List of contents

1. Introduction

The gas detectors are stationary, continuously operating control units for connecting sensors to measure toxic gases. The units excel both through their reliability and the low installation and maintenance work involved.
It is possible to connect up to 4 sensors to the gas detectors. The units can be used both in private homes and in industry.

2. Display and alarm device

The gas detectors have 10 LEDs on the front panel to display the relevant operating mode and the function messages. External devices are activated or information passed on with four relays. The relays operate as a group relay for all 4 sensors. They have zero-potential changeover contacts for a maximum load of 230 V / 5 A (ohmic load).
The relays for alarm 1 and alarm 2 can, for example, control solenoid valves of the sprinkler system. With alarm 2 the horn relay and an acoustic signaling device integrated in the side can also be activated. The horn relay is intended for activating an external horn or siren. This relay can be acknowledged in the event of a gas concentration. A sensor fault can be displayed with the 'Trouble' relay.
Moreover, units with an integrated measurement display are available (GW 504).
The relays in the gas detectors work according to two different principles:

1. Open-circuit current principle:
The relays for alarm 1 and alarm 2 as well as the horn relay are activated on detection of the relevant condition, i.e. the relay coil pulls up if alarm 1 or 2 is exceeded.

2. Closed-circuit current principle:
The fault alarm relay is activated in the fault-free condition, this relay drops. It is therefore possible for a fault signal to be passed on by the fault alarm relay even in the event of a power supply failure to the gas detector.

3. Function modes

The gas detectors operate as a central control facility for the entire gas alarm system. They record the signals from the sensors and evaluate them.
Various operating modes are described below which can occur on the gas detectors.

3.1 Activation

The sensors connected can display undefined values immediately after activation. False alarms may occur due to this mode. Therefore, after activation or after a power failure the alarm messages are blocked for 60 seconds.
The green LED "Power" starts to flash as soon as the power supply is on again. In this period the yellow LED "Trouble" remains illuminated continuously and the fault alarm relay indicates a fault. After these 60 seconds the green LED "Power" is lit continuously and the yellow LED "Trouble" as well as the fault alarm relay assume their normal operating modes, i.e. the yellow LED goes off and the gas detector switches to the Recording measurements mode.

3.2 Measurement recording

The automatic recording of measurements is displayed by the constant illumination of the green LED "Power". The signals of the sensors are now received by the gas detector. Hazardous gas concentrations and faults in the unit or exceeding of the measuring range can now be indicated.

3.3 Alarm

If the alarm thresholds are exceeded, this is indicated by the red LEDs. Each sensor has 2 alarm thresholds. At 20% of the measuring range (2.00 ppm) with the chlorine sensors the red LED "Alarm 1" of the relevant sensor lights up and the relay "Alarm 1" is activated. Alarm 1 is automatically deleted after the value has fallen below 20%. At 40% of the measuring range (4.00 ppm) with the chlorine sensors the red LED "Alarm 2" of the relevant sensor lights up and the relay "Alarm 2" is activated. Alarm 2 is self-holding and can only be acknowledged with the button "Reset/Test" after the gas concentration has fallen below the critical value. Moreover, if the alarm threshold 2 is reached, the internal acoustic signaling device and the horn relay for external signaling devices are activated. They are self-holding and have to be acknowledged with the button "Reset/Test".

3.4 Trouble

A fault is displayed by the yellow LED "Trouble".
The following faults may occur:
Measuring signal fallen short (sensor signal <2 mA):
- Breakage in cable to sensor
- Short circuit in the cable to the sensor
- Defective sensor element

If a measuring signal has fallen short, the yellow LED "Trouble" lights up and the fault alarm relay indicates a fault.
After the fault has been rectified, the LED goes off and the fault alarm relay no longer indicates a fault.
Measuring range exceeded (sensor signal >20 mA), e.g. by:
- Gas concentration higher than the measuring range

If the measuring range is exceeded, both alarm thresholds are exceeded and the red LEDs "Alarm 1" and "Alarm 2" light up.
In addition, the yellow LED "Trouble" lights up and the fault alarm relay indicates a fault. As alarm 2 and the fault message are self-holding if the measuring range is exceeded, they must be acknowledged with the button "Reset/Test".

