



UNIVERSITY OF ICELAND  
INSTITUTE OF EARTH SCIENCES

# Safety guidelines for fieldwork at an eruption site

## Geldingadalir 2021

# Before going to the field

## 1. Risk assessment

- The risk assessment needs to evaluate all possible risks/hazards and list preparatory measures and safety equipment brought in the field. During field activity, daily risk assessments should be done and acted upon. All participants in the field should participate in risk assessment.

## 2. Safety equipment.

- a. Go over the rescue gas-diving equipment before going into field and after.
- b. Make a group demonstration on use of diving equipment before going to field.
- c. Escape oxygen masks and diving equipment should always be accessible.
- d. Necessary equipment for the car.
- e. Rope, mud-jack, tools, spades, and air filters (due to closeness to Reykjavik this can be omitted in Geldingadalir eruption).
- f. Gas meter and communication equipment
  - ✓ Start your gas meter in clean air, before entering the eruption site and outside the vehicle
- g. Gasmasks
  - ✓ Gasmasks should always be cleaned after use, so that the next team gets clean gasmasks, clean with ethanol.
  - ✓ Due to Covid-19 people should not share gasmasks
  - ✓ If exposed to higher values than >20 ppm, the filter should be changed by the end of day.

# What to do when coming into the field

## 1. In the field.

- a. Go over escape routes, gas and burning hazard before entering the area.
- b. At a safe distance do an estimate of hazardous areas and plan escape routes for the day.
- c. If exposed to high levels of toxic gas, while driving, close all air inlets and drive out of the toxic area. Usually perpendicular to the wind.
- d. When crossing the toxic plume, make sure that you know the shortest route through.
- e. If leaving the vehicles, you need a VHF radio/ Tetra station, gas meter and a phone.
- f. Report all incidences in the field.

## How to use a Tetra phone?

Make sure the antenna is firmly connected to the radio

1. **Turn on** the radio by pressing and hold the button nr. 1.
2. Make sure you are tuned on to **correct channel (Gulur 2-2)**
3. Make sure on the small screen that the radio is in **“Trunked mode”**, not in “Direct mode”. If the Tetra is in Direct mode, press “0” for a few seconds and then the radio goes back to Trunked mode.
4. To **talk** on the radio, press the button 4, wait 1 second, and talk.  
Keep the button pressed while talking.

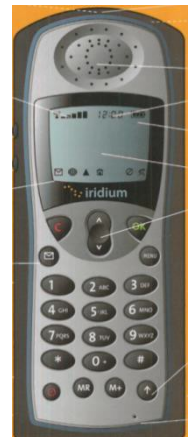


When calling on the radio, first say the name of the person or party you want to talk to, then your name. The Red button nr. 5 should be pressed only in **case of emergency**.

The discussion should be exclusively about work, remember that civil protection, the police and all the people in the field are listening.

## How to use a Satellite phone?

1. Turn on the phone by pressing the button lowest on the left side on the front panel.
2. Extend the antenna on the phone. Remember that you have to be outside the car to get connection to the satellites!
3. To call, dial 00354 and then the phone number you want to call. Press OK to call.
4. To call 112. the National Emergency Number, dial 00354 8090112.
5. To end call, press the symbol of the red phone.



The number of the satellite phone you are using is written *on the yellow box with the satellite phone*.

### Never forget to give this information:

Who you are and who are with you  
Where you are (GPS position if possible)  
What is your problem?  
Give your phone number

### Numbers to call in case of emergency:

Almannavarnir/Civil Protection:	<b>00354 8090112</b>
National Emergency Number:	<b>00354 8090112</b>
Earth Science Institute (cell phone)	00354 8954888
Earth Science Institute (office/Anna Jóna)	00354 6605799
IMO	00354 5226000

**Make sure your mobile phone is working**, text messages will be sent out to all people in the area in case of major incident.

## How to use a Crowcon Gas meter?

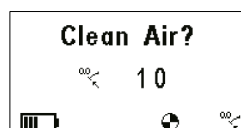
The Institute of Earth sciences has 5 Crowcon GasPro IR meters. They can measure 5 types of gasses SO<sub>2</sub> (sulphur dioxide), CO (carbon monoxide), CO<sub>2</sub> (carbon dioxide), H<sub>2</sub>S (hydrogen sulphide), O<sub>2</sub> (oxygen).

1. How to turn on?

Press the orange button on the front of the gas meter for 4 seconds, it will start a count down. Make sure that you are in clean air outside. Do not turn it on in the car or by the exhaust of the car.

