Nitrogen Dioxide, Toxic gas
Combi Detector - Analog, ModBus, Relay

CNO2

May 16

Features

- **Digital measurement value processing incl. temperature compensation**
- **Internal functional control with integrated Hardware Watchdog**
- **Data / measured values in µC Sensor, therefore simple exchange of sensor uncalibrated <> calibrated**
- **Software according to SIL2 compliant development process**
- **Modular technology (plug-in and replaceable)**
- **Easy maintenance and calibration by exchange of the sensor cartridge or by comfortable on-site calibration**
- **Serial RS 485 interface with protocol for CGD06.**

Technical Data — Sensor Board

Electrical	
Power supply	16 – 29Vdc, reverse-polarity protected
Power consumption	10mA (2.4 VA), 24Vdc
Output for GDG bus	5Vdc, 250mA max. Overload, short circuit and recerse polarity protected
Analog input signal	4 -20mA, overload and short-circuit proof, input resistance 200 Ω
Voltage for external analog sensors	24 Vdc, max. 100 mA
Digital input signal	Potential-free contact
Function	Acknowledge or test function
Analog output signal	Proportional, overload and short-circuit proof, load ≤ 500 Ohm
	4-20 mA or 2-10V = meas. range **3.2 <4 mA =** underrange **>20- 21.6 mA =** overrange **2.5 mA =** fault **>21.8 mA =** fault high
Output for local sensor	5 Vdc, 250 mA max. Overload, short-circuit and reverse-polarity protected"
Temperature range	-20 °C to +50 °C (-31 °F to 122 °F)
Humidity range	15 - 95 % r.H non-condensing
GCD bus interface	1-wire / 19200 Baud
ModBus interface	RS 485 / 19200 Baud
Tool bus interface	2-wire / 19200 Baud
Mounting Height	**0.2 m above floor**
Protection class	IP 65
Wire connection:	
Field bus	Screw-type terminal min. 0.25 mm², max. 2.5 mm²
Local bus	3-pin connector

Application

The Combi Detector is used as a stand-alone unit with its relay outputs or alternatively ModBus RT4 with its analog output signal.

It is also used as a two-wire connection and contact anywhere in the building network.

Design Features

Sensor board with RS 485 interface, 4 – 20 mA output and further options for integration of the sensor and/or for connection of analog sensors.

The Combi Detector provides the power supply of the sensor and makes the measured data available for digital communication and for the 4 to 20 mA output.

Communication with the CGD06 controller takes place via the RS 485 field bus interface with CGD06 protocol.

The optional alarm relays can be controlled both via the CGD 06 controller and locally via the measurement signals.

The digital input for acknowledgment or test function and other options such as various communication protocols for direct connection to superordinate BMS ensure the adaptation to the wide range of applications in gas detection technology.

The sensor is connected to the local bus via a plug connection enabling simple SC exchange instead of an on-site calibration.

The internal X-Change routine recognizes the exchanged sensor after the exchanging process and starts the measurement mode automatically.

An LED indicates the correct procedure of the exchange operation. As an alternative, the on-site calibration via the CGD06 Service Tool can be used with the integrated, comfortable calibration routine.

Ordering Codes on next page

Directives	EMC directives 2004/108/EC CE Conformity to: EN 50271 EN 61010-1:2010 ANSI/UL 61010-1 CAN/CSA-C22.2 No. 61010-1
Options	
Power relays (3)	250 Vac, 5A, potential-free, change-over contact (SPDT)
Modbus protocol RTU RS-485	Transmission of current measured values & alarm stages