4. Action in case of alarm or fault

4.1 Alarm 1

If alarm 1 is triggered, a minimum gas concentration exists. Appropriate action must be initiated immediately. Repair work may only be started after the concentration has fallen below the alarm threshold 1.

4.2 Alarm 2

The endangered area and all surrounding rooms must be evacuated and the measures laid down in the safety rules and the chlorine alarm plans initiated. Repair work may only be started after the concentration has fallen below the alarm threshold 1.

4.3 Trouble in the unit

In the event of faults in the unit which the operator cannot rectify immediately, appropriate action is to be taken and the maintenance service notified. Until the fault has been rectified, warning signs are to be put up and the employees notified of the special situation.

4.4 Troubleshooting

Display	Possible cause	Remedy
LED "Power" is off	Interruption in the power supply	Check the power supply
	Short circuit in the sensor cable	Check the sensor cable
LED "Trouble" lights up	Interruption in the sensor cable	Check the sensor cable
	An unoccupied sensor connection does not have a resistance bridge	Check the sensor cable Insert resistance bridge
LED "Trouble", LED "Alarm 2" and/or LED "Alarm 1" light up	**Caution!** - Measuring range exceeded - Short circuit in the sensor or gas detector	 - Action same as with gas alarm - Eliminate short circuit

5. Maintenance and inspection

The gas detectors have a maintenance mode so that the regular work necessary to ensure proper functioning of the gas detectors can be performed. This mode is safeguarded by an access code to protect against unauthorized interference.

5.1 Test

In the Test mode the LEDs can be checked together with the relays. For this purpose the button "Reset/Test" is activated for longer than 5 seconds.

- All LEDs light up.
- The two relays for alarm 1 and alarm 2 pull up.
- The fault alarm relay drops.
- The acoustic signaling device and the horn relay for external signaling devices are activated for two seconds.

If the button "Reset/Test" is activated again, the unit reverts to the measurement recording mode.

5.2 Maintenance mode

5.2.1 Enter access code

To permit entry of the code, the button "Service" must be pressed. The green LED "Power" flashes. The code can now be entered. The default code is set to "2 3 1". The button "Reset/Test" must be pressed **twice**, then the button "Service" **three times** and then the button "Reset/Test" **once**. Subsequently, this entry must be acknowledged with the button "Service". The gas detector indicates, through the flashing of the yellow LED "Trouble", that it has accepted the access code and has gone into the maintenance mode. The green LED "Power" remains on constantly again. If the wrong or no code is entered after the first activation of the button "Service", the unit returns to the measurement recording mode after 30 seconds.

5.2.2 Maintenance, maintenance test

The maintenance mode is indicated by flashing yellow LED "Trouble". The coil of the fault alarm relay drops and thus reports a fault. The relays for alarm 1 and alarm 2 do not report an alarm. In this maintenance mode a maintenance test can be carried out. For this purpose the button "Reset/Test" is pressed for 5 seconds. Then all LEDs light up and the internal acoustic signaling device is triggered. The unit returns to the maintenance mode when the button "Reset/Test" is pressed again.

The maintenance mode can be terminated manually by activating the button "Service".

For safety reasons the maintenance mode ends automatically after 30 minutes so that a unit accidentally left in this mode resumes normal operation again.

5.3 Maintenance

Maintenance of the system should be performed in accordance with the Information Sheet T 023 of the employees' liability insurance association of the chemical industry. Maintenance comprises the following points:

- Inspection and, if necessary, calibration of the sensors.
- Functional check of the switching stages for triggering the alarms. Here, the sensors are supplied with test gas at a concentration above the alarm threshold 2.
- Functional check of the relay contacts.
- Functional check of the visual and acoustic alarm devices.

