Instructions 95-8541

TXL Series
Oxygen and Toxic Gas Detectors

DET-TRONICS
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4/03 95-8541

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DET-TRONICS®

INSTRUCTIONS

TXL Series
Oxygen and Toxic Gas Detectors

APPLICATION

The TXL family of detectors provide cost-effective gas detection using a reliable electrochemical sensor. Detector output is a two-wire loop-powered 4-20 mA analog signal. The output signal is compliant with industry standards and can be routed to any standard 4-20 mA analog input receiver or controller. An eight character alphanumeric LCD display indicates the gas type and concentration in PPM. All electronic circuitry is contained within an epoxy-coated aluminum enclosure with NEMA 4 rating Non-intrusive calibration is easily performed by actuating a magnetic reed switch with a hand-held magnet.

TXL detectors are intended for life safety protection in hazardous applications including petrochemical, general industrial, municipal, and commercial facilities. The TXL product family provides extremely low power consumption, and can be installed with or without zener diode barriers depending upon installation area requirements.

FEATURES

- Low-cost
- Easy to install
- Intrinsically-safe
- NEMA 4 aluminum enclosure
- 8-character LCD gas level display
- Magnetic, non-intrusive calibration
- 2-wire, loop-powered 4-20 mA output
- Reliable electrochemical sensor

SPECIFICATIONS

ALL TXL MODELS

TRANSMITTER OUTPUT—
4–20 mA linear current signal.

DISPLAY—
8 character LCD.

OPERATING POWER—
24 VDC (12 to 30 VDC). 75 milliwatts maximum.

WIRING—
2-conductor, stranded and shielded.

MAXIMUM CABLE LENGTH—
Up to 4,000 feet using 20 gauge stranded cable.

CONNECTIONS—
Screw terminal.

CALIBRATION—
1-person, non-intrusive magnetic switch on cover.

ENCLOSURE—
NEMA 4, epoxy-coated aluminum enclosure.

SENSOR HOUSING—
Aluminum standard (stainless steel option available).

DIMENSIONS—
4.65" W x 4.5" H x 2.2" D.

SHIPPING WEIGHT—
1 lb (0.5 kg).

CERTIFICATION—
UL approved when properly installed for:
Class I, Groups A, B, C and D;
Class II, Groups E, F and G;
Class III.
CE and DEMKO approvals.

IS BARRIER—
Voc ≤ Vmax = 30 vdc,
Isc ≤ Imax = 125 ma,
Ca ≥ Ci + C cable,
La ≥ Li + L cable.

Suggested barrier models 9002/13-280/110/00 or 9002/13-252/121/04 manufactured by R. Stahl, Inc.

MODEL TXL-H2S

MEASUREMENT RANGE—
0-500 PPM standard (other ranges are field selectable).

ACCURACY—
±2 PPM or ±10% of applied gas concentration.

LINEARITY—
±5%.

REPEATABILITY—
±5%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 1.

TEMPERATURE RANGE—
–20°C to +50°C (–4°F to +122°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
2 years.

Table 1—Cross Sensitivity of H_2S Sensor

Gas	Level	Reading
Carbon Monoxide	50 ppm	0
Hydrogen Sulfide	10 ppm	10
Sulfur Dioxide	2 ppm	0
Nitrogen Dioxide	3 ppm	0
Nitric Oxide	25 ppm	0
Chlorine	0.5 ppm	0
Hydrogen	100 ppm	0
Ethylene	100 ppm	0
Carbon Dioxide	5000 ppm	0
Ammonia	50 ppm	0

MODEL TXL-NH3

MEASUREMENT RANGE—
0-200 PPM standard (other ranges are field selectable).

ACCURACY—
±5 PPM or ±10% of applied gas concentration.

LINEARITY—
>10% full scale.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 2.

TEMPERATURE RANGE—
–15°C to +40°C (+5°F to +104°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
1 year.

MODEL TXL-CO

MEASUREMENT RANGE—
0-999 PPM standard (other ranges are field selectable).

ACCURACY—
±2 PPM or ±10% of applied gas concentration.

LINEARITY—
±<5%.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 3.

TEMPERATURE RANGE—
–15°C to +40°C (+5°F to +104°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
2 years.

Table 2—Cross Sensitivity of NH_3 Sensor

Gas	Level	Reading
Carbon Monoxide	1000 ppm	0
Carbon Dioxide	5000 ppm	0
Hydrogen Sulfide	10 ppm	0
Hydrochloric Acid	5 ppm	0
Phosphine	300 ppb	0
Sulfur Dioxide	2 ppm	0
Nitrogen	100%	0
Chlorine	1 ppm	0
Hydrogen	1%	0
Hydrogen Cyanide	10 ppm	0
Hydrogen Selenide	100 ppb	0
Diborane	100 ppb	0
Arsine	1 ppm	0
Germane	1 ppm	0
Hydrogen Fluoride	4	0
Alcohols	1000 ppm	0

Table 3—Cross Sensitivity of CO Sensor

Gas	Level	Reading
Carbon Monoxide	100 ppm	100
Hydrogen Sulfide	25 ppm	0
Sulfur Dioxide	50 ppm	0.5
Nitrogen Dioxide	800 ppm	20
Nitric Oxide	50 ppm	8
Chlorine	2 ppm	0
Hydrogen	100 ppm	0
Ethylene	100 ppm	85
Ethanol	2000 ppm	3
Ammonia	100 ppm	0
Iso-propanol	200 ppm	0
Acetone	1000 ppm	0
Acetylene	40 ppm	80

MODEL TXL-NO2

MEASUREMENT RANGE—
0-50 PPM standard (other ranges are field selectable).