2. When the meter is turned on it will start to make noises and blinking, that will continue until it has calibrated itself with clean air.

3. The clean air function. The meter will ask the question clean air? And start a countdown, make sure that you are in clean air and press the orange operation button, before the countdown ends

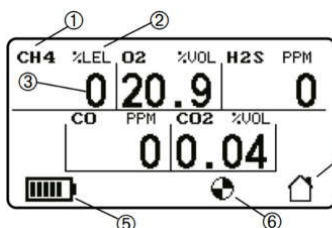


Green OK  
Yellow- check  
Red- do not use

4. The meters have preprogramed warning levels for different gases.

### Warning levels

Gas	STWA (15 min)	LTWA (8hr)	Warning 1	Warning 2
CO	100ppm	20ppm	30ppm	100ppm
H <sub>2</sub> S	10ppm	5ppm	5ppm	10ppm
SO <sub>2</sub>	1,0ppm	0,5ppm	2ppm	5ppm
O <sub>2</sub>			<19,5%Vol	>23,5%Vol
CO <sub>2</sub>			0,5% Vol	1,5% Vol



1. Gas type
2. Unit
3. Level
4. Homescreen icon, instrument active=> sign is blinking
5. Battery level (4 bars 50%)
6. Pump present (roating when pump is on)

It's **very important** to fasten the gas meter on the lower half of your body, preferably around knee height. A gas meter just below your face is not going to give you sufficient warning about CO or CO<sub>2</sub> puddles in lows where you are standing if the gas meter is too high up on your body.

**Turning off**, press the orange button for 4 seconds, the meter will start a countdown, if you stop before the countdown ends, the meter will keep running.

Further information available in Icelandic at the end of the document (to be translated)

**GREEN:** “Safe”. Take personal safety precautions. Monitor gas levels closely. Possible evacuation  
**YELLOW:** Evacuate the area (preferably uphill)  
**RED:** Immediate evacuation (people should NEVER be exposed to these levels)

Exposure Limit	Health effects	
<b>ppm</b>	<b>H<sub>2</sub>S (colourless gas with rotten egg odour at low concentrations)</b>	GASMASK ON
0.008-0.2	Olfactory response (rotten egg smell)	
5	Gas exposure limit of 8 hrs (administration of occupational health and safety, Iceland)	
10	Gas exposure limit of 15 min (administration of occupational health and safety, Iceland)	
20	Sense of smell to gas lost. Concentration tolerated for some time without harm	
20-50	Eye irritation	
50	Prolonged exposure may cause bronchitis	
60	Prolonged exposure may cause conjunctivitis and eye pain	
150+	Irritation of upper respiratory tract. (Maximum of GasPro is 100 ppm)	
250	Pulmonary oedema with risk of death	
<b>%</b>	<b>CO<sub>2</sub> (colourless and odourless gas)</b>	
0.5	Gas exposure limit of 8 hrs (administration of occupational health and safety, Iceland)	
1	Gas exposure limit of 15 min (administration of occupational health and safety, Iceland)	
2-3	Shortness of breath, deep breathing	
5	Breathing becomes heavy, sweating, pulse quickens	
7.5	Headaches, dizziness, restlessness, breathlessness, increased heart rate and blood pressure, visual distortion, muscle weakness	
10	Respiratory distress, impaired hearing, nausea and vomiting, loss of consciousness in 10-15 min.	
15	Leathal concentration	
30	Convulsions and rapid loss of consciousness after a few breaths, Death will occur if level is maintained.	
<b>ppm</b>	<b>CO (colourless and odourless gas)</b>	
25	Gas exposure limit of 8 hrs (administration of occupational health and safety, Iceland)	
50	Gas exposure limit of 15 min (administration of occupational health and safety, Iceland)	
>100	Can be dangerous to human health	
800	Dizziness, muscle pain and diminishing consciousness	
1600	Headache, dizziness, death within 2 hrs	
<b>Exposure Limits</b>	<b>Health effects</b>	
<b>%</b>	<b>O<sub>2</sub></b>	
16-21	No symptoms	
16	Increased heart rate, increased breathing and impaired attention and thinking	
14	Abnormal fatigue upon exertions, emotional upset, faulty coordination and impaired judgement	
12	Verry poor judgement and coordination, vomiting and impaired respiration that may cause permanent heart damage	
<10	Vomiting, lethargic movements, perhaps unconsciousness, inability to perform vigourous movements or loss of all movement	
<6	Convulsions, shortness of breath, cardiac standstill, spasmoic breathing, death in minutes	
<4	Unconsciousness after one or two breathes	
<b>ppm</b>	<b>SO<sub>2</sub> (colourless gas with characteristic irritating smell perceived between 0.3-1.4 ppm and easily noticable at 3 ppm)</b>	GASMASK ON
0 -0.4	No sytoms or slight irritation	
0.5	Gas exposure limit of 8 hrs (administration of occupational health and safety, Iceland)	
1	Gas exposure limit of 15 min (administration of occupational health and safety, Iceland)	
1-5	Threshold for respiratory response in healthy individual upon exercise or deep breathing	
3-5	Gas is easily noticeable. Fall in lung function at rest and increased airway resistance	
5	Increased airway resistance in healthy individuals	
6	Immediate irritation of eyes, nose and throat	
10	Worseneing irritation of eyes, nose and throat	
10-15	Threshold of toxicity for prolonged exposures	
20+	Paralysis or death occurs after extended exposure (maximum or GasPro isinstrument)	