6. Calibration

The gas alarm system is calibrated before leaving the factory. Should calibration become necessary, it may only be performed by authorized specialists.

The gas alarm system is calibrated with test gas directly at the sensor.

6.1 Type and composition of the test gases

Only certified test gases within their admissible period of use may be used. The concentration must be known exactly to 2%. The pure ambient air (without combustible substances) can be used as the reference gas. If this is not guaranteed, synthetic air must be used. The concentration of the test gas must lie above the alarm threshold 2 and below the measuring range end value.

7. Interface RS 485

The computer interface RS 485 is only provided for maintenance purposes. Settings such as alarm thresholds and delay times can be set via this interface. Moreover, the measurements can be retrieved and inputs deactivated. Appropriate software and a handheld programming unit are available on request.

8. Technical data - Amplifier

Mains connection		230 V AC, 50 Hz, 20 VA (max. power consumption)
Sensors		max. 4 (various sensor types available)
Power supply to sensors		24 V DC (uncontrolled) via the measuring line
Sensor connection		4 ... 20 mA
Max. current per sensor		100 mA
Displays		8 red LEDs (alarm) 1 yellow LED (fault) 1 green LED (operation)
Acoustic signaling device		85 dB(A) at 1 m
Relays		4 zero-potential changeover contacts 230 V/5 A
Housing		Polystyrene (PS), light grey (RAL 7035), anodised aluminum front panel, transparent cover (PC)
Dimensions		(H X W x D) 184 x 222 x 115 mm
Temperature range		0° C to + 55° C
Storage temperature		- 25° C to+ 60° C
Relative humidity		5% to 90%
Type of enclosure		IP 54
Interface		RS - 485 (only for service)
OPTIONS		
Digital display		red LEDs; measurement and status display
	Display area	52 x 19 mm
Relay switch box		8 relays
	Switching voltage	250 V AC, 110 V DC,
	Max. current	10 A
	Dimensions	200 x 120 x 58 (W x H x D)
	Level of protection	IP 56
Safety system	Provision of the power supply	max. 10 hours (without alarm)
	Battery type	one 12 V block 7.0 Ah
	Dimensions	500 x 500 x 300 mm (W x H x D)
	Level of protection	IP 65

9. Connection and installation

9.1 Installation specifications

A disconnecting device (e.g. automatic circuit-breaker) must be provided in the electrical installation for the gas detectors in order to ensure safe disconnection from the power supply.

9.2 Mains connection

The gas detectors are intended for fixed connection to a power supply of 230 V / 50 Hz. The unit complies with protection class I in accordance with EN 60335 and must be connected to a protective earth conductor. The maximum power consumption is 20 VA.

9.3 Relay connection

External devices can be activated or information transmitted with 4 relays. The relays have zero-potential changeover contacts for 230 V / 5 A (ohmic load).
It is possible to expand the relays with an external relay switch box for the GW 504. For wiring diagram, see BW 2 36 04 / 9.

9.4 Sensor connection

Up to 4 sensors can be connected to the gas detectors. The sensors are connected using shielded cables. Sensors with an external power supply must not be connected.
If the number of sensors is subsequently reduced, the free terminal location must be occupied with a resistor of 5.6 kohm.
It must be ensured that during installation of the gas alarm units the shielding is applied to each sensor. Only in this condition is interference immunity for the gas alarm system guaranteed. The connection to the sensor is shown in the drawing.

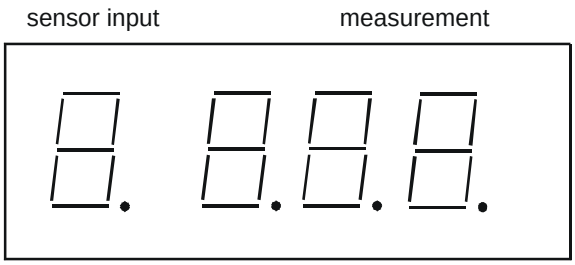
9.5 Installation

The units are intended to be mounted on the wall. Free access must be ensured. The power supply must not be switched on until installation has been completed.
Caution!
When working in the unit, make sure the power is turned off!