ACCURACY—
±0.2 PPM or ±10% of applied gas concentration.

LINEARITY—
>10% full scale.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 4.

TEMPERATURE RANGE—
–20°C to +40°C (–4°F to +104°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
2 years.

MODEL TXL-PH3

MEASUREMENT RANGE—
0-20 PPM standard (other ranges are field selectable).

ACCURACY—
±0.2 PPM or ±10% of applied gas concentration.

LINEARITY—
>10% full scale.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 5.

TEMPERATURE RANGE—
–20°C to +50°C (–4°F to +122°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
2 years.

Table 4—Cross Sensitivity of NO_2 Sensor

Gas	Level	Reading
Carbon Monoxide	1000 ppm	0
Carbon Dioxide	5000 ppm	0
Hydrochloric Acid	5 ppm	0
Nitrogen	100%	0
Hydrogen	1%	0
Hydrogen Sulfide	10 ppm	0
Ozone	1 ppm	0.7
Chlorine	1 ppm	3
Alcohols	1000 ppm	0

Table 5—Cross Sensitivity of PH_3 Sensor

Gas	Level	Reading
Arsine	150 ppb	120 ppb
Diborane	300 ppb	100 ppb
Sulfur Dioxide	5 ppm	1 ppm
Silane	1000 ppb	900 ppb
Germane	600 ppb	510 ppb

MODEL TXL-SO2

MEASUREMENT RANGE—
0-20 PPM standard (other ranges are field selectable).

ACCURACY—
±0.2 PPM or ±10% of applied gas concentration.

LINEARITY—
>10% full scale.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 6.

TEMPERATURE RANGE—
–20°C to +50°C (–4°F to +122°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
2 years.

MODEL TXL-HCN

MEASUREMENT RANGE—
0-50 PPM standard (other ranges are field selectable).

ACCURACY—
±2 PPM or ±10% of applied gas concentration.

LINEARITY—
>10% full scale.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 7.

TEMPERATURE RANGE—
–15°C to +40°C (+5°F to +104°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
1 year.

Table 6—Cross Sensitivity of SO_2 Sensor

Gas	Level	Reading
Carbon Monoxide	300 ppm	<3 ppm
Hydrogen Sulfide	15 ppm	0
Nitric Oxide	35 ppm	0
Nitrogen Dioxide	5 ppm	–5 ppm

Table 7—Cross Sensitivity of HCN Sensor

Gas	Level	Reading
Carbon Monoxide	1000 ppm	0
Carbon Dioxide	5000 ppm	0
Hydrochloric Acid	5 ppm	0
Phosphine	300 ppb	0
Chlorine	5 ppm	–1
Hydrogen	1%	0
Hydrogen Sulfide	10 ppm	0
Nitrogen	100%	0
Hydrogen Fluoride	3 ppm	0
Alcohols	1000 ppm	0

MODEL TXL-CL2

MEASUREMENT RANGE—
0-20 PPM standard (other ranges are field selectable).

ACCURACY—
±0.2 PPM or ±10% of applied gas concentration.

LINEARITY—
>10% full scale.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 8.

TEMPERATURE RANGE—
–20°C to +40°C (–4°F to +104°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
18 months.

MODEL TXL-CLO2

MEASUREMENT RANGE—
0-9.9 PPM standard (other ranges are field selectable).

ACCURACY—
±0.2 PPM or ±10% of applied gas concentration.

LINEARITY—
>10% full scale.

REPEATABILITY—
<±3%.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 9.

TEMPERATURE RANGE—
–15°C to +40°C (+5°F to +104°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
18 months.

Table 8—Cross Sensitivity of Cl_2 Sensor

Gas	Level	Reading
Hydrogen Sulfide	25 ppm	–16 ppm
Nitrogen Dioxide	50 ppm	1.2 ppm
Hydrogen Chloride	9 ppm	1.2 ppm
Sulfur Dioxide	50 ppm	9 ppm
Carbon Dioxide	2000 ppm	0
Ammonia	50 ppm	–2 ppm

Table 9—Cross Sensitivity of ClO_2 Sensor

Gas	Level	Reading
Carbon Monoxide	1000 ppm	0
Carbon Dioxide	5000 ppm	0
Hydrochloric Acid	5 ppm	0
Chlorine	5 ppm	–1
Hydrogen	1%	0
Hydrogen Sulfide	10 ppm	0
Nitrogen	100%	0
Hydrogen Fluoride	3 ppm	0
Alcohols	1000 ppm	0

MODEL TXL-O2

MEASUREMENT RANGE—
0-40% by volume standard (other ranges are field selectable).

ACCURACY—
0.5% by volume.

LINEARITY—
±0.5% O_2.

REPEATABILITY—
±0.5% O_2.

RESPONSE TIME—
T90 < 20 seconds.

SENSOR CROSS SENSITIVITY—
See Table 10.

TEMPERATURE RANGE—
–15°C to +40°C (+5°F to +104°F).

HUMIDITY RANGE—
15 to 90% (non-condensing).

WARRANTY—
2 years.