## Some **RULES** to respect when exposed to gas hazard

The table above is a **guide to self-diagnosis of the effects of gas on your body**. Take caution the values indicated in the table can be lower when gases are mixed as it is in natural environments.

**Gas sensors are warning devices only. If you feel any discomfort you should evacuate the area immediately.**

**Gas sensors should be used at all times.** Familiarize yourself with the sensor, and ensure that it is functioning properly before reaching the eruption site. **If the alarm sounds, remove yourself from the area immediately.**

Be sure that **your gas mask fits you properly**. Check that your gas mask is equipped with appropriate, **still functional gas filters**. **No contact lenses** to be worn in the field -Risk of permanent eye damage. **Goggles** will avoid any reaction between your tears and SO<sub>2</sub>.

**Always stay upwind – Never bend down** or crouch into hollows as heavy gases can accumulate. Be aware that around the lava flows, the heat of the lava causes very unpredictable wind turbulence.

**In case someone collapses in front of you, know that it is almost impossible to drag an unconscious body.** You will be putting yourself in danger if you try to evacuate the person. **Remove yourself from the area and leave them behind** (unless trained in the correct response procedure).

**Make sure** there is at least one person per car who knows exactly the location of the oxygen masks in the car and **everybody has practiced using the oxygen mask**.

## How to use an oxygen mask in case of emergency?

One oxygen mask put away in a big black box in each car.

### Step 1

Adjust the harness to your size. Fit your chin to the chin-cup, pull the harness to the top of your head and tighten the straps in sequence from bottom, middle, top.

DO NOT over-tighten. This should not distort the seal, and be comfortable.



### Step 2

Slowly open cylinder valve.

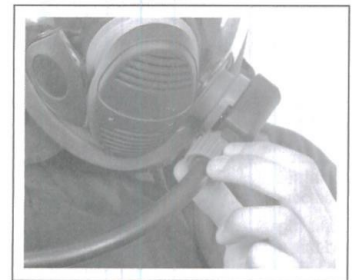
Inhale sharply to start the air supply to face mask. Check the mask is well sealed.



### Step 3

Open the bypass and check there is a regular flow of air into the mask. Then close the bypass.

If the system is beeping, it means you have no more than 15 minutes to replace the tank.



There are also 2 other kind of oxygen masks per car stored in **orange bags**. Those one are **ONLY for emergency case** (evacuation) as they will bring **only 15 minutes of oxygen**.

Once the valve is open, the oxygen will be delivered continuously contrary to the previous oxygen mask.





## Some RULES to respect when entering the Geldingardalir area

When working in the field, the **car should be parked as close as allowed to the eruption site**. At least one oxygen diving suit should be in the area. Contact other groups that are operating in the field, two diving suits are available at IES. When sampling the lava field or operating far from the vehicles take smaller oxygen flask with you. Sampling group should ALWAYS use thermal protective gear.

Geldingadalir is a valley, thus gas can accumulate in and around the lava. Escape route if gas warning is given is to go straight up hill.

One track is into the area via Meradalir. Keep in mind that in case lava breaks out from current eruption site it might harm the tracks.

Avoid being downwind from the eruption site due to high toxic conditions.

