

# INDUSTRIAL GAS LEAK DETECTOR WITH PRE - ALARM

## RFG 782 Eng.



- Remote sensor for Methane-Natural gas, LPG-Propane, CO-Carbon monoxide
- Two SPDT output relays: "Operational" and "Pre-alarm"
- One SPDT output relay: "External alarm"
- Programmable "not energized (N.O.)" or "energized (N.C.)" relays output
- Adjustable alarm threshold
- Self-diagnosis sensor fault
- Construction and operation in accordance with  
CEI EN 50194 and CEI EN 50244 for Methane and LPG - Propane  
CEI EN 50291 and CEI EN 50292 for CO - Carbon monoxide
- Power supply 230 V~ or 12 V–
- Constructed in DIN 144x144 case with IP 40 protection

### 1. APPLICATION

RFG 782 is designed to detect the presence of gas in industrial (laboratories, workshops, etc.) or non industrial premises (boiler houses, garages, etc.).

It can monitor, with one or two remote sensors, the concentration in air of the most common types of combustible gas, Methane-Natural gas and LPG-Propane, or the CO-Carbon monoxide produced by incomplete combustion, according to type of sensor used.

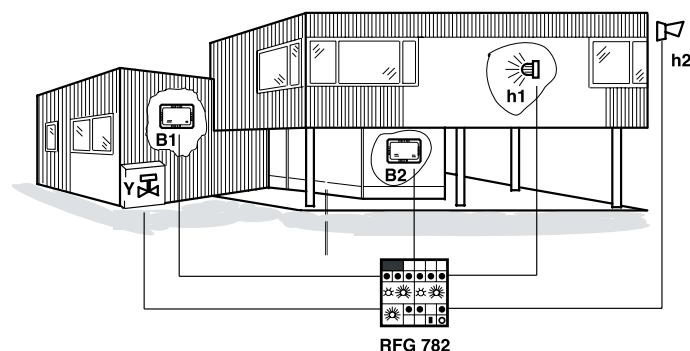
By means of three output relays it can operate:

- relay "Pre-alarm": it can activate a warning signal or switch on low speed of a two-speed aeration fan,
- relay "Operational": it can operate a gas shut-off valve, an aeration fan, etc.,
- relay "External alarm": it can activate a remote alarm device.

### 2. GAS MONITORING SENSORS

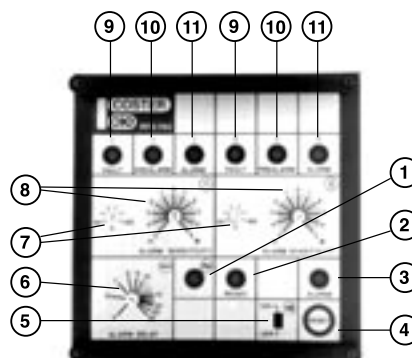
Code	Description	Gas	Sensing element	Protection	Data sheet
<b>SGC 300/M</b>	Sensor in non industrial case	Methane-Natural gas	Figaro TGS 842	IP 30	–
<b>SGC 300/P</b>	Sensor in non industrial case	LPG-Propane	Figaro TGS 813	IP 30	–
<b>SGC 301</b>	Sensor in non industrial case	CO- Carbon monoxide	Figaro TGS 812	IP 30	–
<b>SGR 300/M</b>	Sensor in industrial-type case	Methane-Natural gas	Figaro TGS 842	IP 44	–
<b>SGR 300/P</b>	Sensor in industrial-type case	LPG-Propane	Figaro TGS 813	IP 44	–
<b>SGR 301</b>	Sensor in industrial-type case	CO-Carbon monoxide	Figaro TGS 812	IP 44	–

### 3. TYPICAL INSTALLATION



B1,B2 – Monitoring sensors  
Y – Gas shut-off valve  
h1 – Pre-alarm  
h2 – External alarm