10. Options

10.1 Digital display

The gas detectors can optionally be equipped with a digital display (GW 504). It is a red LED display which alternately shows the measurement of all channels. The display has one digit for the activated sensor inputs and three digits for the measurement.



The maximum value is stored if alarm 2 is exceeded. Each activated sensor is displayed alternately.
Inputs which are not wired can be switched off via the computer interface and are then not displayed.

10.2 Relay switch box

The relay switch box serves to extend the relays of the gas detectors GW 504. The relay switch box is connected to the detector with a 6-core cable and switches the alarms 1 and 2 separately for each sensor.

10.3 Safety system

The safety system is an uninterrupted power supply which, in the event of a power failure, supplies auxiliary power to the gas detector. This power supply safeguards the operability of the gas alarm unit for about 10 hours.

11. Tests

EMC Directive 89/336/EEC:
The gas detectors have been EMC-tested according to the basic industrial standards EN 50081-1 and 50082-2 and can be used in industry and in private households as regards the emitted interference and interference immunity.
Low-voltage Directive 3/23/EEC:
In accordance with the standard EN 61010 Part 1, Safety provisions for electric measuring, control and laboratory equipment.

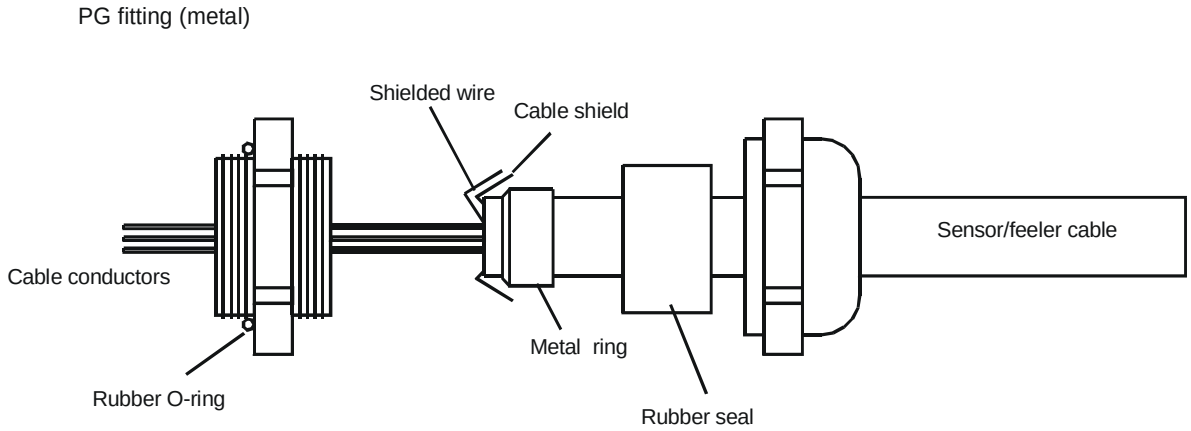
12. Sensors

The sensors for the gas detectors are electronic measuring cells which operate according to the electrochemical principle.
Testing, calibration and setting work is possible directly on the sensor. The electrochemical sensor and an evaluation board are installed in the sensor housing. The signal from the measuring sensor is converted into the standard current signal 4-20 mA on the evaluation board,. This signal is made available to the gas detector. The power supply for the sensor board is provided by the measuring cable (2-conductor connection).