Technical Data Sensor

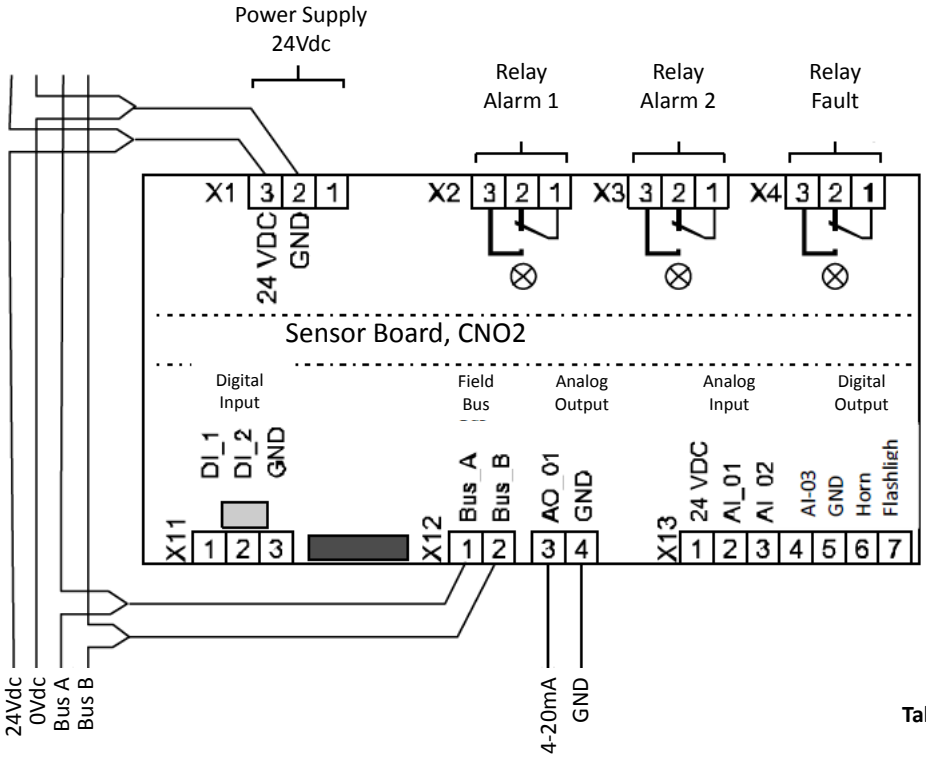
Electrical	
Power supply	5 Vdc from sensor board, reverse polarity protected
Power consumption:	50 mA, max. (1.0 VA)
Serial interface local bus	1-wire / 19200 Baud
Sensor element	Electrochemical
Measuring range	0 – 10, 0 - 30, 0 - 500 ppm
Accuracy	± 0.5 ppm, 20 ppm 0 - 500
Resolution	0.1 ppm, 2 ppm 0 - 500
Repeatability	< ± 2 % sig.
Response time t_{90}	≤25 sec.
Zero point variation	± 0.2 ppm
Zero Drift	< 1 % signal / month
Zero Gain	< 2 % signal / month
Pressure range	Atmospheric ± 20 %
Sensor life time	2 years / normal ambient conditions
Calibration interval[1]	12 months
Storage temperature range	+ 5 to + 30 °C (41 to 86 °F)
Warranty	1 year on material (without sensor element)

[1] Manufacturer-recommended calibration interval for normal environmental conditions.

