



CMF
IP44
plastic enclosure



CMX
IP54
plastic enclosure



CMA
IP65
plastic enclosure



CMK
IP65 plastic enclosure
with duct mounting set



CMR
IP55 stainless steel
enclosure



TL1 SSE
To avoid unauthorized
opening,
the stainless steel
enclosure CMS can
only be opened by the
opening tool TL1 SSE

Features

- Electrochemical sensor element
- 4-20 mA or 2-10 Vdc output
- Wide supply voltage range (18-28 Vdc)
- Overload and short circuit protected
- Reverse polarity protected
- Continuous monitoring
- Low zero point drift
- Positioning stable
- Long life sensor
- Modular plug-in technology

Applications

- vehicle exhaust in parking structures (e.g. underground garages)
- engine repair shops
- tunnels
- equipment rooms
- ventilation systems etc.

Intended Use

The CO detector 4-20 mA / 2- 10 Vdc output is used for the continuous monitoring of the ambient air to detect the presence of carbon monoxide (CO) gas concentrations within the ambient conditions defined in the specifications.

Main application ranges for carbon monoxide detectors are underground car parks, tunnels, engine test stations, shelters, loading areas etc.

The intended sites are all areas being directly connected to the public low voltage supply, e.g. residential, commercial and industrial ranges as well as small enterprises (according to EN50 082).

The CO detector must not be used in potentially explosive atmospheres.

Technical data

Sensor element	Electrochemical, diffusion
Output	4-20 mA, load < 500 ohm, 2-10 Vdc, load < 50 Kohm, overload and short circuit proof
Power supply	18-28 Vdc, (reverse polarity protected)
Power consumption	22 mA, max. (0.6 VA)
Accuracy	+/- 3 ppm
Repeatability	+/- 3% of reading
Long term output drift	< 5% signal loss/year
Response time	t90 < 50 seconds
Sensor life expectancy	5 years, normal operation environment
Mounting height	1.5 to 1.8 m above floor
Humidity range	15 to 90% non-condensing
Temperature range	Working: -10 to +50 °C Storage: +5 to +50 °C
Pressure range	Atmospheric ± 10%
Enclosure color	RAL 7032 (light grey)
Installation	Wall mounting
CE-approval	EMC_Directive 2004/1008/EEC, CE
Enclosure/Protection	
CMF	Plastic, GW Plast 75 GW, IP44
CMX	Plastic, Polycarbonate, IP54
CMA	Plastic, Polycarbonate, IP65
CMK	Plastic, Polycarbonate, IP65 for duct
CMR	Stainless steel V2A, 1 mm, Material 1.4301 corrosion-resistant, IP55
Dimensions	
CMF	Diameter 87 mm, height 46 mm.
CMX	H94 x W65 x D57 mm
CMA	H130 x W94 x D57 mm
CMK	H130 x W94 x D57 mm
CMR	H113 x W135 x D45 mm excluding cable entry

CMF, CMX, CMA and CMR wall types:

Sensor coverage	400 m2 to 500 m2 (recommended)
Mounting height	1.5 to 1.8 m above floor



CMF



CMX



CMA



CMR

CMK duct type

Gas inlet	Via a sampling pipe/ connection tube
Flow speed	Min. 5000 m/h, Max. 20,000 m/h
Duct diameter (ca.)	Min. 0.1 m, max. 1.0 m
Length of sampling pipe	250 mm, adaptable to the duct diameter by cutting to lengths: 192, 133 or 77 mm
Tube length	2 x 1000 mm
Mounting	Arrow at the sampling set in flow direction. Always mount in the middle of the duct. Keep a minimum distance of 1000 mm to duct bends etc.



