



GROVELEY DETECTION

Anchor Works, Groveley Road, Christchurch BH23 3HB
Tel. +44 (0) 1202 483497 web:www.groveley.co.uk

GDU-01

Ultrasonic Gas Leak Detector

Commissioning, functional & performance testing procedure

RELEASE NOTES				
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2 Introduction

The GDU has been designed to detect the airborne ultrasound generated from a pressurised gas leak using a piezoelectric disc and conditioning electronics.

Airborne ultrasound is generated when gas moves from a high-pressure area to a low-pressure area. This is because it expands very rapidly causing turbulent flow and creating a sound wave. The sound wave ranges from audible frequencies into ultrasonic frequencies the level of which depend on three main factors:

Pressure drop across leak

Size of leak (area)

Specific gas properties (molecular weight and specific gas ratio)

The GDU will not detect specific values of LEL or ppm but instead responds instantaneously to small leak rates (<0.1 Kg/s). The GDU is not affected by extreme weather conditions.

This document covers the generic steps taken to commission a Groveley GDU-01 ultrasonic gas leak detector. Specific sections cover alarm level set up, functional testing and performance / mapping verification.

3 Safety Guidelines

3.1 Warning

Disconnect all power to the detector before connecting or disconnecting.

The power supply must be adjusted to a MAXIMUM of 30Vdc before powering up; failure to do so could result in damage to the detector or detector electronics.

The GDU is an intrinsically safe unit and therefore should have voltage and current levels limited by the appropriate Ex approved isolator or barrier. See Electrical installation section for details of isolators / barriers.

The detector satisfies ATEX II 1 G D EEx ia IIC T4 $-40^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$ and is certified by certificate number DNV-2005-OSL-ATEX-0327X, preamplifier and sensor type GDU1278.

3.2 Use in hazardous areas

Components used have been inspected and approved in accordance with international explosion-protection regulations and should only be used under the specified conditions.

The GDU may not be modified in any manner.

Appropriate regulations must be observed when carrying out maintenance or inspection and should only be undertaken by competent personnel.

3.3 Accessories

GDU should only be used with Groveley Detection approved accessories and mounting equipment.

3.4 Liability

All liability for the correct function of the GDU is irrevocably transferred to the owner / operator to the extent that the GDU is altered or installed incorrectly by personnel not authorised by Groveley Detection or if the GDU is used in a non conformance to its intended use.



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4 Recommended Commissioning Equipment

- GDU-01 mapping tool
- Performance verification kit
- Detector test kit
- PPE covering the following, as a minimum: Thick gloves; Safety goggles; Ear defenders; Hard Hat



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5 Commissioning Procedure

The following steps should be followed sequentially, please note there are two types of final detector test available, functional and / or performance.

5.1 Mechanical Installation

- The GDU is a sealed unit with the exception of the terminal cover; the enclosure is not to be opened by anybody other than Groveley or Groveley Authorised personnel. All warranties are nullified if these seals are broken or tampered with.
- Visually inspect location, orientation and mechanical rigidity of detector installation.
- Ensure that the terminal cover is fixed and secured.
- Groveley recommended mounting the GDU with the cable gland pointing downwards to reduce the possibility of unwanted water ingress.
- Extreme care must be taken if the GDU is to be positioned close to any equipment capable of generating high levels of airborne noise that are not classified as normal background noise such e.g. helipads. Contact Groveley should this be the case.
- Identification tags need to be firmly secured to prevent unwanted locally generated ultrasonic noise.



WARNING: DO NOT POWER THE GDU UNTIL ALL CONNECTIONS HAVE BEEN MADE. THE POWER SUPPLY SHOULD BE SET AS CLOSE TO 24VDC AS POSSIBLE FOR MAXIMUM PERFORMANCE.

- Check wiring per IS requirements and safety certification in the safe area.
- The GDU must be used in conjunction with an approved Galvanic Isolator to prevent excess current and voltage passing to the GDU (or hazardous area).
- Any certified barrier is acceptable as long as it meets the following:

$$V_i \leq 30V \quad I_i \leq 100mA \quad P_i \leq 0.9W$$

- Connecting cable between the barrier and the GDU should be of individually shielded pair construction and the following requirements:
- The capacitance shall not exceed $0.057\mu F$ and the inductance to resistance ratio shall not exceed $60 \mu H/\Omega$. The cable used may be a separate cable or may be installed in a type "A" or type "B" multicore cable (as defined in clause 53 of BS5501:1982 [EN 50039]) provided that the peak voltage of any circuit within the type "B" multicore cable does not exceed 60V.
- Ensure detector outputs are isolated and control system alarms are inhibited.
- Verify and record control system alarm delay period.
- Record how the detector output is represented through the HMI. Groveley recommend displaying the milliampere (mA) level.
- Ensure cabling at the detector end is correct.
- Ensure voltage at the barrier is no higher than 30Vd.c.
- Power detectors.
- Record the detector mA output. Detector output should register between 4 and 20mA, with some fluctuations.