Table 10—Cross Sensitivity of O_2 Sensor

Gas	Level	Reading
Carbon Dioxide	5%	<0.5% O_2 Reading
Hydrogen	2%	<0.1% O_2 Reading

IMPORTANT SAFETY AND WIRING NOTES

WARNING

Be sure to read and understand the entire instruction manual before installing or operating the gas detection system. Only qualified personnel should install, maintain or operate the system.

WARNING

The wiring procedures in this manual are intended to ensure proper functioning of the device under normal conditions. However, because of the many variations in wiring codes and regulations, total compliance with these ordinances cannot be guaranteed. Be certain that all wiring complies with the NEC as well as all local ordinances. If in doubt, consult the authority having jurisdiction before wiring the system.

WARNING

Power must be switched off at the source during all wiring operations. Each TXL detector must be installed with an approved, power-limiting zener diode barrier installed in a non-hazardous area. Only the TXL gas detector may be located within the hazardous area.

WARNING

To maintain the intrinsically safe approval rating, the TXL detector wiring must be routed through a zener diode barrier, which meets the entity parameters as described in the Specifications section of this manual. The selected barrier shall be approved with intrinsically safe circuits for the hazardous location class and group as appropriate for the application. The cable capacitance plus the transmitter capacitance (Ci) must be less than or equal to the Ca on the barrier. The cable inductance plus the transmitter inductance (Li) must be less than or equal to the La on the barrier. The barrier must be located in a non-hazardous area.

WARNING

All intrinsically safe wiring must be kept separate from non-intrinsically safe wiring. Terminate barrier earth ground to the ground bus of the power distribution panel. Resistance to ground must not be greater than 1.0 ohm.

WARNING

Electrical apparatus connected to an intrinsically safe system must not generate more than 250 Vrms with respect to earth ground.

WARNING

Installation must be in accordance with the barrier manufacturer's instructions and with article 504/505 of the National Electrical Code (NEC), and ANSI/NFPA 70.

WARNING

Barrier enclosure must meet the requirements of ANSI/ISA S82 for use in non-hazardous or Class 1, Division 2, Groups A, B, C, D hazardous locations. Always use a UL listed or NRTL approved dust-tight enclosure and conduit fitting appropriate for the environmental protection required in Class II, Division 2, Groups E, F, G and Class III hazardous areas.

WARNING

The detector wiring must be in conduit or armored cable. For Class II, Division 1 and Division 2 installations, use only dust-tight rated conduit fittings or cable glands approved for the application safety requirements.

INSTALLATION

LOCATING THE GAS DETECTOR

Identifying potential leak sources and leak accumulation areas is the first step in determining the best detector mounting locations. In addition, identification of air current/wind patterns within the protected area is useful in predicting gas leak dispersion behavior, especially outdoors. This information should be used to identify optimum sensor installation points. The most effective number and placement of detectors varies depending on the conditions at the job site. The individual designing the installation must often rely on experience and common sense to determine the detector quantity and best locations to adequately protect the area. Note that it is typically advantageous to locate detectors where they are accessible for maintenance, and also where the digital display can be easily seen. Locations near excessive heat/vibration sources should be avoided if possible.

Final suitability of possible gas detector locations should be verified by conducting a job site survey. Gas detector area of coverage is a subjective evaluation, and may require long-term empirical data to confirm effectiveness. A typical rule of thumb is that one detector can cover a 900 square foot area. However, this rule of thumb is subject to change depending upon specific application properties and requirements.

NOTE

For intrinsically safe installations, only the TXL detector can be located in a hazardous area. The barrier and controller must be located in a non-hazardous area.

MOUNTING REQUIREMENTS

The TXL Series is provided with built-in mounting holes that will accept #8 x 1" mounting screws. The cover must be removed from the TXL for access to the mounting holes. See Figure 1. Always ensure that the mounting surface is vibration-free and can suitably support the total weight of the TXL detector without assistance from electrical cabling or conduit system.

The TXL Series of gas detectors is classified intrinsically safe for Class I, Division 1, Groups A, B, C, and D atmospheres; and Class II, Division 1, Groups E, F, G, and Class III areas when used with specified barrier. Intrinsically safe approval was completed in 20.9% O_2 atmosphere only.

For Class I, Division 1 hazardous areas, the use of certified intrinsically safe cabling is recommended for use with the TXL to ensure that all applicable hazardous area installation requirements are fulfilled.

DEVICE MOUNTING ORIENTATION

It is recommended to always install the TXL Series gas detector with the sensor pointing downward. While the TXL is not position-sensitive in terms of sensor operation, the sensor protection hydrophobic filter will provide optimum performance if the sensor is installed pointing downward. Accumulation of contaminants on the sensor may occur if the device is installed with the sensor pointing upward or sideways.

DIGITAL DISPLAY VISIBILITY

It is recommended to select a mounting orientation where the display is easily visible to personnel within the area.

24 VDC POWER WIRING

Continuous, two-conductor stranded and shielded 20 AWG cable, such as Belden #8762 or # 9154 is recommended for use with the TXL. Conduit is highly recommended for improved shielding and cable protection.

Calculate the total system power consumption rate in watts from cold start-up. Select a linear power supply with adequate capability for the calculated load. Ensure that the selected power supply provides regulated and filtered 24 VDC output power for the entire system.

