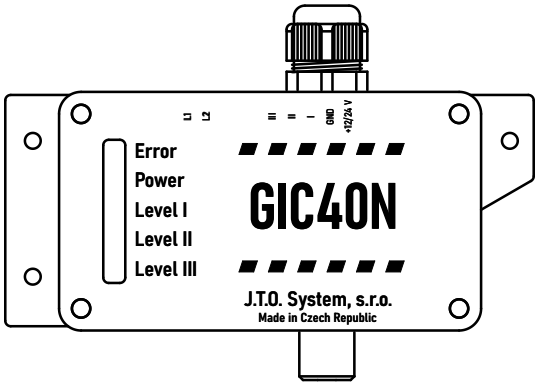
Carbon monoxide detector GIC40N

Technical Specifications and User Guide

- Stationary electronic device for carbon monoxide detection
- Part of industrial and commercial detection applications
- Use in small and medium-sized boiler rooms, garages or various warehouses and technology operations where CO may occurs (for non-hazardous areas)
- Three levels of detection with separate outputs
- Error output with the possibility of connection to the alarm loop



The purpose of the detectors is to send a signal about the creation of a potentially dangerous atmosphere for health. They use a heated semiconductor sensor for their operation, which can react to the presence of many others flammable gases or vapors. However, a special sensor control procedure achieves high sensitivity to CO with reduced effect of other gases.

Detectors can be used individually or in groups of several pieces. Each detector is separate unit requiring 12V or 24V DC power supply and its output is a two-state signal showing whether the set concentration is, or is not exceeded. The detector contains three separate outputs allowing monitoring up to three different concentration levels. The output element for all levels is switching transistor with open collector and indicators signaling exceeding the set level. Adjustment elements are located on the electronics board, which allow selection of the desired level monitored concentrations and control some properties of the detector. The user can thus select the idle status of the output signal, its delay or the memory function for one of the outputs.

GIC40N is ready to be fastened with screws to the designated place and it is assumed to be regular on-the-spot checks.

Technical Specifications

Device Parameters

Detectable gas	carbon monoxide
Signalling	three-stage (three outputs)
Outputs	open collector transistor (60 V / 0.3 A)
Auxiliary output	relay (60 V=/0,6 A max)
Warm-up time	30 sec
Default signaling level (see below for other settings)	100 ppm for level III, 50 ppm for level II and 30 ppm for level I
Maximum measuring range	up to 250 ppm
Response / stabilization time	max. 20 sec / max. 1 min
Delayed switching of outputs	optional 15 min averaging of values
Supply voltage	12 V= ± 10% or 24 V= ± 10%
Current consumption	90 mA max
Protection	IP20
Weight	about 250 g
Operation conditions	-5 to 50°C, 95 to 105 kPa, 5 to 95% RH
Working environment	without the danger of explosion
Storage temperature	-20 to 50°C/ non-condensing humidity
Dimensions without holder	115×103×40 mm
Detector connection	multicore (3 to 7) cable, diameter 5 mm; for a distance over 5 m use shielded cable
Constructed according to	ČSN EN 45544
Certificate	VVUÚ a.s., č. 358/D/2017

Usage Limitations

GIC40N detectors are designed to detect the presence of CO in a standard atmosphere. We do not guarantee correct detection at low or high oxygen concentration. The use of the device in an environment where there may be special chemical substances, e.g. those based on sulfur, arsenic, or phosphorus, can lead to the so-called sensor *poisoning*. Possible applications in such environment must be consulted with the manufacturer.

When the detector sensor is exposed to a concentration above the specified measuring range, it returns to normal operation when the detector is placed in clean air again. Recovery time is up to 2 minutes in the whole range of permitted climatic conditions.

Detector Location

When the detectors are located in a building, we recommend following ČSN EN 45544–4, which describes the *Selection, installation, use and maintenance*. The detector should never be placed in locations where it may be affected by impurities such as water (or color) droplets or oil vapors and it should never be exposed to chemicals!

