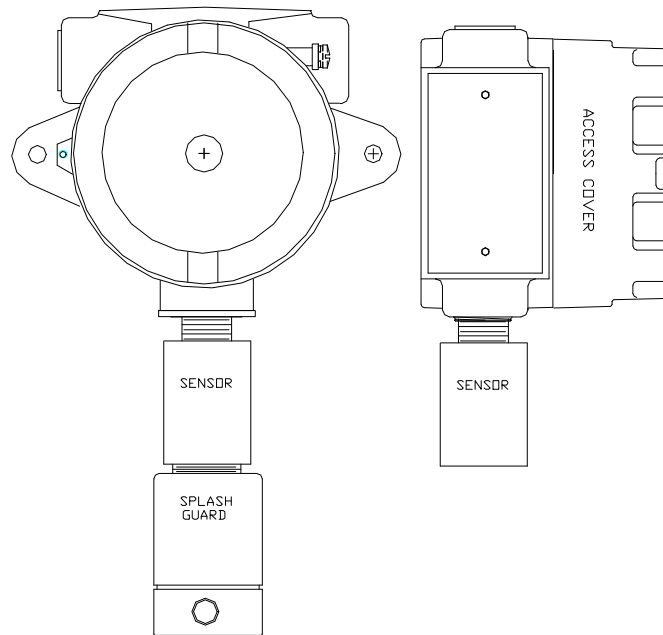


**MODEL QTS-1710 SERIES
COMBUSTIBLE GAS
TRANSMITTER/SENSOR**



**INSTALLATION
OPERATION AND MAINTENANCE
MANUAL**

QUATROSENSE ENVIRONMENTAL LTD.
5935 OTTAWA STREET, PO BOX 749 RICHMOND, ONTARIO CANADA K0A 2Z0
PHONE: (613) 838-4005 FAX: (613) 838-4018
Web: www.QELsafety.com Email: QEL@QELsafety.com

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QTS-1710 TRANSMITTER/SENSOR

1. GENERAL SPECIFICATIONS

Power Supply 24 VDC
(12 to 30 VDC)
125 mA Max
80 mA typical

Signal 4 - 20 mA Linear
0 - 100% LEL

Wiring 3 wires: Power (+)
Signal
Common (-)

Max. Signal Load (Burden resistance)
700 Ohms at 24 VDC
500 Ohms at 20 VDC
200 Ohms at 12 VDC

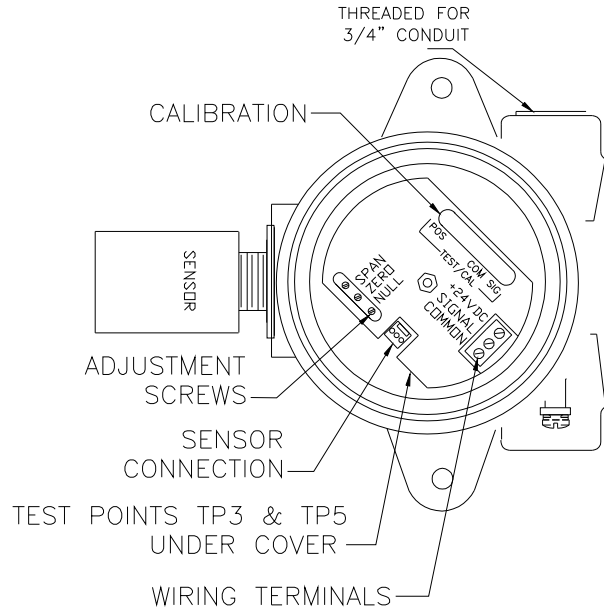


Figure 1 Connection and Adjustments

Hazardous Locations Enclosures:
Expl. Proof: CL1, Div 1, Gr. A, B, C, D
CSA, FM, ATEX Approval

Temperature -40 C to +50 C (-40 F to +122 F)

Humidity 0 - 99 % RH (Non- Condensing)

Calibration recommendation: every 90 days max.

* Please allow 24 hours warm-up time period before calibrating

2. INSTALLATION

Sensor orientation should be pointing downwards.

Mounting height is dependent upon whether a gas is heavier or lighter than air: Methane (natural gas), Hydrogen and Ammonia are lighter than air, sensors should be placed close to the ceiling. Most other combustible gases are heavier than air and the sensor should be placed close to the floor.

Take note of any barriers, which may cause the gas to collect. Note likely sources of gas and place the sensors near them.

Procedure

Remove electronics module for pulling wires and reinstall for connection. Undo the centre nut and disconnect the sensor wire from the jack. Pull outward.