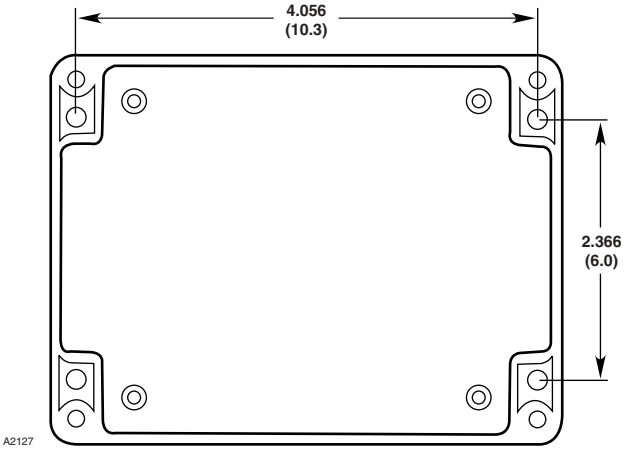


Figure 1—Mounting Dimensions of the TXL Detector in Inches (CM)

If battery back-up power is required, use a float type battery charging system. If using a battery back-up power system, calculate "normal, alarm, and recharge" battery operation duration requirements if applicable, then select a charger and batteries that will meet these requirements.

If an existing source of 24 VDC power is being utilized, verify that no high levels of noise, ripple, or electromagnetic interference are present on the power conductors or the system earth ground. Marginal input power sources can result in nuisance faults and insufficient detector sensitivity.

Always use proper cable type and diameter for input power as well as for output signal wiring. Determine if voltage drops will occur within the installation. The TXL detector should receive 24 VDC at the detector. Consider the use of field-installed power supplies or power distribution cabinets if long power cable runs result in unacceptable voltage drops. A properly sized master power fuse or breaker on the system power circuit is highly recommended.

CALCULATING MAXIMUM CABLE LENGTH

The maximum cable length is determined by the capacitance and inductance of the cable, and must be equal to, or less than, the capacitance (Ca) and inductance (La) values indicated on the barrier being used.

$$\text{Maximum Distance} = \frac{\text{Ca on barrier}}{\text{Cable capacitance / ft.}}$$

$$\text{Maximum Distance} = \frac{\text{La on barrier}}{\text{Cable inductance / ft.}}$$

NOTE

Because Ci = 0 and Li = 0, they are not part of this formula.

The shortest of these two distances is the maximum wiring distance.

NOTE

If cable parameters are unknown, 60 pf / ft. and 0.2 µh / ft. must be used to calculate maximum distance.

Do not exceed 4000 feet total field cabling length using 20 AWG conductor size.

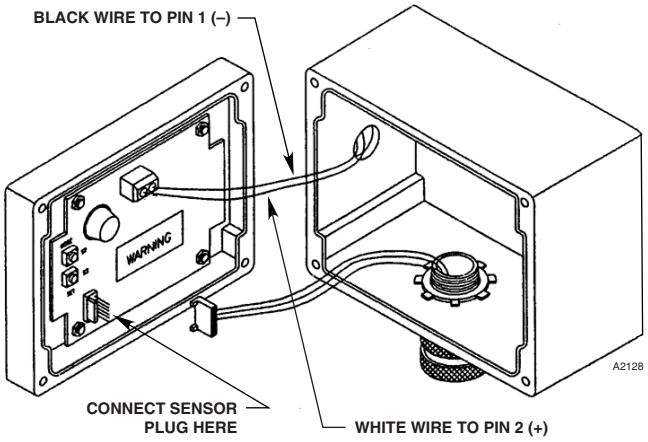


Figure 2—Inside View of the TXL Detector

WIRING TERMINATION

Ensure that all cables are terminated properly. The required screw terminal torque range is 0.4-0.5 Nm.

Connect the white wire to pin 2 (+) and the black wire to pin 1 (–) inside the TXL enclosure. See Figure 2.

For toxic sensors, remove the jumper wire from the sensor plug, then plug the sensor into the 6-pin connector on the inside of the enclosure cover. See Figure 3.

Connect the white wire from pin 1 of the TXL and the black wire from pin 2 of the TXL to the barrier as shown in Control Drawing No. P-1115. Connect the shield to the barrier case.

Connect a length of two-conductor shielded cable from the barrier to the controller as shown in Control Drawing No. P-1115. Connect the shield to the barrier case at the barrier end and to the controller case at the controller end. Connect the barrier and controller cases to earth ground at the controller.

Refer to the controller manual for instructions on wiring the controller.

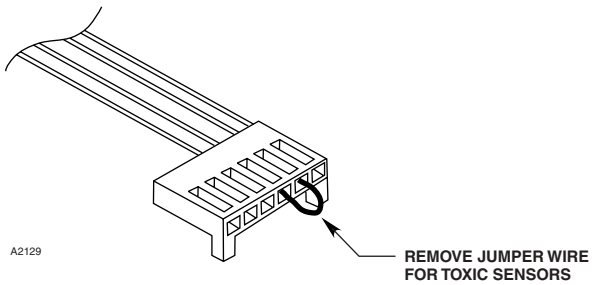


Figure 3—Sensor Plug

CONTROL DRAWING

DATE	REV.	SYM	REVISION DIRECTIVE	DR.	APP.
5/21/02	0.1		NEW DRAWING	AC	JS
5/21/02	A		RELEASED DRAWING	AC	

HAZARDOUS LOCATION — NONHAZARDOUS LOCATION

Class I,II,III, Division 1, Groups A-G Hazardous Locations or Class I, Zone 0 IIC