Function description

GIC40N detector uses a heated semiconductor sensor to detect gas. These sensors are not selective, they react in the presence of various flammable substances in the air. In order to achieve high sensitivity to CO and reducing the influence of other substances, the sensor is controlled in periodic cycles and is additionally inserted in front of the active layer carbon filter suppressing the effect of organic substances.

During operation, the sensor is first heated to a higher temperature for 3 seconds (indicated by the green light LED) and then the ambient air is left at a lower temperature (green LED for this time off). At the end of the time with a lower temperature the state of the sensor - ambient CO concentration - is evaluated. Depending on the detected concentration and the set gas levels, it changes the corresponding output (according to setting the corresponding switches - see below).

Detector Connection

The detector is connected to the detection system with several wires connected to the screw terminal block on electronics board.

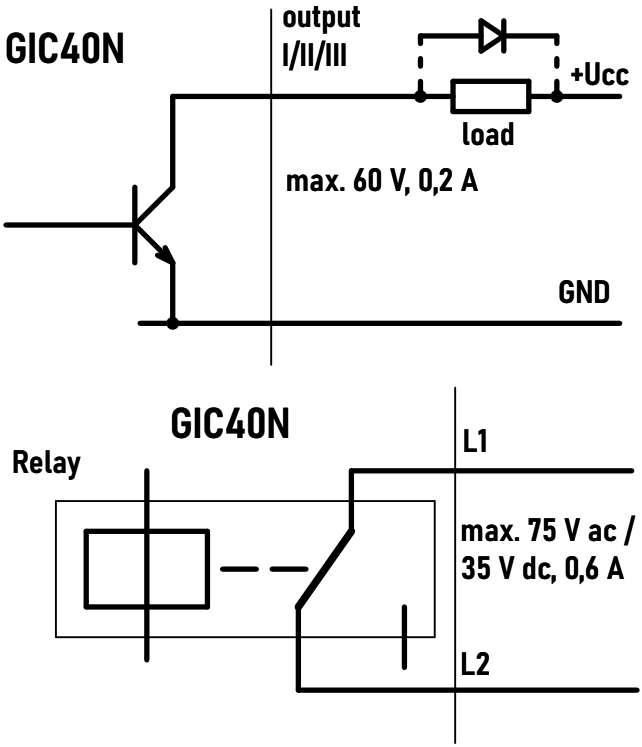
Marking	Signal – use and meaning
+	Positive pole of the detector supply voltage. The superior control system or the power supply e.g. NZ34, NZ34-DIN could be used to power the detector. We recommend using surge protectors on the mains supply to the system.
GND	Common wire (ground). A wire with a reference potential for the power supply and output signals.
I	Stage I output. Switching (ON) at the concentration exceeding the level I setting.
II	Stage II output. Switching (ON) at the concentration exceeding the level II setting.
III	Stage III output. Switching (ON) at the concentration exceeding the level III setting.
L1, L2	Output loop signaling detector failure. If everything is OK, terminals L1 and L2 are connected. In the event of a fault, this loop will be disconnected.

Detector power supply

The detector can be supplied with a voltage of 12 V = or 24 V =. There is no need to do any adjustments for to supply 12 V and the detector can be connected directly. For supply 24 V = the wire jumper located on the printed circuit board under the resistor near the „+“ terminal must be interrupted. Slightly bend the resistor to the side and break the wire jumper with a sharp tool (splitting pliers). Then return the resistor to its original position.