CMK

Ordering

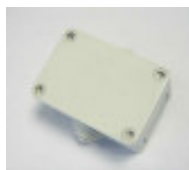
Type no.	ppm range	Enclosure
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CMF 050VC	0-50 ppm	IP44
CMF 100VC	0-100 ppm	IP44
CMF 150VC	0-150 ppm	IP44
CMF 200VC	0-200 ppm	IP44
CMF 300VC	0-300 ppm	IP44
CMF 400VC	0-400 ppm	IP44
CMF 500VC	0-500 ppm	IP44
CMF 1000VC	0-1000 ppm	IP44



CMF

CMX 050VC	0-50 ppm	IP54
CMX 100VC	0-100 ppm	IP54
CMX 150VC	0-150 ppm	IP54
CMX 200VC	0-200 ppm	IP54
CMX 300VC	0-300 ppm	IP54
CMX 400VC	0-400 ppm	IP54
CMX 500VC	0-500 ppm	IP54
CMX 1000VC	0-1000 ppm	IP54



CMX

CMA 050VC	0-50 ppm	IP65
CMA 100VC	0-100 ppm	IP65
CMA 150VC	0-150 ppm	IP65
CMA 200VC	0-200 ppm	IP65
CMA 300VC	0-300 ppm	IP65
CMA 400VC	0-400 ppm	IP65
CMA 500VC	0-500 ppm	IP65
CMA 1000VC	0-1000 ppm	IP65



CMA

CMK 050VC	0-50 ppm	IP65, duct
CMK 100VC	0-100 ppm	IP65, duct
CMK 150VC	0-150 ppm	IP65, duct
CMK 200VC	0-200 ppm	IP65, duct
CMK 300VC	0-300 ppm	IP65, duct
CMK 400VC	0-400 ppm	IP65, duct
CMK 500VC	0-500 ppm	IP65, duct
CMK 1000VC	0-1000 ppm	IP65, duct



CMK

CMR 050VC	0-50 ppm	IP55, s/s
CMR 100VC	0-100 ppm	IP55, s/s
CMR 150VC	0-150 ppm	IP55, s/s
CMR 200VC	0-200 ppm	IP55, s/s
CMR 300VC	0-300 ppm	IP55, s/s
CMR 400VC	0-400 ppm	IP55, s/s
CMR 500VC	0-500 ppm	IP55, s/s
CMR 1000VC	0-1000 ppm	IP55, s/s



CMR



TL1 SSE
Tool for opening
CMS enclosure

Important notes before ordering:

CMF, CMX, CMA, CMK and CMR are manufactured on request.

As the storage life for CMF, CMX, CMA, CMK and CMR is up to 6 months unpowered we need pre-payment before process the order, this to avoid any cancellation of order.

Delivery time is normally 4 weeks after receipt of payment.

Functional Description

The sensor portion of the transmitter is a micro-fuel cell, which is completely sealed.

The ambient air to be monitored diffuses through a membrane filter into the liquid electrolyte of the sensor.

The chemical process of the measurement is one of oxidation where one molecule of the target gas is exchanged for one molecule of oxygen.

The reaction drives the oxygen molecule to the counter electrode, generating a current signal (nA) between the two electrodes.

This signal is linear to the volume concentration of the sensed gas.

The signal is evaluated by the connected amplifier and transformed into a linear 4-20 mA / 2-10 Vdc output signal.

Electrochemical processes always lead by-and-by to a loss of sensitivity.

Therefore regular calibration of zero-point and gain with the potentiometers Zero and Gain is necessary.

There is a small quantity of corrosive liquid in the sensor element. If in case of damage persons or objects touch the liquid, you have to clean the affected areas as fast and carefully as possible with tap water.

Out of use sensors must be disposed in the same way as batteries.

Silicon leads to an undesirable chemical reaction in the sensor and so causes a drift of the zero-point to the positive side.

Prolonged exposure leads to an important reduction of the sensor sensibility.

After exposure to silicone the sensor has to be replaced in order to provide for the functional reliability furthermore.

Electronics can be destroyed by static electricity.

Therefore, do not touch the equipment without a wrist strap connected to ground or without standing on a conductive floor (acc. to EN 61340-5-1).

Mounting Instructions

When choosing the mounting site please pay attention to the following:

The specific weight of carbon monoxide CO is smaller than that of air (factor 0.967).

Recommended mounting height is 1.5 m (5 feet) to 1.8 m (6 feet) above floor.

Choose mounting location of the unit according to local regulations.

Consider the ventilation conditions! Do not mount the unit in the centre of the airflow (air passages, suction holes).