CALCULATE CABLE PARAMETERS:

1. Calculate "C cable" = $\frac{\text{Ca on barrier}}{\text{Cable Capacitance/ft}}$: MAXIMUM DISTANCE
2. Calculate "L cable" = $\frac{\text{La on barrier}}{\text{cable inductance/ft}}$: MAXIMUM DISTANCE

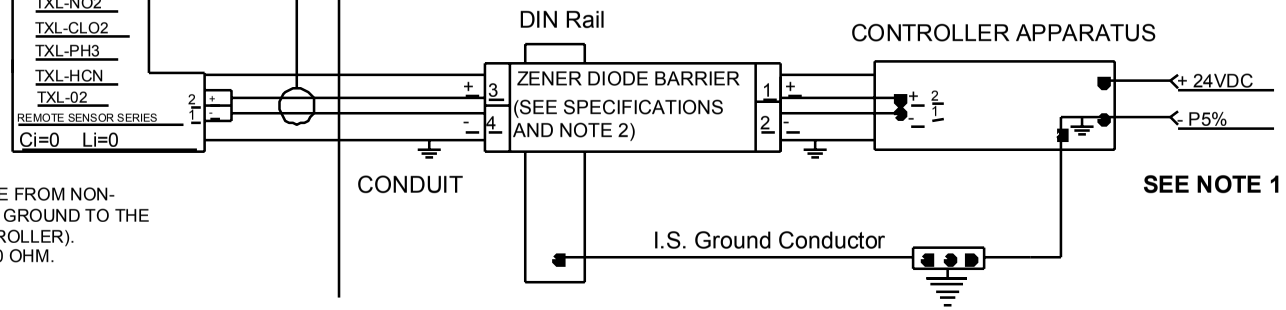
(Note: Because Ci=0 and Li=0, they are not part of this formula)

The shortest of these two distances is the maximum distance. Note: If cable parameters are unknown 60pf/ft and 0.20uh/ft must be used to calculate maximum distance. Because of circuit limitations, do not run cable in excess of 4,000ft even if the above formulas allow a longer length.

MODEL:
- TXL-CO
- TXL-CL2
- TXL-H2S
- TXL-H2S1
- TXL-H2S2
- TXL-SO2
- TXL-NH3
- TXL-NO2
- TXL-CLO2
- TXL-PH3
- TXL-HCN
- TXL-02

REMOTE SENSOR SERIES

Ci=0 Li=0



-WARNING-

ALL INTRINSICALLY SAFE WIRING SHALL BE KEPT SEPARATE FROM NON-INTRINSICALLY SAFE WIRING. TERMINATE BARRIER EARTH GROUND TO THE GROUND BUS OF THE POWER DISTRIBUTION PANEL (CONTROLLER). RESISTANCE TO GROUND MUST NOT BE GREATER THAN 1.0 OHM.

Barrier Specifications:

Voc≤Vmax = 30vdc
Isc≤Imax = 125ma
Ca≤Ci+C cable
La≤Li+L cable

Suggested Manufacturer = R. Stahl Inc.
Model No's 9002/13-280/110/00 or
9002/13-252/121/04

-WARNING-

TO MAINTAIN INTRINSIC SAFETY, THE TRANSMITTER WIRING MUST BE ROUTED THROUGH A ZENER DIODE BARRIER WHICH MEETS THE ENTITY PARAMETERS SHOWN ABOVE. THE SELECTED BARRIER SHALL BE APPROVED WITH INTRINSICALLY SAFE CIRCUITS FOR THE HAZARDOUS LOCATION CLASS & GROUP AS APPROPRIATE FOR THE APPLICATION. THE CABLE CAPACITANCE PLUS THE TRANSMITTER CAPACITANCE(Ci) MUST BE LESS THAN OR EQUALTO THE Ca ON THE BARRIER. THE CABLE INDUCTANCE PLUS THE TRANSMITTER INDUCTANCE(Li) MUST BE LESSTHAN OR EQUAL TO THE La ON THE BARRIER. THE BARRIER MUST BE LOCATED IN THE NON-HAZARDOUS AREA AS SHOWN.

Notes:

1. Electrical apparatus connected to an intrinsically safe system must not use or generate more than 250V, (Vrms), with respect to earth ground.
2. Installation should be in accordance with the barrier manufacturers instructions and with Article 504/505 in the National Electrical Code, ANSI/NFPA 70.
3. Barrier Enclosures:
   a. Use general purpose enclosures meeting requirements of ANSI/ISA S82 for use in nonhazardous or Class I, Division 2, Groups A,B,C and D Hazardous Locations.
   b. Use a UL Listed or NRTL approved Dust-tight enclosure appropriate for environmental protection in Class II, Division 2, Groups F and G; and Class III,Division 2 Hazardous Locations.

		P.C. N.A.
TOLERANCES (UNLESS NOTED): P.010	TITLE: CONTROL DRAWING	DATE: 5/21/02
		DRAWN BY: A.P.C.
		APPROVED BY:
ANGULAR: N.A.	MATERIAL: N.A.	DRAWING NUMBER: P-1115 REV. A
SCALE: NTS		

Control Drawing No. P-1115

SHIELD WIRE TERMINATION

Terminate the cable shield wire at a single location only — at the signal receiver or, for intrinsically safe installations, at the barrier. Leave the detector end of the shield wire unterminated and insulated it from contacting any terminal or other conductor. The shield must be floating at the detector to provide proper EMI protection.