Output connection

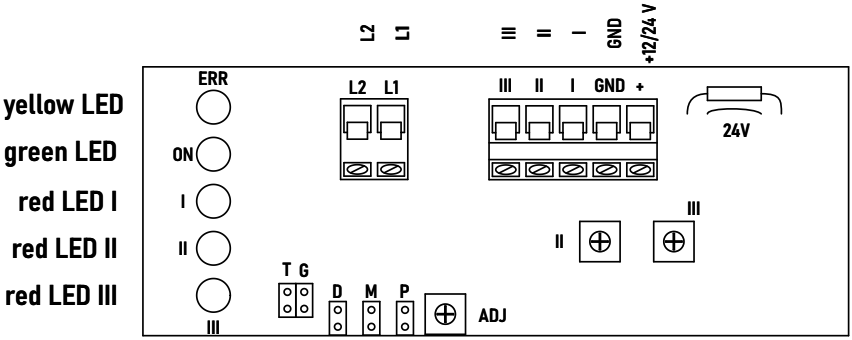
Outputs III, II and I are used to signal that the concentration of level III, II or I has been exceeded. All 3 outputs are connected as a transistor with an open collector. They switch the load connected against + supply voltage. The terminals are connected directly to the output transistor. There are no additional protection circuits on the board. When switching eg inductive loads, an external protective element must be used.



There are 2 more fault loop terminals located on the electronics board. The switching element here is the contact relay. It is not necessary to observe the polarity of the current flowing in the loop. The fault (disconnection of L1 and L2) is signaled by the yellow LED. If the detector is without power the „fault“ loop is open.

Control and signaling elements

Several elements are located on the electronics board to control the detector functions and signal its status.



Trimmers and jumpers for setting the monitored gas concentration. The setting of the level of monitored gas concentration for individual stages is preset by jumpers T / G to a fixed value or when using the T-jumper with trimmers. The following table specifies concentration values [1]:

Jumper T	Jumper G	Concentration I [ppm]	Concentration II [ppm]	Concentration III [ppm]
Open	Open	30	50	100
Short	Open	30	trimmer II	trimmer III
Open	Short	30	60	150
Short	Short	trimmer II	trimmer II	trimmer III

The trimmer marked ADJ is intended for adjusting the sensitivity of the sensor. Used only for setting detector using calibration gas (see Installation and inspection of GIC40N detectors).

If jumper T is short and jumper G is open, the concentration selection for stages II and III is made with trimmers. Each of these stages has a separate trimmer. When turning the trimmer clockwise sets higher gas concentrations - see figure.

[1]For devices with firmware version 1.0 (devices manufactured before mid-2019), the limit concentration III is 120 ppm CO in the case of jumpers T and G open.

The range of the whole trimmer corresponds to a concentration of 0 to 250 ppm. When divided into 10 divisions, 1 division corresponds approximately a concentration of 25 ppm.

In the case[2] of both jumpers T and G short, the concentration of I and II is the same. It is set using trimmer II. The concentration of III is adjusted with trimmer III. Trimmer ADJ is then used to set the range for trimmers II and III.

Output function selection jumpers

Jumper M allows you to set the memory function on output III. When the jumper is short the output remains signaled presence of gas even after the gas concentration falls below the set level. This status can be only canceled by switching off the supply voltage or removing jumper M. If there is jumper open, output III monitors the current state of concentration exceeded or not exceeded.

Jumper D sets the delayed response of outputs I and II. If short, the concentration value is compared to the set limits calculated from a 15-minute weighted average. So the detector averages the 90 values (15 minutes per 10 seconds) that were last measured and this average value compares with the set appropriate limit. After start, the internal memory of measured values is cleared. If jumper D is open, the outputs react without delay at the same time as the corresponding signal light comes on LEDs always when measuring the concentration state.

Jumper P reverses the idle state at output III. When the jumper is short, the output transistor is closed and opens when the set concentration is exceeded. If the jumper is open, the output transistor does not lead at idle and closes only when the corresponding concentration is exceeded.

Indicator lights

The status of the detector is optically signaled by 5 LEDs with a diameter of 5 mm.

Green	Detector is on, presence of supply voltage. The indicator light blinks for a period of 10 seconds (On for 3 seconds and off for 7 seconds).
Red - I level	Exceeding the set concentration for the stage I.
Red - II level	Exceeding the set concentration for the stage II.
Red - III level	Exceeding the set concentration for the stage III.
Yellow - error	A fault in the sensor or electronics or an overload of the detector sensor with a high concentration is signaled by this indicator. If the detector is OK, the light is off.