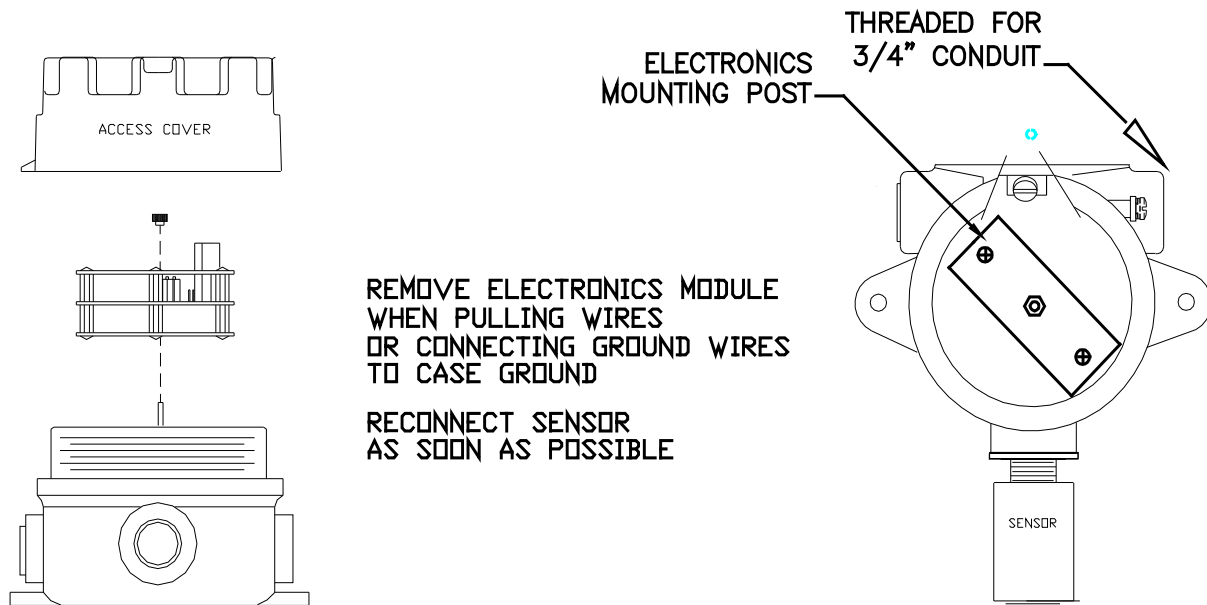


Figure 2 Enclosure Access

3. FILTERS AND SENSOR POISONS

Catalytic bead sensors such as are used in these instruments are subject to certain poisoning effects from some gases. Some gas classes, notably silicones are permanent poisons: they coat the surface of the sensor, preventing the sensor from interacting with the hydrocarbon gases being measured. There is no "cure" for sensors poisoned with silicones.

There are other gases which have similar effects, but which are to some degree reversible. These are Chlorinated solvents, sulphur based products and some others. The symptoms are the same, in that the sensor becomes non-responsive; however, it is possible to "burn off" the coating by applying an "overdose" by, for instance a short exposure to pure butane. The procedure is always slightly damaging to the sensor, so it should not be done indiscriminately, and the sensor should be recalibrated afterwards.

It is important to note that THE ONLY WAY TO DETERMINE WHETHER A SENSOR IS POISONED

IS TO APPLY A TEST GAS.

3.1 Poison Resistant Sensors

QEL uses improved catalytic bead sensors, which are very resistant to poison of this sort; however, they are not proof against poisons and should be tested regularly.

3.2 Filters

QEL has instituted the use of poison filters of activated charcoal impregnated cloth. These supply good protection against most poisons; however, they are not proof against poisons and should be changed regularly in an area known to have poisons present. When installing be certain that the filter presses firmly up against the flame arrestor face.

Activated charcoal filters may not be used when the gas being tested is of a type which will be absorbed by the filter. General use for methane and Hydrogen detection, use with propane detection is recommended for non hazardous area such a parking garages, as the response time may be slowed.

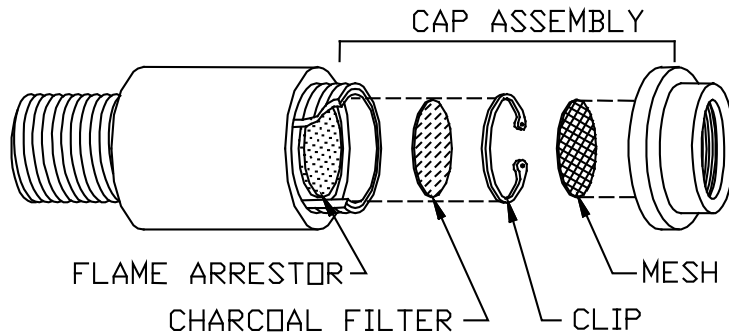


Figure 3 Sensor Head Assembly

4. CALIBRATION PROCEDURES

Equipment: Digital Multimeter c/w Pos and Neg probes with:
a) 20.0 mA scale
b) 200 mV scale
Source of clean air
Source of appropriate span gas (usually 40 - 50 % LEL, Balance air)
Small adjustment screwdriver.