Further information on Gas meters- Icelandic see below



## Stuttar leiðbeiningar fyrir Crowcon GasPro

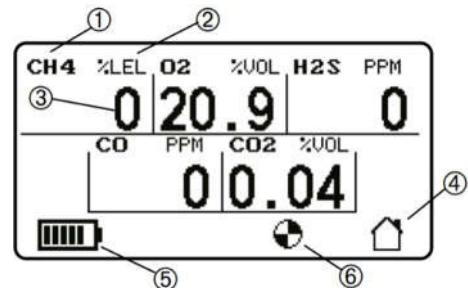
www.valskyn.is



Grænt blikk: OK  
Gult blikk: Athuga  
Rautt: Ekki nota

- Núllun
- TWA
- Forathugun fyrir inngöngu
- Hámarksgildi sem hefur komið
- Uppsetning

1. Gastegund
2. Eining
3. Gasgildi
4. Heimaskjár. Tæki virkt => tákn blikkar. (Tákn breytist eftir skjámyndum).
5. Rafhlöðustaða (4 strík 50%)
6. Ef með innri dælu (snýst ef dæla er á)



1. **Til að kveikja á tæki:** Halda niðri hnapp þar til heyrst stöðugt píphljóð (eftir c.a 4 sek). Þá fer tækið í gegnum prófunar- og upplýsinga fasa. Eftir það birtist á skjá spurning hvort að tækið sé í hreinu lofti (clean air?) og byrjar að telja niður. Ef ýtt er á hnappinn á tækinu áður en niðurtalningu er lokið fer mælirinn í það að nústilla gildi, öðrum kosti heldur ferlið áfram og birtir heimaskjáinn með stöðu á nemum. Best er að sleppa því að nústilla í uppkeyrslu, frekar eftir nokkar mínútur, sjá lið 3.
2. **Til að slökva á tæki:** Halda hnapp niðri meðan telur niður á skjá.
3. **Til að núllstilla í hreinu lofti:** Tvísmella með hnapp, þá birtist skjár með táknum til að velja aðgerðir. Fletta með hnapp á tákn með visir , tvísmella og ýta á hnapp áður en niðurtalningu líkur.
4. **Mengunarmörk - Meðaltal yfir 8 klst og 15 mín tímabil (TWA Time weighted average):** Þegar þessu gildi er náð þá fer tæki að væla (warble, breytir stöðugt tónhæð), blikka ljósi og birtir tákn í hægra horni á skjá ásamt tölustaf. Það er aðeins mögulegt að taka þessa aðvörun af með því að slökva á tækinu.
5. **Aðvaranir fyrir augnabligsgildi:** Um er að ræða aðvörun 1 og 2.  
**Aðvörun 1** => Bjöllumerki með tölunni 1 inn í merki á skjá, skjár verður rauður, væla (slitinn fjórtóna) og blikkandi blátt/rautt ljós ásamt því að tæki fer að titra. Hægt að stoppa vælu með hnapp. Síðan þarf að ýta aftur á hnapp til að kvitta fyrir aðvörunina þegar gildi er komið niður fyrir aðvörungildið.  
**Aðvörun 2** => Bjöllumerki með tölunni 2 inn í merki á skjá, skjár verður rauður, væla (fjórtóna) og blikkandi blátt/rautt ljós ásamt því að tæki fer að titra. Ekki hægt að stoppa vælu fyrr en gildi er komið niður fyrir aðvörungildi 2.
6. **Uppsetning fyrir notanda, hljóðstyrk og dælu ef er:** Tvísmella með hnapp, þá birtist skjár með táknum til að velja aðgerðir. Fletta með hnapp á tákn með tannhjól, tvísmella og þá birtast valmöguleikarnir og velur þar hljóð, notanda eða dælu ef til staðar. Í hljóðvali er hægt að velja á milli tveggja styrkleika og fyrir notanda milli 1-5. Staðfesta val með því að tvísmella.
7. **Birta hámarksgildi:** Tvísmella með hnapp, þá birtist skjár með táknum til að velja aðgerðir. Fletta með hnapp á tákn með hámarksgildi, tvísmella og þá koma valmöguleikar til að birta, frá því að síðast var kveikt á tækinu, síðustu 8 klst eða 12 klst., velja og tvísmella til birtingar.
8. **Ath stöðu á rafhlöðu og hvaða namar eru í tæki án þess að kveikja:** Ýta augnablik á hnapp, þá birtast upplýsingar á skjá.



Aðvörunargildi sem sett eru í GasPro þegar kemur frá Crowcon

Gas	STWA (15mín)	LTWA (8tíma)	Aðvörun 1	Aðvörun 2
CO	100ppm	20ppm	30ppm	100ppm
H <sub>2</sub> S	10ppm	5ppm	5ppm	10ppm
SO <sub>2</sub>	1,0ppm	0,5ppm	2ppm	5ppm
O <sub>2</sub>			<19,5%Vol	>23,5%Vol
CO <sub>2</sub>			0,5% Vol	1,5% Vol