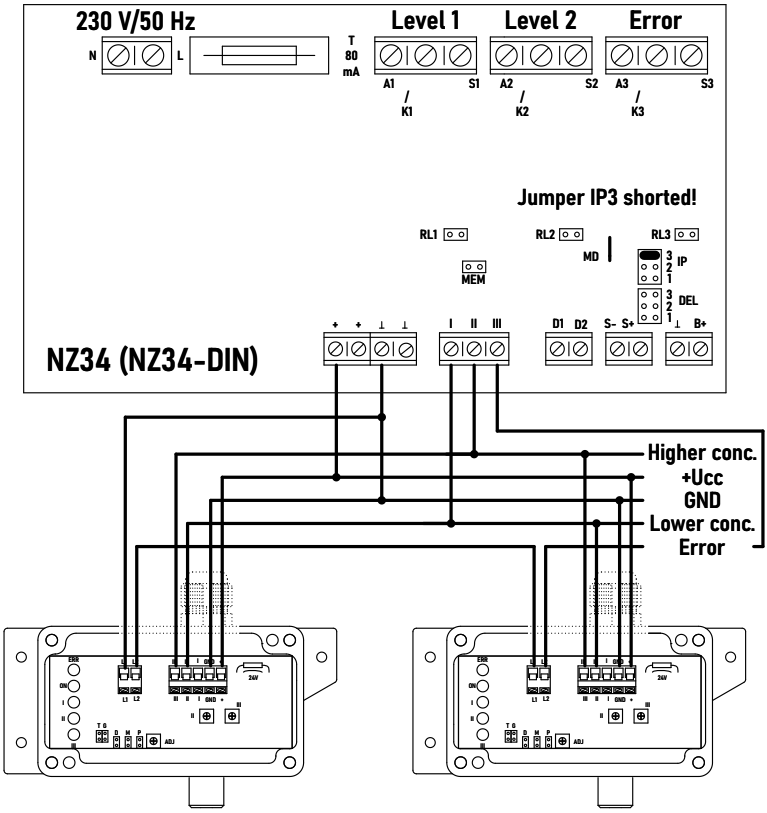
[2]This mode is functional only from firmware version 1.2 (devices manufactured in the second half of 2020 and later)

Connection examples

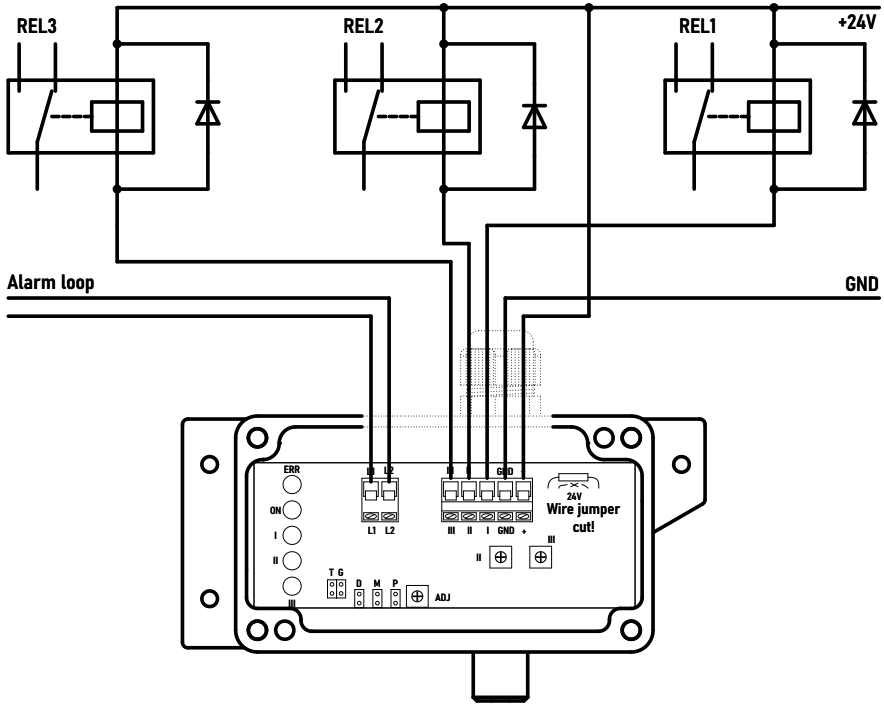
The following figure shows an example of a simple assembly for monitoring two (or more) different places. Two (or there may be more) detectors are used together with the NZ34 power supply. Four signal wires from detectors (+ 12V, GND, II and III) are connected in parallel. Outputs II from the detectors are led to input I of power source, outputs III to input II. When concentration II is exceeded, the relay responds on terminals S1, A1, K1 in the source. When the concentration III is exceeded, the relay connected to terminals S2, A2, K2 reacts.