Clean air adjustments:

1. If sensor is NEW, pull out electronics module slightly and measure voltage between NULL testpoints TP3 & TP5 (use 200 mV scale) and adjust NULL to get 000.0 mV. (See Figure 1.)
2. Set multimeter to 20 mA scale, attach probes, and insert Pos probe to "POS" jack, Neg probe to

"SIG" jack. If Transmitter is connected to a QEL controller, insert Neg probe into "COM" jack to avoid fault condition. Adjust Zero to get 4.00 mA in clean air.

Span Adjustments:

3. Multimeter still attached as in (2) apply appropriate calibration gas to sensor and adjust SPAN to read appropriate signal on the multimeter.
4. Wait 2 or 3 hours and check (2) and (3) again, if required.

Conversion Formula:

$$\text{Signal(mA)} = \frac{\text{Conc.(\% LEL)} \times 16}{100} + 4$$

5. CALIBRATION WITH METHANE STANDARD GAS FOR OTHER COMBUSTIBLE GASES.

Most combustible gas detection systems are concerned with %LEL (Lower Explosive Limit). 100 % LEL of Methane (Natural Gas) is 5% by volume in air. If the gas shipped to you is not labelled in %LEL, divide the concentration by 5 to get % LEL.

$$\text{e.g. } \frac{2.36\% \text{ vol}}{5} \times 100 = 47.2 \% \text{LEL}$$

QTS-1710 combustible transmitter/sensor respond to all gaseous hydrocarbons, but to each in different degree. Methane may be used to calibrate by referring to the table below and applying the formulas given. For gases not in the list consult factory.

Relative Response to Flammable Gases

Gas	Lower Explosive Limit LEL	Response Relative to Methane	J Methane Multiplier
Acetylene	1.5%	0.57	1.75
Benzene	1.2%	0.40	2.46
Cyclohexane	1.3%	0.45	2.22
Ethanol	3.3%	0.45	2.22
Hexane	1.0%	0.45	2.22
Hydrogen	2.2%	0.95	1.05
iso-Octane	0.95%	0.35	2.86
iso-Propyl Alcohol	2.2%	0.35	2.86
n-Butane	1.8%	0.55	1.82
n-Octane	1.0%	0.55	1.81
Nonane	0.85%	0.25	4.00
n-Propyl Alcohol	2.2%	0.40	2.50
Propane	2.1%	0.60	1.67

5.1 Conversion Formulae:

C = %LEL of Methane Test Gas
R = Equivalent % LEL of Target Gas
S = Signal in milliamps
J = number from the table above

$$R = C * J$$

$$S = 4 + \frac{16 \times R}{100} \text{ mA}$$

e.g. Calibration for propane using 2.46 % Methane Test Gas

2.46 % Methane = 49.2 % LEL Methane

R = 1.67 x 49.2 = 82.2 %LEL Propane

S = 4 + $\frac{16 \times 82.2}{100}$ = 17.15 mA signal

5.2 Calibration Gases

Calibration gas flows of 0.5 litre/minute are acceptable.

Sudden changes in humidity as from dry calibration gases may have a small transient effect on signal, usually gone within a minute.

Long exhaust hoses (more than six inches or so) may cause back pressure conditions at the sensor and enhanced signal, especially at high flow rates.

6. Wiring

Wiring is three wires, DC 24 V with one analog signal line.

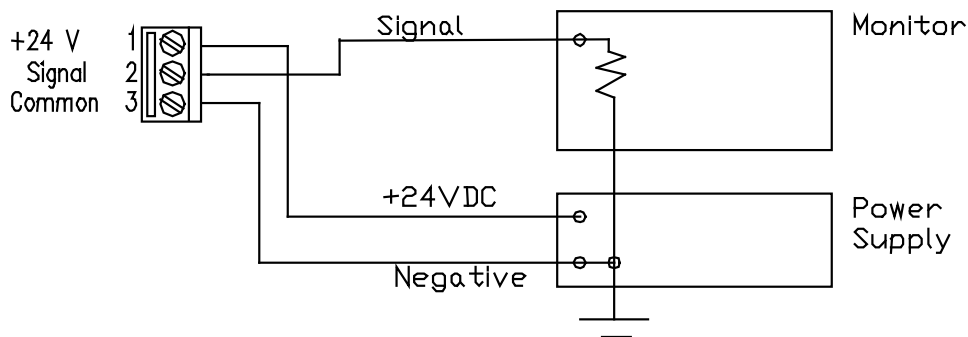


Figure 4 Wiring Hoop-Up

7. Remote Sensor Head Mounting

It is often the case that the sensor must be mounted in an inaccessible location. In these cases it is useful to consider mounting the sensor head remote from the electronics to allow easy access for testing and calibration. This is quite reasonable and considerable distances are possible if proper installation practices are followed.