If unused, clip the shield wire off short and insulate it within the detector housing to prevent it from accidentally contacting the detector housing or any other conductor.

IMPORTANT

Be sure that all wiring terminations and cover screws are properly tightened after installation is complete.

OPERATING MODES

WARM-UP

Upon power-up, the digital display will indicate the operating software version (e.g. "LSP1.00"), and will then count down from 30 to zero, followed by a display of the gas type and detected concentration (e.g. "H2S 0"), at which time the detector is in the normal operating mode. It is recommended that the detector be allowed to operate for a minimum of 1 hour after warm-up to enable sensor stabilization before attempting calibration or gas exposure testing.

NORMAL

The digital display will indicate the gas type and detected concentration in PPM (e.g. "H2S 0").

FULL SCALE RANGE ADJUSTMENT

TXL Series gas detectors offer the ability to field-select full scale measurement ranges other than the standard factory default range. The procedure for selecting a different range requires removal of the cover from the enclosure, with all field wiring and cable connectors connected and power applied to the device.

Two pushbutton switches are located on the inside of the detector cover assembly. These switches are identified as "**mode**" and "**set**". To change the full scale range of the TXL detector:

1. Press and release the **mode** switch. This places the detector into the Calibration adjustment mode.

2. Press the **mode** switch a second time and hold for at least 6 seconds. This places the detector into the Span adjustment mode.

3. Press the **set** switch to select the desired full scale range on the LCD readout on the detector faceplate.

4. Once the full scale range is set to the desired level, press and release the **mode** switch. The detector will return to normal operating mode with the full scale range set to the new level.

5. The full scale range setting can be checked at any time with the detector in normal operating mode by repeating steps # 1, 2, and 4 above.

6. After selecting a new full scale range, it is highly recommended to also change the calibration gas concentration level to a level that is at or near the midpoint of the new full scale measurement range.

7. After this has been completed, it is recommended to perform calibration using a calibration gas that matches the new calibration gas concentration setting.

Table 11 shows the adjustment range, adjustment increment, and default setting for each TXL model.

Table 11—Full Scale Range Adjustment for TXL Gas Detectors

Model	Full Scale Adjustment Range (PPM)	Increment	Factory Default Setting
TXL-CL2	5 - 20	5	20
TXL-CLO2	5 - 10	5	10
TXL-CO	50 - 1000	50	1000
TXL-HCN	10 - 50	10	50
TXL-H2S	50 - 500	25	500
TXL-NH3	50 - 200	50	200
TXL-NO2	5 - 50	5	50
TXL-O2	25% - 40%	5%	40%
TXL-PH3	5 - 20	5	20
TXL-SO2	5 - 20	5	20

CALIBRATION

FREQUENCY OF CALIBRATION

The TXL detector is typically utilized to protect human life. For this reason, a frequent calibration inspection is recommended. The specific frequency required in different applications can vary depending upon the amount of background gas, concentration of gas, and ambient environmental conditions.

Calibration **must** be performed:

– When a new system is initially put into service.

– When the sensor or TXL detector housing is replaced.

– If a transmitter, controller or other device used in conjunction with the TXL detector is replaced.

– When the hydrophobic filter is cleaned or replaced.

The following calibration schedule is recommended when placing a new sensor into operation and will ensure reliable operation in most applications:

1. 24 hours after initial power-up

2. One week later

3. Every 30 days thereafter, or as determined by the needs of the specific application.

IMPORTANT

To ensure adequate protection, the gas detection system must be calibrated on a regularly scheduled basis.

CALIBRATION GAS

For best results, calibration should be performed using a calibration gas concentration equal to mid-point of the sensor's measurement range. Calibration kits are available from Detector Electronics to ensure accurate calibration. Each kit provides the proper compressed gas, pressure regulator, hose, and special calibration cup for the TXL detector. If background gas is present, it may be necessary to purge the detector with clean air to ensure that an accurate zero or “clean air” condition is present prior to initiating calibration. A bottle of “clean air” is provided with the calibration kit for this purpose.

IMPORTANT CALIBRATION NOTES

- Ensure that the proper gas type and concentration is being used for calibration.
- Ensure that only clean air is present at the sensor prior to entering the calibration mode. If the possibility of background gases exists, purge the sensor with clean air to ensure accurate calibration.
- Ensure that the concentration of the calibration gas matches the calibration gas setting (Det-Tronics supplied calibration gas cylinders are labeled). Typically, a calibration gas concentration equal to 50% full scale is used.

- If the calibration procedure is not completed or if the sensitivity of the sensor has deteriorated to the extent that calibration cannot be successfully completed, a fault will be generated and the system will automatically revert back to the former calibration settings (after 2.5 minutes or when the gas level drops below the lowest setpoint). If a successful calibration cannot be accomplished, replace the sensor and the hydrophobic filter (if used) and recalibrate.
- It is recommended to allow the TXL detector to operate in powered normal mode for a minimum of 24 hours prior to calibration to ensure maximum sensor stabilization and calibration accuracy.
- Visually inspect the sensor. Loss of sensitivity can be caused by various factors. One common cause is by clogging of the hydrophobic or sintered filter by dirt, oil, paint, etc. Problems of this nature will not be detected by the transmitter's diagnostic circuitry. If a filter is dirty or plugged, it should be replaced.