Mount the unit at a location with minimum vibration and minimum variation in temperature (avoid direct sunlight).

Avoid locations where water, oil etc. may influence proper operation and where mechanical damage might be possible.

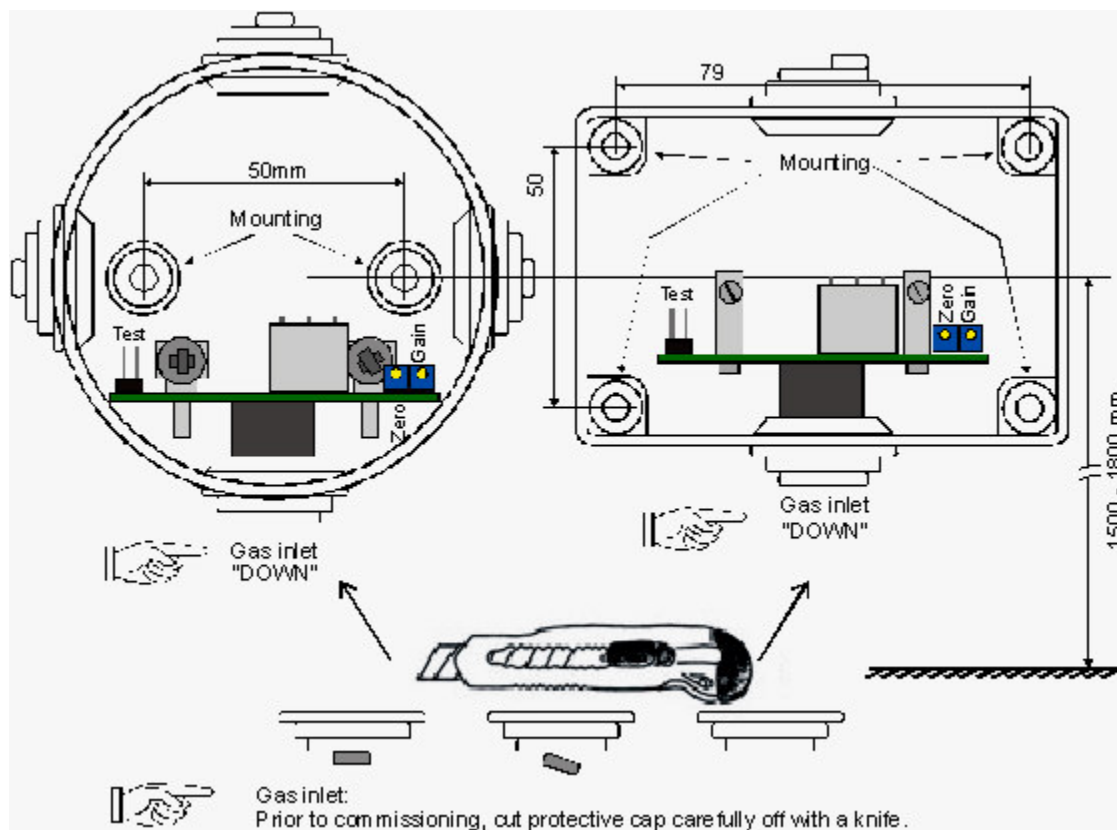
Provide adequate space around the unit for maintenance and calibration work.

Installation

Open cover of enclosure.

Fix the enclosure by the 2 screws (gas inlet to the ground).

Replace the cover.



Note:

The above image show the round enclosure CMF-type with IP 44 protection class.

Electrical Connection

Installation of the electrical wiring should only be performed by a trained specialist according to the connection diagram, without any power applied to conductors and according to the corresponding regulations!

Avoid any influence of external interference by using a shielded cable.

Recommended cable: J-Y(St)Y 2x2x0.8LG (18 AWG), maximum resistance 73 W/1000 m (20.8 W/1000 ft)
When the PCB is mounted, it is important to ensure that the wire shields or any bare wires do not short the PCB.