7.1 Wiring

The sensor head has a very low resistance, so any interposing wiring will have an effect on accuracy and power. One should use the maximum wire diameter practical to minimize voltage drops. e.g.

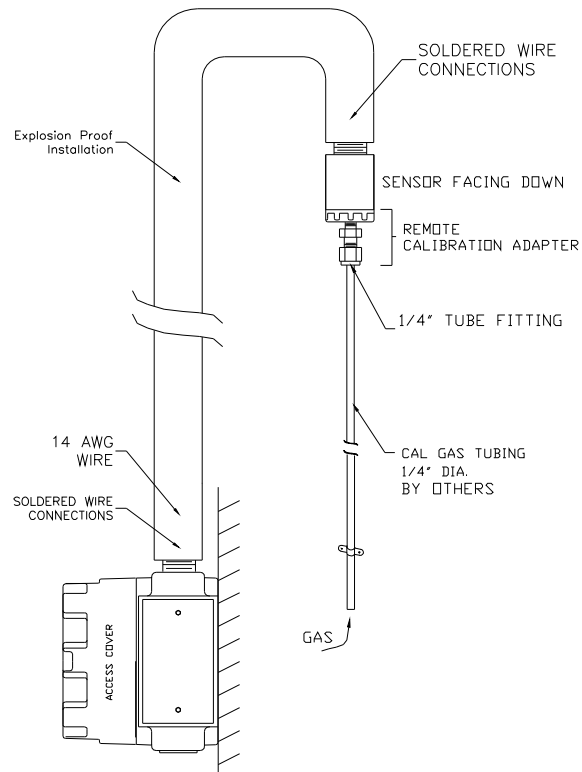
Maximum suggested distances:

- 16 awg 50 feet (15 meters)
- 14 awg 100 feet (30 meters)
- 12 awg 125 feet (35 meters)

It is simply necessary to extend the wire cable length accordingly. **Use soldered connections** at all wiring joints to prevent resistance changes with age.

7.2 Calibration

For calibration QEL sells an adapter to connect a 1/4" o.d. tubing to the sensor for remote application of gas. Note that gas flow should be higher than normal especially if the sensor head is in an area of moving air. **Calibration gas flows of up to 1 liter/minute** are standard.



8. WARRANTY STATEMENT

The information contained in this manual is based upon data considered accurate; however, no warranty is expressed or implied regarding the accuracy of this data. All QEL equipment is warranted against defects in material and workmanship for a period of two years from date of shipment with the following exceptions:

Electrochemical Sensors (Toxic)	Six Months
Catalytic Sensors (Combustible)	One Year

During the warranty period we will repair or replace, at our discretion, any components or complete units that prove, in our opinion, to be defective. We are not liable for consequential or incidental damage to auxiliary interfaced equipment.

A returned material authorization number should be obtained from the factory prior to returning any goods. All return shipments must be shipped freight prepaid and a copy of the maintenance records should accompany the unit concerned.

Warranty should be considered F.O.B. the factory. Labour and travel time are chargeable for any field site visits required for warranty work.

LIMITED LIABILITY

All QEL systems shall be installed by a qualified technician/electrician and maintained in strict accordance with data provided for individual systems in the form of installation/maintenance manuals. QEL assumes no responsibility for improper installation, maintenance, etc., and stresses the importance of reading all manuals. QEL shall not be responsible for any liability arising from auxiliary interfaced equipment nor any damage resulting from the installation or operation of this equipment.

QEL's total liability is contained as above with no other liability expressed or implied as the purchaser is entirely responsible for installation and maintenance of systems.

This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for QEL any liability in connection with the sales of our products other than that set forth herein.

NOTE: Due to on-going product development, QEL reserves the right to change specifications without notice and will assume no responsibility for any costs as a result of modifications.

For further information or assistance, contact:

QUATROSENSE ENVIRONMENTAL LTD.

5935 Ottawa Street, PO Box 749

Richmond, Ontario

K0A 2Z0

Tel: (613) 838-4005

Fax: (613) 838-4018

Email: QEL@QELsafety.com

Web: www.QELsafety.com