Ordering Codes

CNO2 010C	CGD bus	0-10 ppm 16-29Vdc
CNO2 010M	ModBus	0-10 ppm 16-29Vdc
XNO2 010	Sensor Head	0-10 ppm for exchange (2-years)
CNO2 030M	ModBus	0-30 ppm 16-29Vdc
CNO2 030C	CGD-bus	0-30 ppm 16-29Vdc
XNO2 030	Sensor Head (Repl.)	0-30 ppm for exchange (2 years)
CNO2 500M	ModBus	0-500 ppm 16-29Vdc
CNO2 500C	CGD-bus	0-500 ppm 16-29Vdc
XNO2 500	Sensor Head (Repl.)	0-500 ppm for exchange (2 years)
CPS 230	Power Supply 230V	
CRELNO2	3 relay outputs for different alarm levels, standard 2/5/10 ppm (0-10 ppm version)	
CSTOP	Reset button with external input, incorporated in detector	
CBUZ LED	Buzzer with built-in LED indication in three colours, incorporated in detector	
CDUCT	Duct Kit	
DR 24/30	Power supply 24Vdc	
CSTAIN	Option, stainless housing	
REG	Pressure regulator, flow adjustment to 0.5 l/min	
GAS	Calibration Gas 17 liters	
GKIT	Calibration Kit	
Alarm Units		
AAW 24	Warning Horn 24Vdc 98dB	
AAW 230	Warning Horn 230Vac 98dB	
OA 24	Flashlight 24Vdc, red	
OAW 24	Combined Warning Horn/Flashlight, 24Vdc 98dB	
OAW 230	Combined Warning Horn/Flashlight, 230Vac 98dB	
OAW 24T	Combined Warning Horn/Flashlight with reset button, 24Vdc 98dB	
Warning Plate		
Gas Alarm	Flashing gas alarm plate “GASALARM” 24Vac/dc	
SP 600	Impact protetction	

Electrical Connection



Field Bus

Table: Connection options for sensors

Connection to CCO	Sensors via local bus	Analog sensors with 4-20 mA signal
Number	0	1 - 3
Number	1	0 - 2
Number	2	0 - 1

Gas monitoring and ventilation control in parking areas

Gas monitoring in parking areas meets two main needs:

- To give a warning when the amount of harmful gases reaches an unhealthy level.
- To ensure that the ventilation control is done in the best and most profitable way, ie for fresh air needs.

Hazardous gases

Petrol and diesel exhaust fumes emit harmful levels of nitrogen dioxides (NO_2), hydrocarbons (CH) and carbon monoxides (CO).

As a rule only carbon monoxides and nitrogen dioxides are monitored in parking areas since it is often (wrongly) believed that other gases do not reach harmful levels.

Carbon monoxide is a highly dangerous toxic gas (see table at the top of page 5).

Nitrogen dioxide is a carcinogen.

When considering monoxide from gas monotoring persective it is appropriate to have two alarm levels, where one level, occurs at about 20 ppm, and the other at about 35 ppm.

A gas alert sign or similar can warn of unhealthy carbon monoxide levels at the lower alert level. At the higher alert level, ie critical alarm level, it may be appropriate to allow the system to activate a warning siren.

A detector density of at least 1 detector/400 m^2 is would be appropriate.

In case there are diesel vehicles in the parking area, it is important to take other harmful gases into consideration, such as nitrogen oxides and hydrocarbons.

In cases described above, specific monoxide detectors cannot cover the detection needs. Detectors that can detect these gases are required, eg, the GNO_2 gas detector.

Application areas

- Car repair shops
- Trucks/Indoor
- Parking areas
- Tunnels
- Mines
- Ice Hockey Rinks
- Bus/Lorry Terminals
- Generator rooms
- Garages

Ventilation control

The minimum requirement to be set in ventilation control is to make certain that the gas monotoring facility affects the ventilation in such a way that if harmful gas concentrations occur, the fresh air intakes must increase in order to reduce gas concentrations to reach harmless levels.

A well-regulated demand controlled ventilation in a parking area not only improves the air quality but it also minimizes the energy consumption by avoiding unnecessary ventilation.

Optimal ventilation with regard to gas concentrations can usually be achieved by regular ventilation.

In a modern gas monitoring facility there are functions both for alarms (two levels) and controls for air evacuation.

The control options in the gas monitoring facility can be adapted to the control modes of most ventilation facilities.

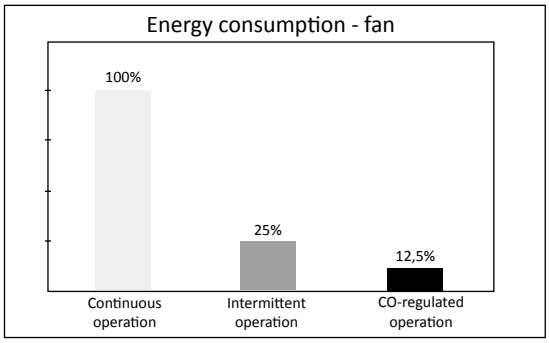
The gas monotoring facility allows for incrementally controlled ventilation.