Wiring Connection

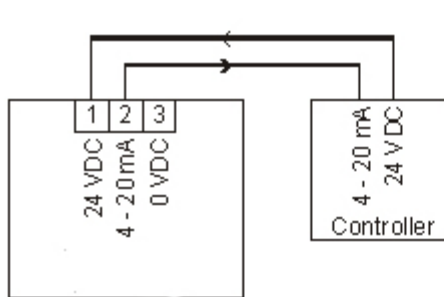
Open cover of enclosure.

Insert cable and strip it off.

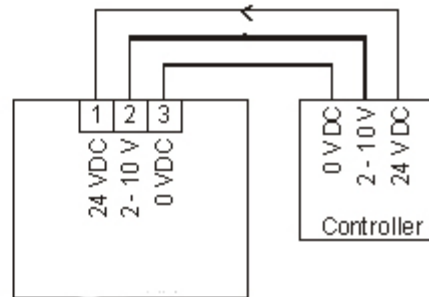
Remove triple-pole socket board and connect the cable according to the wiring diagram.

Replug the socket board correctly at the multi-pin connector.

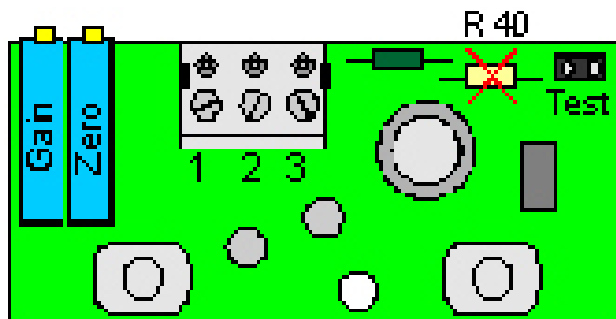
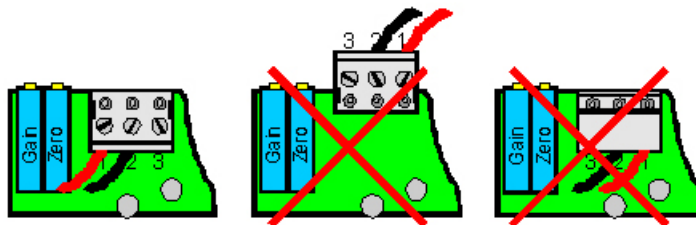
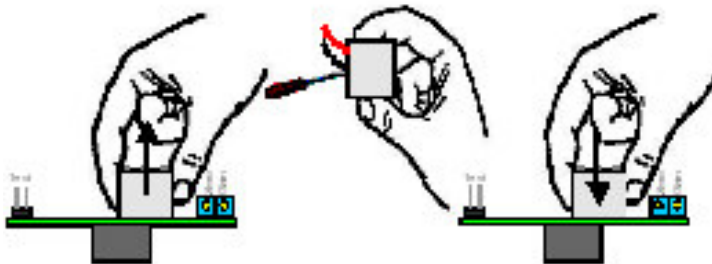
Close the cover.



Operation mode 4 - 20 mA



Operation mode 2 - 10 V



Operation mode 4-20 mA (loop):
The transmitter is always current source.
Only 2-wire connection.

Operation mode 2-10 Vdc:
Remove R40 by using a wire cutter.
Always 3-wire connection.

Power supply
24 Vdc (18-28 Vdc)
for both 4-20 mA output and 2-10 Vdc output.

Wire connection
screw type terminal
min 24 AWG (0.25 mm²) and
max 14 AWG (2.5 mm²)

Wire distance:
Max. loop resist. 500 W
(= wire resistor + controller input resistor)

Commissioning

CO calibration gas is toxic, never inhale the gas!

Symptoms: Dizziness, headache and nausea.

Procedure if exposed: Bring into fresh air at once, consult a doctor.

Please observe proper handling procedures for test gas bottles and the regulations according to TRGS 220!

Prior to calibration the sensor element must be powered and fully stabilized for at least 1 hour without interruption. Calibration must only be performed under operation typical ambient conditions.

Always consider the commissioning instructions when exchanging the sensor element.

Only trained technicians should perform the following:

- Cut the protective cap at the gas inlet carefully off by using a knife (only for enclosure CMF / CMX).
- Check mounting location.
- Check power voltage.
- Calibrate the transmitter (if not factory calibrated).