The fault loop is connected to input III of the power source, which monitors the correct function and sends a failure message.

The mains voltage of 230 V is supplied to the power supply. Relay outputs LEVEL1 and LEVEL2 are ready to control actuators according to the needs of the application.



Another example is the connection of a detector to a control system that requires potential free switching inputs. The detector is powered from a 24V= source. Relays with a 24V coil are connected to its outputs. Relay coil is always bridged by a protection diode. The relay contacts can then be on or off according to control system requirement. The output contacts are connected directly to the inputs of the control system.



Installation and inspection of GIC40N detectors

Installation procedure

1. Screw the detector to the designated place using screws through the holes in the metal holder. Recommended position (due to dust) is the sensor down. The location of the detector must not be moisty and must be avoid contamination of the detector sensor with any substances (eg oil, petrol, paint, vapors solvents, etc.). Install detectors in the building when all welding and painting have been completed! We do not place detectors in close proximity to magnets, such as those contained in speakers, etc.

2. Unscrew the upper cover of the detector.

3. Before connecting, check the supply voltage and the load connected to the detector. E.g. when the load is activated, measure the magnitude of the connected voltage with a voltmeter against the GND and ammeter connected to GND the amount of current flowing through the load.

4. Pass the cable with connecting wires through the bushing. Connect appropriate wires to the terminal block signals as shown (without voltage) and tighten the bushing.

5. Screw on the detector cover.

6. We turn on the power. When operating correctly, the green indicator will light for 3 seconds and then go off for 7 seconds. This process must be repeated periodically. The yellow light must be off in normal operation.

7. After at least 5 minutes, we will perform a functional check of the detector to verify the correctness of detector connection into the system.

GIC40N detector check

When inspecting the detector, it is necessary to ensure stable conditions under which the inspection is performed. For stabilization operating state, the detector must be switched on at least 15 minutes before the start of the inspection. If the detector was long time without power, it is advisable to leave the detector on for several hours in a clean environment (eg 10 hours without gas). It is also advisable to turn off the memory with jumper M and jumper D. The detector can be checked as follows:

Functional check:

This check determines whether the detector responds to the presence of CO in the air. For inspection can be used a test ampule with a smoke stick that is supplied to inspect any new J.T.O. System, s.r.o. CO detector. Take the stick out of the ampule,

light it and let it smoke like a cigarette. Move smoking stick in to a distance of about 5 cm so that the rising smoke passes around to the sensor. Within about 30 seconds must activate all detector stages and the system response must follow. If jumper D is short, only stage III is activated.

Check with calibration gas:

To check the monitored levels, it is necessary to provide a mixture of calibration gas with the required concentration (in the range of 100 to 200 ppm CO) or mix desired concentration in the space around the sensor.

Calibration procedure

Procedure when using a permanent magnet

1. Verify that the detector is turned on long enough before the actual calibration. After switching off in a few days it needs to be stabilized for at least 3 hours. With a longer switch-off time, the stabilization time is extended (shutdown 1 month - stabilization at least 10 hours, shutdown several months - stabilization at least 2 days).