### 4. FACIA



1 – Line LED  
2 – Ready LED  
3 – Alarm LED  
4 – Re-start (reset)  
5 – Exclusion alarm  
6 – Alarm delay

7 – Adjustment pre-alarm threshold  
8 – Adjustment alarm threshold  
9 – Sensor fault LEDs  
10 – Sensor pre-alarm LEDs  
11 – Sensor alarm LEDs

**5. TECHNICAL DATA**

Power supply	230 V~ or 12 V~ ±10%	Adjustable alarm threshold:	
Consumption	5 VA	– Methane-Natural gas	0.8%(8,000ppm)...
Electromagnetic compability	EEC 93/68		0.25%(2500ppm)
Output relay:		– LPG-Propane	0.35%(3,500ppm)...
– type	airtight with inert gas	– CO-Carbon monoxide	0.06%(600ppm)
– contacts	SPDT voltage-free	Adjustable pre-alarm threshold	50...100 % alarm threshold
– maximum voltage applicable	250 V ~	Adjustable alarm delay	5...30 seconds
– rated capacity	5 (1) Amp	Ambient temperature:	
Audible alarm	85 db	– operation	0...45 °C
Suitable monitoring sensors:		– storage	– 25...60 °C
– Methane-Natural gas	SGC/SGR 300/M	Ambient humidity	class F (DIN 40040)
– LPG-Propane	SGC/SGR 300/P	Protection	IP 40
– CO-Carbon monoxide	SGC/SGR 301	Weight	1,4 kg

**6. OPERATION**

RFG 782, when powered, does not activate alarms for a period of about two minutes so as to give time to monitoring sensors to become stabilized. At the end of this period the lighting of "Ready" LED (4.2) indicates that detector is ready to signal alarm.

The monitoring sensors continuously analyze the surrounding air and send to detector electric signals of 0...5 V– proportional to gas concentration in air. When concentration exceeds pre-alarm threshold, detector causes pre-alarm sensor LED (4.10), corresponding to sensor concerned, to light up, and at the same time activates "Pre-alarm" relay.

When the alarm threshold is exceeded, detector immediately causes alarm sensor LED (4.11), corresponding to sensor concerned, to light up. When delay time has expired (4.6), detector activates:

- internal alarm buzzer and causes alarm LED (4.3) to flash,
- "Operational relay" to operate gas shut-off valve or start aeration fan,
- "External alarm" relay to operate any remote alarm device used.

The switch on facia (4.5) gives the option of excluding internal audible alarm and external alarm.

**6.1 Monitoring of Methane-Natural gas and LPG-Propane**

The alarm thresholds of each sensor are adjustable by means of "Alarm sensitivity" potentiometers (4.8) so as to adapt them to special requirements or characteristics of premises to be monitored.

Sensitivity	Methane-Natural gas		LPG-Propane	
	%	ppm	%	ppm
– 5	0.8	8,000	0.35	3,500
0	0.52	5,200	0.2	2,000
+ 5	0.25	2,500	0.06	600

In condition of low sensitivity (– 5) the alarm threshold corresponds to about 16 % LEL (Lower Explosive Limit).

The regulations require that alarm threshold is 25 % below LEL:

- LEL Methane- Natural gas = 5 % (50.000 ppm),
- LEL LPG-Propane = 2,1 % (21.000 ppm).

Accordingly, in event of a gas escape, RFG 782 permits intervening under conditions of maximum safety.

The pre-alarm thresholds of each sensor are adjustable (4.7) from 50... 100 % of alarm threshold.

**6.2 Carbon monoxide monitoring**

The danger of Carbon monoxide-CO does not derive from its flammability but from its toxicity for humans and this depends on concentration level and time of exposure to this gas.