Required instruments to calibrate the transmitter:

- Test gas bottle with synthetic air or CO-free ambient air.
- Test gas bottle with CO. Concentration 30 – 70 % of the measuring range. The rest is synthetic air.
- Gas pressure regulator with flow meter.
- Calibration adapter with tubing.
- Digital voltmeter with range 0-10 Vdc, accuracy 1%
- Small screwdriver.

Calibration Zero Point (Output Signal 4 mA)

- Open cover of enclosure.
- Connect digital voltmeter to pin "Test" for zero-point calibration.
- Connect the calibration adapter to the sensor element.
- Apply zero calibration gas, 150 ml/min; 1 Bar (14.5 psi), or other CO-free air source.
- Wait one minute until the signal is stable, adjust signal with potentiometer "Zero" until the signal is $40 \text{ mV} \pm 1 \text{ mV}$ and stable ($= 4 \text{ mA} / 2\text{V}$).

Calibration Span

- Connect calibration adapter to the sensor element.
- Connect digital voltmeter to pin "Test".
- Apply span calibration gas (30 – 70 % CO of measuring range), 150 ml/min; 1 Bar (14.5 psi).
- Wait two minutes until the signal is stable, adjust signal with potentiometer "Gain" until the signal corresponds to the calculated value, see calculation for control voltage $5.3, \pm 1 \text{ mV}$ and is stable.

At a loss of sensitivity of more than 70% caused by ageing, operational or climatic influences, calibration will not be possible any more. Then the sensor has to be replaced.

Calculation of Control Span Voltage

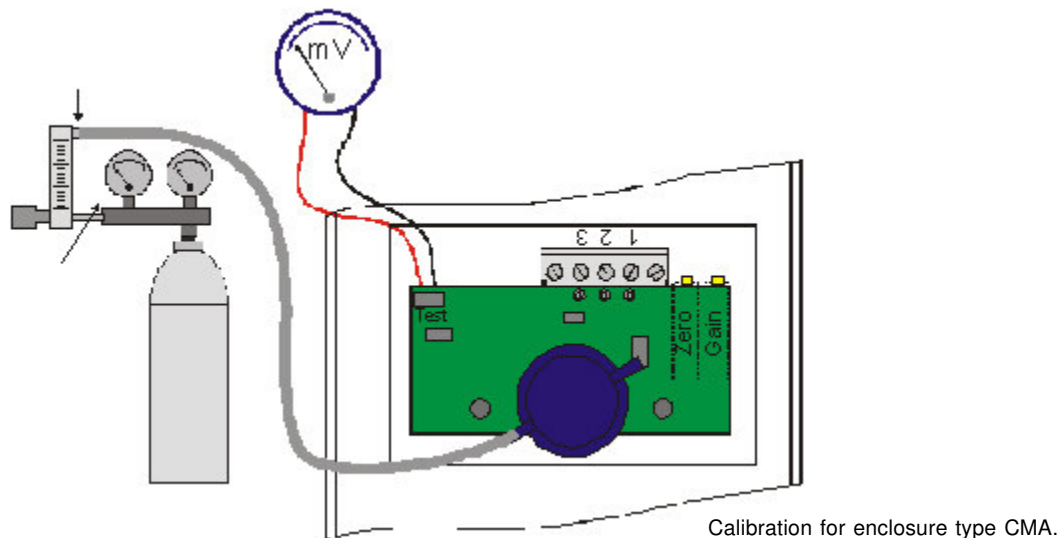
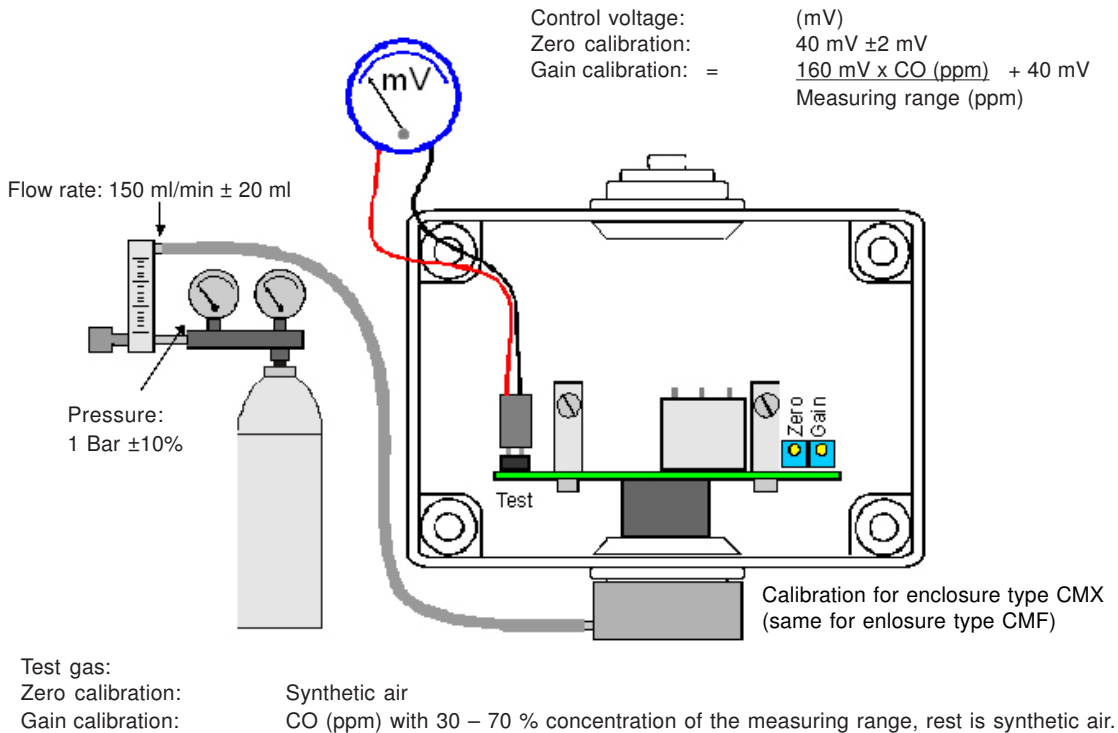
The control voltage at the pin "Test" simulates the 4-20 mA signal at a 10 Ohm measuring resistance.