2. Move the permanent magnet closer to the side of the detector box on the side of the lights. Switch to calibration mode is indicated by short flashes of the green light when it would be off in normal operation.

3. A calibration gas of known concentration is introduced around the detector sensor. If a flow meter is available, set the flow to 0.5 l / min. Allow the sensor to stabilize in the gas for at least 1 minute.

4. Set the ADJ trimmer on the electronics board so that the 2 LEDs for stage I and II flash signaled the currently used concentration. The concentration is signaled by the number of flashes of these red lights in the period between the green lights coming on. The concentration is then determined by calculation:

   $$\text{Concentration in ppm} = \text{number of flashes of the II indicator light} \cdot 100 + \\ + \text{number of flashes of the I indicator light} \cdot 10$$

   Example: The red LED II flashes 1× and at the same time the red LED I flashes 4×. The concentration is 140 ppm (1·100 + 4·10).

5. After the inspection, the detector must be ventilated in clean air for at least 5 minutes.

Procedure using a calibration gas with a concentration of 100 ppm or 150 ppm

This mode can be used if the jumpers T and G are open and we have a calibration gas with a concentration of 100 ppm CO, or if only jumper G is short and we have a calibration gas with a concentration of 150 ppm CO.

1. Verify that the detector is turned on long enough before the actual calibration. After switching off in a few days it needs to be stabilized for at least 3 hours. With a longer switch-off time, the stabilization time is extended (shutdown 1 month - stabilization at least 10 hours, shutdown several months - stabilization at least 2 days).

2. A calibration gas of known concentration is introduced around the detector sensor. If a flow meter is available, set the flow to 0.5 l / min. Allow the sensor to stabilize in the gas for at least 1 minute.

3. Set ADJ trimmer on the electronics board so that the stage III output just lights up.

4. After the inspection, the detector must be ventilated in clean air for at least 5 minutes.

Unless otherwise specified in the standard, we recommend checking the detector with a calibration gas at least once a year. For severe environments and higher detector loads (higher humidity, dust, temperature, etc.) it is advisable to check the detector twice a year.

The frequency of functional checks can be determined according to the specific use and operation of the detector, eg every 1 to 3 months.

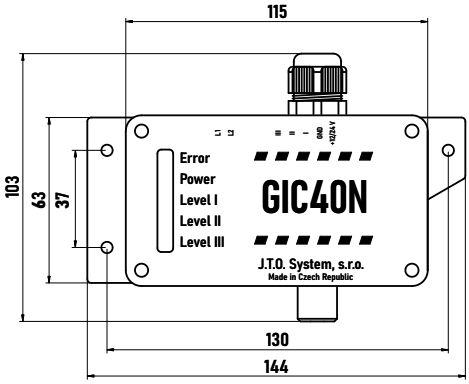
Troubleshooting

If the detector indicates for no apparent reason that the first or higher level has been exceeded, connect it to a suitable power supply in clean air and allow the detector sensor to ventilate for at least 3 days. If the fault persists or the problem persists, contact the manufacturer. If the yellow fault indicator light is on and the three red LEDs are off at the same time signaling, check the supply voltage of the detector. If the power supply is OK, send the detector to the manufacturer for repair.

If a fault occurs for which you do not know the solution, contact technical manufacturer support.

Detector accessories

The detector comes with *an ampule containing smoke stick* and a metal mounting bracket (see illustration on the front page).



Storage and Service

Detectors should be stored for the shortest time under the above conditions. If the detectors are not exposed to some chemicals during storage they are not damaged. During storage it flows period of time for recommended periodic calibration checks however. In the case of storage for more than 6 months, it is recommended to carry out recalibration before using it. The year of manufacture can be determined from the last 2 digits of the serial number.

Warranty and post-warranty service or technical assistance can be obtained at:
J.T.O. System, s.r.o., 1. máje 823, 756 61 Rožnov pod Radhoštěm, Czech Republic
tel. +420 571 843 343

If the device is taken out of service, it must be disposed of ecologically – ie to hand over to a company authorized to dispose of electrical waste.

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