Concentration	Time	Effects
0.01% (100 ppm)	–	irrelevant
0.03% (300 ppm)	60 minutes	lethargy
0.05% (500 ppm)	90 minutes	headache, nausea
0.06% (600 ppm)	90 minutes	loss of senses
0.07% (700 ppm)	120 minutes	coma, death

You must use the alarm threshold with sensitivity at – 5, equal to a concentration of 0.05% (500 ppm) of carbon monoxide in air.

**6.3 Output relay**

The "Operational", "Pre-alarm" and "External alarm" relays can be used in two different ways:

• Normally not energized:

- internal links (section 10) positioned on L,
- in normal condition (detector powered, not in alarm), relays are not energized with contacts 6-7, 9-10 and 19-20 closed, 5-7, 8-10 and 18-20 open,
- in alarm condition, relays are energized with contacts 6-7, 9-10 and 19-20 open, 5-7, 8-10 and 18-20 closed,

⊙ Normally energized (BSI 7348 requirement):

- internal links (section 10) positioned on R,
- in normal condition (detector powered, not in alarm), relays are energized with contacts 6-7, 9-10 and 19-20 open, 5-7, 8-10 and 18-20 closed,
- in alarm condition, relays are not energized, with contacts 6-7, 9-10 and 19-20 closed, 5-7, 8-10 and 18-20 open.

## 6.4 Latching alarm and resetting

When RFG 782 enters alarm state, if switches 3 and 4 of internal programmer (section 8) are in On position (with Latching Alarm), this alarm state remains even when gas concentration returns below threshold level; to re-start normal functioning, press "Reset" key (4.4). If switches 3 and 4 are in Off position (without Latching Alarm), when the gas returns below alarm threshold, normal functioning re-start automatically.

## 6.5 Alarm delay

In order to ensure that unusual and transient ambient conditions do not set off the alarm unnecessarily, RFG 782 delays its intervention with respect to the signals from sensors. This delay can be adjusted (5...30 seconds) by means of potentiometer (4.6) on facia.

## 6.7 Self-diagnosis

In event of a fault in a sensor, or of sensor having been connected incorrectly, RFG 782 signals the anomalous situation by means "Sensor fault" (4.9) and "Sensor alarm" (4.11) LEDs.

Type of fault	LED "fault"	LED "alarm"
Self heating element of sensor broken	X	
No connection to terminal 1 of sensor	X	
No connection to terminal 2 of sensor		X
No connection to terminal 3 of sensor	X	X
Connections 1 and 2 of sensor inverted	X	
Connections 1 and 3 of sensor inverted	X	X
Connections 2 and 3 of sensor inverted	X	X

## 7. INSTALLATION

### 7.1 RFG 782 detector

This must be sited in dry premises with a temperature not above 45 °C and as far as possible from water leakages or sprays. **If sited in premises classified as "dangerous", it must be installed inside a cabinet constructed according the regulations in force for the type of danger involved.**

The electrical connections must be strictly in accordance with the wiring diagram (section 12) and the safety regulations in force must be strictly observed.

### 7.2 Sensors

The correct siting of the sensors is essential for efficient operation and depends on the type of gas to be monitored and its density in respect of air:

- **Methane-Natural gas** (a gas lighter than the air that tends to move upwards): at a distance of 10...50 centimeters from the ceiling and, in any event, above the door or the highest window,
- **LPG-Propane** (a gas heavier than the air that tends to move downwards): at a distance of 10...30 centimeters from the floor,
- **CO-Carbon monoxide** (a gas with a density similar to the air and which therefore tends to diffuse uniformly): at a height of 150...200 centimeters from the floor.