$$\text{Control span voltage (mV)} = \frac{160 \text{ (mV)} \times \text{test gas concentration CO (ppm)}}{\text{measuring range CO (ppm)}} + 40 \text{ (mV)}$$

Example:

Measuring range CO 300 ppm
Test gas concentration 200 ppm CO
Control voltage 146,7 mV

$$\frac{160 \text{ (mV)} \times 200 \text{ (ppm)}}{300 \text{ (ppm)}} + 40 \text{ (mV)} = 146,7 \text{ mV}$$



Inspection and Service

Inspection, service and calibration of the unit should be done by trained technicians and executed at regular intervals.

According to EN 45544-4, inspection and service has to be executed at regular intervals.

The maximum intervals have to be determined by the person responsible for the gas warning system according to the legal requirements.

VCP recommends checking the unit every three months and maintaining it every 12 months.

If different intervals are indicated, always consider the shortest interval.

Inspections and services must be documented.

The date for the next maintenance has to be affixed to the transmitter.

Inspection

The CO detector should be controlled regularly by a competent person according to EN 45544-4.

The following has to be checked in particular:

- Maintenance/ calibration interval not exceeded.
- Visual inspection of the transmitter including cable for damage etc.
- Remove dust deposits, especially at the gas inlet.

Service and Calibration

When performing the maintenance you have to do the calibration and the functional test in addition to the inspection.

- Calibration: See pages 6 and 7.
- Functional test: Check the output signal at the test pins during calibration.

Exchange of Sensor Element

Sensor should always be exchanged without power applied (remove the socket board):

- Unscrew the two fixing bolts.
- Remove the board with the sensor upwards out of the sensor cup.
- Unplug old sensor element from the PCB, plug in new original sensor element.
- Plug in the PCB with the sensor into sensor cup and tighten it by the screws.
- Plug in the socket board correctly. page 5.
- Calibrate the sensor, See pages pages 7.

