ERROR CODES

Table 5-1 shows the instrument error codes, their causes, and corrective action.

Table 5-1. Instrument Error Codes

Error Code	Cause	Corrective Action
2	Too much light - out of design range. The instrument may have been zeroed while SiF4 was present.	Purge and zero the instrument.
3	No light detected.	<p>Purge and zero the instrument. If error persists after zeroing:</p> <ul style="list-style-type: none"> • Do not open the unit without prior permission from TAPI. • Contact TAPI immediately for service instructions. It may be possible to repair your unit in situ. • If you do remove the unit, check the KF16 ports for powder contamination. Powder contamination indicates presence of particulate matter or a deposited film. Make sure that provisions are in place to prevent particulate matter or film deposition onto the surfaces of the absorption cell.
4	Too much light - signal cannot be measured. The instrument may have been zeroed while SiF4 was present.	Purge and zero the instrument.
5	Instrument warming up.	Will clear automatically three minutes after the instrument boots up.
6	A zeroing request was invalid because the instrument was warming up. The instrument did not honor the zeroing request.	Wait for the three minute warm-up period to complete, then re-zero the instrument.
7	Insufficient light.	Same as for Error Code 3.
8	Timing error.	Purge and zero the instrument. Contact TAPI if the problem occurs repeatedly.
9	Missed reading.	Purge and zero the instrument. Contact TAPI if the problem occurs repeatedly.

6. TECHNICAL ASSISTANCE

Please contact our Technical Support department for any technical assistance needed:

Teledyne API Technical Support
9970 Carroll Canyon Road
San Diego, California 92131-1106 USA

Toll-free Phone: +1 800-324-5190

Phone: +1 858-657-9800

Fax: +1 858-657-9816

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