The TXL gas detector uses an automatic, non-intrusive calibration procedure, and requires no adjustments by the operator.

CALIBRATION PROCEDURE

1. If the possibility of background gases exists, purge the sensor with Det-Tronics compressed clean air to ensure accurate calibration.

2. The Calibrate mode is entered by holding the calibration magnet to the magnetic switch target (labeled "CAL") on the faceplate of the detector. See Figure 4. Upon activation of the internal magnetic switch, the digital display will indicate the number "30" and begin counting down to "0".

3. When "0" is indicated, the digital display will indicate "GAS" and then "CAL". At this time, remove the clean air, if used, and apply the calibration gas to the sensor.

4. The digital display will indicate an increase in the detected gas level. When 50% of the calibration gas concentration is displayed (e.g. 25 PPM displayed with 50 PPM cal gas applied), the display will change and begin a countdown to zero (0).

Figure 4—Location of Magnetic Calibration Switch

5. Upon reaching "0" the detector will revert to normal operating mode and indicate the concentration of calibration gas that is applied. Note that upon reaching this condition, the analog signal output level of the TXL detector will be delayed 60 seconds before transmitting a live signal to the analog signal receiver. Be sure to remove the calibration gas from the sensor as soon as possible (<60 seconds) to preclude any false alarms.

6. Calibration is complete when the detector returns to normal mode.

CALIBRATION GAS LEVEL ADJUSTMENT

The preset calibration gas level for the TXL Series of toxic gas detectors is field adjustable. However, it is recommended to use a level that equals one half (50%) of the detector's full scale range of measurement. The TXL's default settings for calibration gas level typically provide the recommended setting, and should be used for most normal gas detection applications. Changes to the default calibration gas level may change sensitivity, and therefore the customer assumes all responsibility for device performance if changes to the default calibration gas level are made.

Calibration gas level adjustment procedure:

1. Remove the TXL cover by loosening the four corner screws on the faceplate.

2. Locate the two pushbuttons on the inside of the cover marked **Mode** (S2) and **Set** (S3).

3. Power up the TXL and allow it to enter the Normal operating mode.

Table 12—Default Calibration Gas Levels

Gas	Calibration Gas Level
CO	50 PPM
H_2S	25 PPM
HCN	10 PPM
NH_3	25 PPM
SO_2	10 PPM
CL_2	10 PPM
CLO_2	1 PPM (no cylinder available; requires calibrator)
NO_2	10 PPM
PH_3	5 PPM
O_2	20.9% vol

4. Depress and release the **Mode** (S2) button. The digital display will read "Std xx". This is the default calibration gas level if no changes have been made. See Table 12 for factory default settings.

5. To change the calibration gas level, press and release the **Set** button to step the gas level reading on the digital display to the desired calibration gas level setting.

6. When the level is at the desired setting, depress the **Mode** button to return to the normal operating mode.

7. Reinstall the cover and secure it with the four corner screws.

The calibration gas level may be checked at any time by depressing the **Mode** button while the instrument is operating in normal mode. Depressing the **Mode** button again will return the unit back to normal mode.

MAINTENANCE

The TXL Series detector is a robust gas detection device suitable for a wide variety of challenging environmental conditions. However, a routine maintenance schedule is recommended to ensure that the detector is in peak operating condition at all times. To ensure top performance, service the device as follows.

VISUAL INSPECTION

A visual inspection of the detector approximately once per week is recommended to ensure that physical obstructions such as trash, debris, mud, snow, or oil have not blocked or impeded hazardous gas access to the sensor. This includes visually inspecting the hydrophobic filter on the detector nosepiece.

RESPONSE TEST

It is acceptable to perform a detector response verification test in lieu of a complete calibration if the detector output in clean air appears stable and the device has been calibrated recently. This test involves simply applying calibration gas to the detector while in normal operating mode and confirming that the detector output is proportional to the applied gas concentration. It is the operator's responsibility to bypass any and all system alarm output devices, if necessary, prior to conducting the detector response test. If the response test results are not acceptable, then a complete calibration must be performed.

CAUTION

Be sure to secure all output devices that are actuated by the system to prevent unwanted activation of this equipment, and remember to place these same output devices back into service when the checkout is complete.

SENSOR CELL REPLACEMENT

The electrochemical sensor is not field repairable. If calibration can no longer be properly performed, the sensor must be replaced.

NOTE

Handle the sensor cell carefully. To avoid possible damage, observe the normally accepted procedures for handling electrostatic sensitive devices. See form 75-1005 for additional information.

Follow the procedure below to replace the sensor cell.

1. Remove power to the detector prior to replacing the sensor cell.

2. Remove the knurled cover from the sensor base. (There is no need to remove the sensor housing from the junction box for this operation.)

NOTE

Compare part numbers to be sure that the correct replacement cell is being used.

3. Remove the old sensor cell. The sensor cell contains a small amount of lead – dispose of properly. Check for corrosion or contamination on the terminals of the sensor base, and clean if necessary.