Troubleshooting

Diagnostics at the Unit

Trouble	Cause	Solution
Output signal 0 mA and control voltage 0 V	Power voltage not applied or not connected correctly.	Measure power voltage at terminal block 1 (+) and 2 (-) (16 – 28 VDC)
	Socket board not plugged in correctly	Plug in the socket board acc. to fig.3.
Output signal < 3 mA and/or control voltage < 30 mV	Transmitter not calibrated	Calibrate transmitter
Control voltage doesn't reach the calculated value	Sensor sensitivity < 30 %	Replace sensor element

If faults cannot be eliminated by the above mentioned actions or if other faults not described in this table occur, please contact the service.

Cross-sensitivity Data

The table does not claim to be complete.

Other gases can have an influence on the sensitivity, too.

The indicated sensitivity data are only standard values referring to new sensor elements.

Gas	Chemical formula	Gas concentration	Exposure Time (min)	Influence on the reading (ppm CO)
Acetone	$(CH_3)CO(CH_3)$	1000 ppm	5	0 ppm
Acetylene	C_2H_2	40 ppm	5	80 ppm
Ammonia	NH_3	100 ppm	5	0 ppm
Carbon dioxide	CO_2	5000 ppm	5	0 ppm
Chlorine	Cl_2	2 ppm	5	0 ppm
Ethanol	C_2H_5OH	2000 ppm	30	5 ppm
Hydrogen	H_2	100 ppm	5	20 ppm
Hydrogen sulphide	H_2S	25 ppm	5	0 ppm
Iso Propanol	C_3H_7OH	200 ppm	120	0 ppm
Nitric oxide	NO	50 ppm	5	8 ppm
Nitrogen dioxide	NO_2	50 ppm	900	1 ppm
Sulphur dioxide	SO_2	50 ppm	600	< 0.5 ppm

Calibration Adaptor



CAL KIT 100

Calibration kit CAL KIT 100
for CO detectors CMF-series and CMX-series.



CAL KIT 200

Calibration kit CAL KIT 200
for CO detectors CMA, CMK and CMR-series.

Notes and General Information

It is important to read this user manual thoroughly and clearly in order to understand the information and instructions.

The CO detector must be used within product specification capabilities.

The appropriate operating and maintenance instructions and recommendations must be followed.

Due to on-going product development, VCP reserves the right to change specifications without notice.

The information contained herein is based upon data considered to be accurate.

However, no guarantee is expressed or implied regarding the accuracy of this data.

Intended Product Application

The CO detector are designed and manufactured for control applications and air quality compliance in commercial buildings and manufacturing plants.

Installers' Responsibilities

It is the installer's responsibility to ensure that all CO detectors are installed in compliance with all national and local codes and OSHA requirements.

Installation should be implemented only by technicians familiar with proper installation techniques and with codes, standards and proper safety procedures for control installations and the latest edition of the National Electrical Code (ANSI/NFPA70). It is also essential to follow strictly all instructions as provided in the user manual.

Maintenance

It is recommended to check the CO detector regularly.

Due to regular maintenance any performance deviations may easily be corrected.

Re-calibration and part replacement in the field may be implemented by a qualified technician and with the appropriate tools.

Alternatively, the easily removable plug-in transmitter card with the sensor may be returned for service to VCP.

Limited Warranty

VCP warrants the CO detector for a period of one (1) year from the date of shipment against defects in material or workmanship.

Should any evidence of defects in material or workmanship occur during the warranty period, VCP will repair or replace the product at their own discretion, without charge.

This warranty does not apply to units that have been altered, had attempted repair, or been subject to abuse, accidental or otherwise.

The warranty also does not apply to units in which the sensor element has been overexposed or gas poisoned.

The above warranty is in lieu of all other express warranties, obligations or liabilities.

This warranty applies only to the CO detector.

VCP shall not be liable for any incidental or consequential damages arising out of or related to the use of the CO detector.

We reserve the right to make changes in our products without any notice which may effect the accuracy of the information contained in this leaflet.