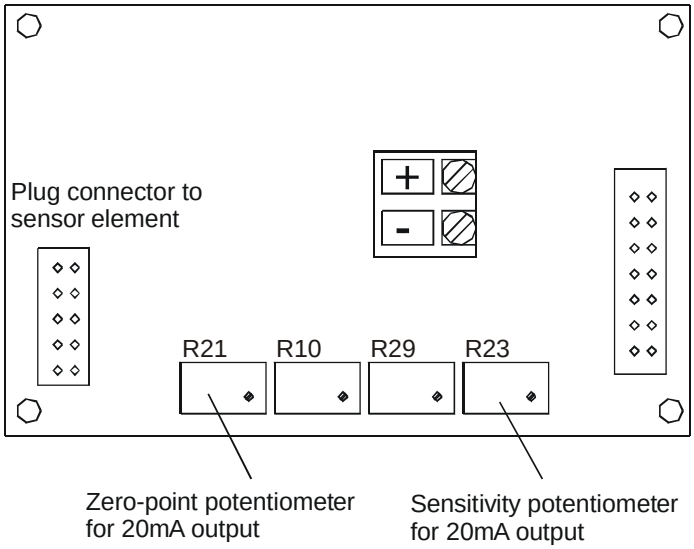
Please note!

The sensors are calibrated in the factory. Any change in the setting by an unqualified person disables the function.

Connections of the sensors



Sensor board



Alignment:

1. Turn 4mA potentiometer (R21) to left-hand stop
2. Set offset between -60mV and -70mV on offset potentiometer (R29) (measured at U- and U+)
3. Set output current on 4mA potentiometer (R21) to 4mA
4. Set offset potential on offset potentiometer (R29) to 0mV
5. Wait for system to run in
6. Apply test gas and set the corresponding current on cutting potentiometer (R23)