It is advisable to position sensors at a certain distance from gas appliances in order to avoid unnecessary alarms:

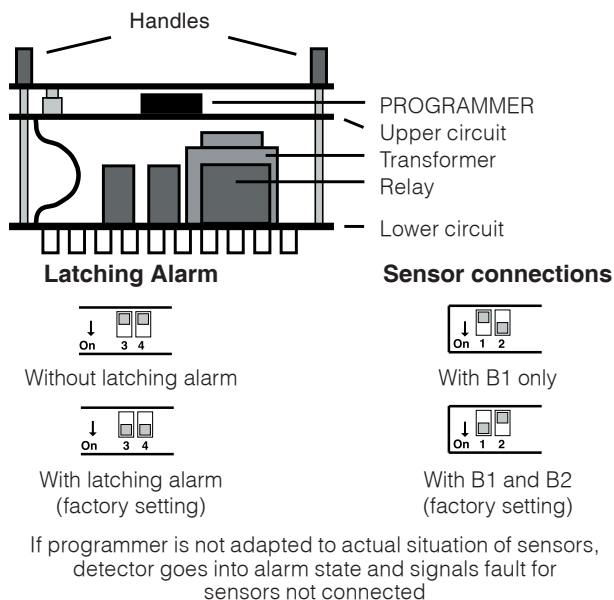
- boilers and calorifiers: at a distance of 1...2 meters,
- cookers: at a distance of 2...3 meters.

### 7.3 Gas shut-off valve

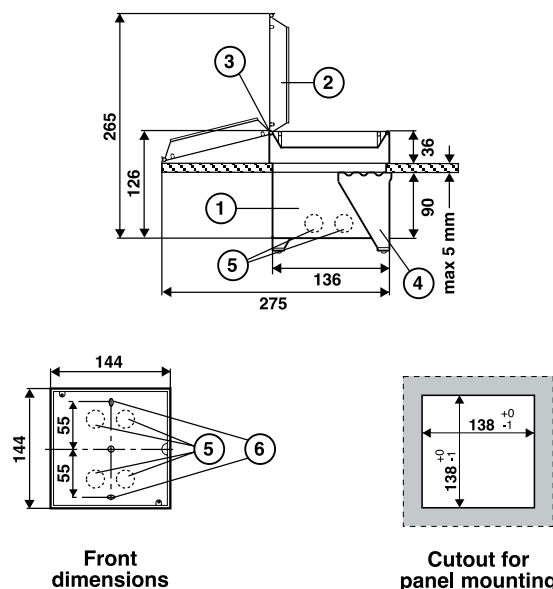
This must be installed on the gas supply pipe, if possible **outside premises monitored, in an easily accessible place protected from the weather.**

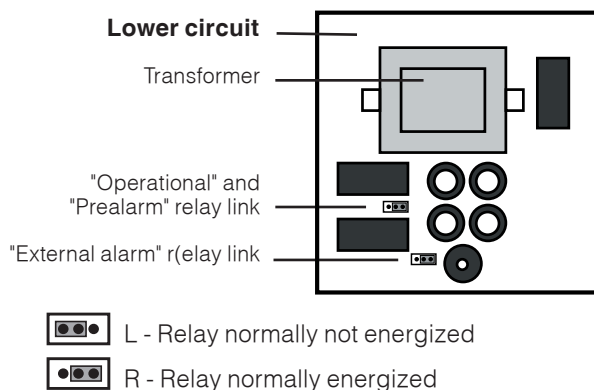
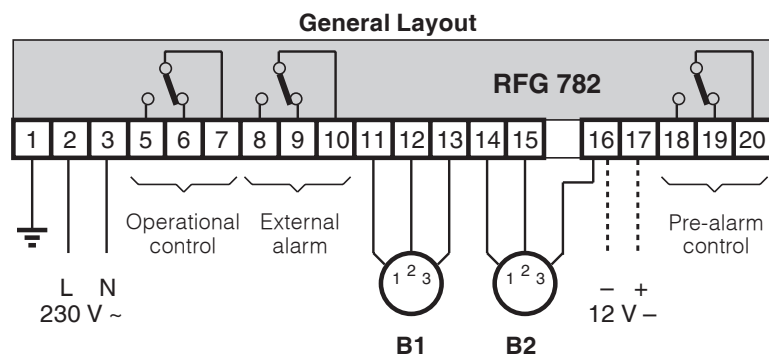
In LPG-Propane installation with external tank it must be installed downstream of low pressure reducing valve (30...40 mbar).