4. Remove the shorting spring from the bottom of the new sensor (see Figure 5).

5. Determine proper orientation for the new cell, then carefully plug it in.

6. Replace the knurled cap. Do not over-tighten; it should be finger tight only.

7. Apply power and allow the sensor to stabilize for a minimum of 1 hour (24 hrs. recommended).

8. Calibrate the new sensor.

An adequate supply of spare electrochemical cell assemblies should be kept on hand for field replacement. For maximum protection against contamination and deterioration, they should not be removed from the original protective packaging until the time of installation. To ensure maximum storage life, electrochemical cells should be stored in the unopened package, at a temperature between 32°F and 68°F (0 to 20°C) and a relative humidity between 15 and 90 percent.

HYDROPHOBIC FILTER REPLACEMENT

The hydrophobic filter on the front of some of the electrochemical sensor housings protects the sensor cell from contaminants in the environment, and also enables the operation of the cell in "wet" environments without plugging its screen. The operator should frequently inspect the hydrophobic filter for cleanliness. A dirty filter can significantly reduce the amount of gas that is able to reach the sensor cell, thereby impairing the ability of the system to respond to a hazardous condition. If the filter becomes dirty or if it is damaged, it must be replaced. To replace the hydrophobic filter, simply unscrew the knurled cover, carefully extract the internal rubber O-ring, and extract the hydrophobic filter. Replace it with a new filter and reinstall the O-ring. Do not over-tighten the knurled cover after replacement.

NOTE

A dirty hydrophobic filter can adversely affect the response of the sensor by blocking the flow of gas to the sensor cell. If the detector cannot be calibrated or responds slowly to the calibration gas, check the condition of the hydrophobic filter before replacing the sensor cell.

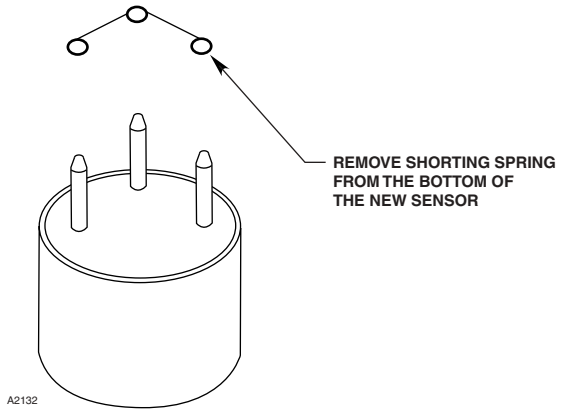


Figure 5—Shorting Spring on Replacement Sensor

DEVICE REPAIR AND RETURN

The TXL Gas Detector is not designed to be repaired in the field. If a problem should develop, first carefully check for proper wiring and calibration. If it is determined that the problem is caused by an electronic failure, the device must be returned to the factory for repair.

Prior to returning devices or components, contact the nearest local Detector Electronics office so that a Service Order number can be assigned. A written statement describing the malfunction must accompany the returned device or component to expedite finding the cause of the failure.

Return all equipment transportation prepaid to the factory in Minneapolis.

ORDERING INFORMATION

When ordering, please specify:

Part Number	Description
000518-001	Model TXL-H2S Hydrogen Sulfide Gas Detector, 0-500 PPM Range
000518-003	Model TXL-NH3 Ammonia Gas Detector, 0-200 PPM Range
000518-004	Model TXL-CO Carbon Monoxide Gas Detector, 0-999 PPM Range
000518-005	Model TXL-NO2 Nitrogen Dioxide Gas Detector, 0-50 PPM Range
000518-006	Model TXL-PH3 Phosphine Gas Detector, 0-20 PPM Range
000518-007	Model TXL-SO2 Sulfur Dioxide Gas Detector, 0-20 PPM Range
000518-008	Model TXL-HCN Hydrogen Cyanide Gas Detector, 0-50 PPM Range
000518-009	Model TXL-CL2 Chlorine Gas Detector, 0-20 PPM Range
000518-010	Model TXL-ClO2 Chlorine Dioxide Gas Detector, 0-9.9 PPM Range
000518-011	Model TXL-O2 Oxygen Detector, 0-40% Range

REPLACEMENT SENSOR CELLS

Part Number	Description
000518-101	H_2S sensor cell, 0-500 PPM range
000518-103	NH_3 sensor cell, 0-200 PPM range
000518-104	CO sensor cell, 0-999 PPM range
000518-105	NO_2 sensor cell, 0-50 PPM range
000518-106	PH_3 sensor cell, 0-20 PPM range
000518-107	SO_2 sensor cell, 0-20 PPM range
000518-108	HCN sensor cell, 0-50 PPM range
000518-109	Cl_2 sensor cell, 0-20 PPM range
000518-110	ClO_2 sensor cell, 0-9.9 PPM range
000518-111	O_2 sensor cell, 0-40% range

CALIBRATION KITS

Part Number	Description
000518-201	Model TXL-KIT-H2S (25 PPM)
000518-203	Model TXL-KIT-NH3 (25 PPM)
000518-204	Model TXL-KIT-CO (50 PPM)
000518-205	Model TXL-KIT-NO2 (10 PPM)
000518-206	Model TXL-KIT-PH3 (5 PPM)
000518-207	Model TXL-KIT-SO2 (10 PPM)
000518-208	Model TXL-KIT-HCN
000518-209	Model TXL-KIT-CL2
000518-211	Model TXL-KIT-O2 (21%)

Kit includes: Two 0.58 liter cylinders, one containing calibration gas, one containing “zero” clean air, carry case, calibration cup, 3 ft length hose, gauge/regulator, calibration magnet.

For additional information or for assistance in ordering a system to fit your application, please contact:

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