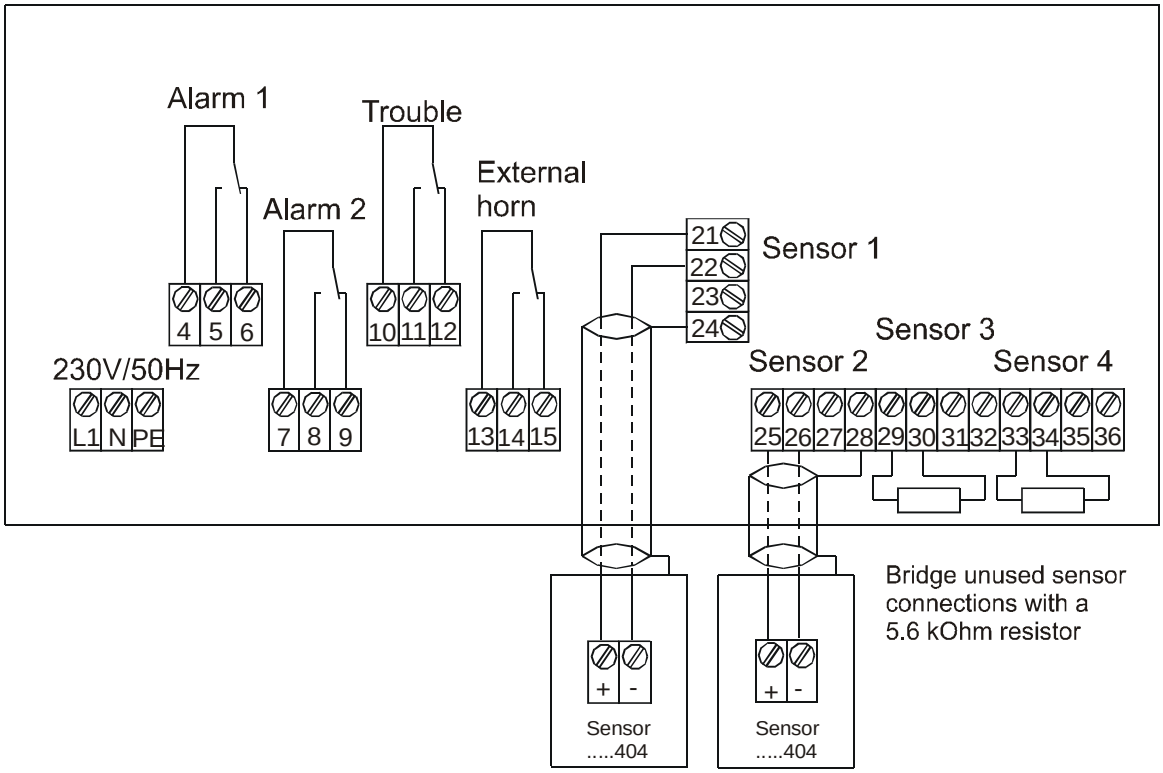
Technical data - Sensor for chlorine

Type of gas	Chlorine (Cl_2)
Measuring principle	electrochemical cell
Standard measuring range	0 ... 10 ppm
Other measuring ranges	0 ... 20 ppm, 0 ... 50 ppm, 0 ... 5 ppm
Cross-sensitivity	NO_2, O_3
Heat-up time	approx. 24 hours (in case of power failure lasting more than 3 hours, renewed heat-up phase necessary)
Response time (t_{90})	about 3 minutes
Temperature range	10°C to +45°C, briefly up to +55°C
Humidity range	20% to 99% relative air humidity
Power supply	18.5 - 30 V DC (2-conductor technology)
Signal output	4 ... 20 mA
Power consumption	about 0.5 W
Area which can be monitored by diffusion	With room monitoring about 40 m² to 60 m² (depending on local conditions)
Service life	about 2 years; silicone, boron or phosphorous compounds like $SiCl_4$ BCl_3 or PCl_3 clog the capillary gas inlet openings!e kapillaren
Installation position	Close to the ground; due to the particularly poor propagation of chlorine attention must be paid to optimum positioning. Position in accessible place for maintenance purposes! Protect against splash water!(rain hood)
Max. load	400 Ohm
Maintenance	2 times per year recommended
Cable length	max. 2000 m of the shielded special cable is used, 3 x 0.8 mm, Part No. 78017
Special notes	A rain hood is provided for installation; pay attention to temperature range
Type of enclosure	IP 54
EMC test	EN 50081-1 (emission), EN 50082-2 (interference immunity)

Sensor (Part No. 23500106)
Yellow HF-proof metal housing with protective cap.

The service life of the sensors is about 2 years. After this period the sensors should be replaced as a precaution. Appropriate replacement sensors are available from JESCO if the existing sensors are returned.

13. Wiring diagram, gas alarm unit



L	Mains connection 230 V / 50 - 60 Hz
N	Neutral conductor connection
PE	Protective conductor connection
4	Relay alarm 1
5	Relay alarm 1 (make contact)
6	Relay alarm 1 (break contact)
7	Relay alarm 2
8	Relay alarm 2 (make contact)
9	Relay alarm 2 (break contact)
10	Relay fault
11	Relay fault (make contact)
12	Relay fault (break contact)
13	Relay ext. horn
14	Relay ext. horn (make contact)
15	Relay ext. horn (break contact)

21	+24 V sensor 1
22	Signal (4 - 20 mA) sensor 1
23	free
24	Shield sensor 1
25	+24 V sensor 2
26	Signal (4 - 20 mA) sensor 2
27	free
28	Shield sensor 2
29	+24 V sensor 3
30	Signal (4 - 20 mA) sensor 3
31	free
32	Shield sensor 3
33	+24 V sensor 4
34	Signal (4 - 20 mA) sensor 4
35	free
36	Shield sensor 4

Connection GW 504 - Relay switch box

The relay switch box serves to expand the relays for the gas detectors GW 504. 8 relays are accommodated in a separate housing. These relays also switch if the alarms 1 and 2 of the sensors connected to the group relays in the gas detector are triggered. Each alarm switches a relay using the open-circuit current principle. The appropriate relays switch like the alarms in the gas detector, i.e. in normal position alarm 1 is self-acknowledging and alarm 2 self-holding.

The connection terminals in the GW 504 are located under the front panel of the gas detector. Due to little connection space in the gas detectors the front panel has to be removed to connect the connection cable; then the connection terminals become visible. The connection is to be made with a shielded cable.