## 8. PROGRAMMER

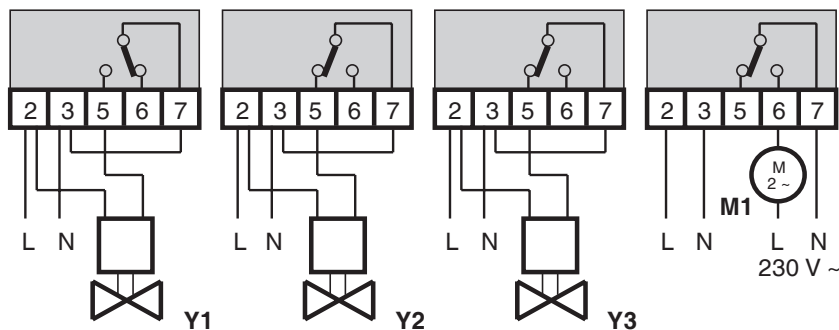


## 9. OVERALL DIMENSIONS



**10. RELAY LINKS****12. WIRING DIAGRAMS**

All diagrams are with 230 V ~ power supply  
 Relay contacts of General Layout are shown in condition of detector not receiving power.  
 Relay contacts of Examples diagrams are shown in condition of detector receiving power and not in alarm.

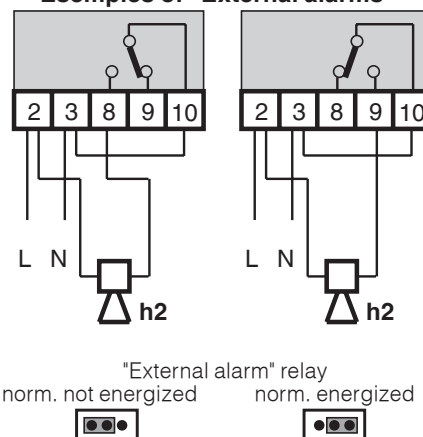
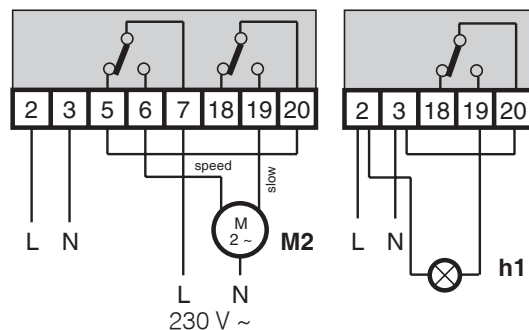
**Examples of "Operational" controls**

"Operational relay" norm. not energized

"Operational relay" norm. energized

"Operational" relay norm. energized

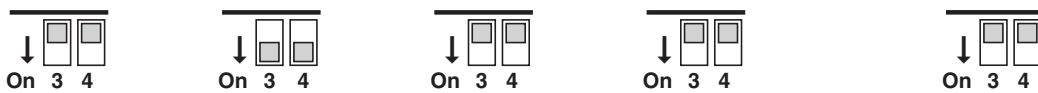
"Operational" relay norm. energized

**Esemples of "External alarms"****Examples of "Pre-alarm" controls**

"Operational" and "Pre-alarm" relays norm. energized

"Operational" and "Pre-alarm" relays norm. energized

Without Latching alarm With Latching alarm Without Latching alarm Without Latching alarm Without Latching alarm



B1-2 - Monitoring sensors  
 Y1 - Solenoid valve N.O. with reset  
 Y2 - Solenoid valve N.C.  
 Y3 - Solenoid valve N.C. with reset

h1 - Pre-alarm LED  
 h2 - External alarms  
 M1 - One-speed aeration fan  
 M2 - Two-speed aeration fan

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