Example:

At low load, ventilation is running at 1/2-power. If the gas concentration exceeds 20 ppm (level 1), the sensors react and ventilation is controlled is switched over to the 1/1 power.

Staff Alarm - e.g. warning by sirens in the parking area - is given when the concentration exceeds 25 ppm (level 2).

Stepless control via frequency converter controller or via DDC/PLC gives the best energy savings.



By monotoring CO levels and only running the fans when necessary the CO detector becomes a significant energy saver.

Normally parking area ventilation need only be operational in 2 out of 24 hours, which naturally saves a great deal of energy.

Poisoning Hazard

There are several gas that when released in the air uncontrolled can poison and kill people. Common poisonous gases in industry are e.g. ammonia, carbon monoxide and hydrogen sulphide (all the examples listed are also flammable).

Experts within occupational health and medicine estimate the gas concentrations for harmful gases when the adverse impacts are minor.

In Sweden, these so called hygienic levels are set and updated by the Swedish Work Environment Authority.
A distinction is made between the maximum exposure limit, i.e. the maximum value for a 15-minute average exposure, and the exposure limit value, i.e. the maximum value for an 8-hour average exposure.

When monotoring gas it is advisable to let the hygienic exposure limit values provide indications for the choice of alarm levels.

This does not mean however that you necessarily need to adhere to the above described levels.

Alarm levels should be chosen according to how dangerous the gas is and the particular installation conditions.

How carbon monoxide affects people			
Vol-%	**ppm**	**Contact duration**	**Symptom med möjliga följder**
0.02	200	2-3 h	Light headache
0.04	400	1-2 h	Severe headache (forehead)
0.08	800	45 min 2 h	Malfunctions in the body Unconsciousness
0.16	1600	20 min 2 h	Malfunctions in the body Death
0.32	3200	5-10 min 30 min	Malfunctions in the body Death
0.64	6400	1-2 min 10-15 min	Malfunctions in the body Death
1.28	12800	1-3 min	Death

Emission values for different engine types, as well as hygienic exposure limits of the gases									
GAS	Impurities (g/kg fuel) caused by petrol and diesel engines			ppm content petrol exhausts	ppm content diesel exhausts	Hygienic limits			
						ppm 8 h	mg/m³ 8 h	ppm 15 min	mg/m³ 15 min
NO_2	25	10,5	42	100-200	2000	25	30	-	-
CO	155	12	13	20000-60000	1000	35	39	50	55
CH	15	6	4	200-1500	500	25-1000			

By using gas detectors with an analog output, 4-20 mA, which sends the signal to a computerized control, regulation and monitoring system, the ventilation control is done in a more refined manner.

Depending on the capacity of the computerized system, the ventilation can be controlled continuously instead of stepwise. One can have a throttle control, optional time delays, breakdown of the ventilation into zones, etc.

The impact of various gases and vapours on people and hygienic exposure limits. Gas concentration in ppm (parts per million).					
Gas	**Lethal dose 5-10 min duration**	**Severe poisoning**	**Tempo-rary trouble**	**Max exp. lim.**	**Av. exp. lim.**
Ammonia (NH_3)	5.000	2.500	250	50	25
Carbon monoxide (CO)	7.000	2.000	1.000	100	35
Petrol	20.000	7.500	3.000	-	200*
Acetylene	500.000	250.000	100.000	-	-
* Refers to mg/m³					

Installation exemple

nstallation in parking area with mechanical ventilation at 40 x 40 m (1600m²).

The CO-detectors are placed at 140-180 cm above the floor, evenly distributed over the area, with consideration taken for walls and section dividers.

As a rule of thumb there should be one detector per 400m², the exact number depending on the shape of the area.