5.3 Time delayed alarm activation

In order to minimise unwanted alarms it is essential the control system be capable of time delayed activation.

The delay prevents spurious intermittent trips from other ultrasonic sources such as pneumatic valves and tools.

The control system must be capable of monitoring the detector output once the alarm threshold has been breached. Provided the alarm threshold has been exceeded for periods upwards of 15 seconds the control system should consider that the detector is in alarm.

If the GDU is used in combination with other (dissimilar) hazardous gas detection equipment a cascaded logic may be utilised to reduced the delay period.

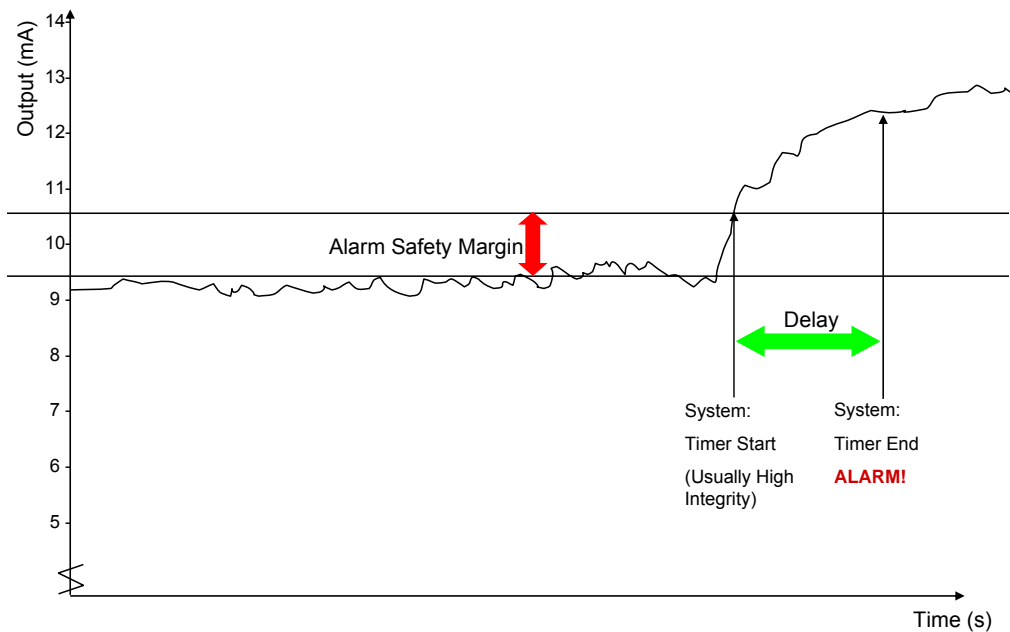


Figure 1: Alarm Setting & Time Delay

5.4 Alarm Set Up

- The GDU has no adjustable controls and is therefore set up by the controlling software giving the end user ultimate flexibility.
- Identify potential leak sources (e.g. pressurised flow lines with multiple joints) and obstructions to clear line of sight.
- Determine whether the process is running normally, if not data from previous survey works may be used indicate base line levels and hence alarm thresholds.
- Measure the ultrasound level with the GDU01-MT, as close to the detector as possible. Record the mA reading; compare this with the reading through the control system. – This is for reference purposes only the levels do not need to be the same.
- Check for other potential sources of ultrasound using the GDU01-MT mapping tool, record any mA level and location for all values 0.5mA higher than that at the detector.
- The control system alarm threshold must be determined based on the measured mA background levels. It must be remembered that the alarm threshold must be uniquely set for each device as the acoustic environment may vary.
- As a guide, where the detector base (“normal”) mA level is <10mA the alarm trip point should be set 2mA above this value. For devices registering more than 10mA the alarm trip point should be reduced to 1mA.



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5.5 Functional Test

- To functionally test the detector set the control system alarm time delay to ZERO seconds.
- Using the detector test kit (low pressure, non-flammable aerosol) initiate a release within one metre of the device. Ensure the alarm trip threshold is exceeded.
- Having successfully functionally tested the detector reinstate the control system time delay.

5.6 Performance Test

- It should be noted that the type of release expected in real service would be generated from a continuous source of pressured gas. Using portable test equipment it is not possible to recreate this sound source for the whole duration of the control system time delay.
- The performance verification kit allows for “burst” release testing only. The outlet pressure of this kit is set to 50 bar, using a hole size of 4 mm gives a mass flow rate of 0.1 Kg/s.
- To verify the performance / mapping of a detector location set the control system alarm time delay to ZERO seconds.
- Using the verification kit initiate a release at the furthest potential leak point, within the mapped detection envelope, directly in line with the detector face. Ensure the alarm trip threshold is exceeded.
- Repeat this test at least one other position within the detection envelope. Note, no more than four tests should be needed to verify the total detection envelope.
- Having successfully verified detector coverage reinstate the alarm system time delay.

5.7 System start up

On system start up it is recommended to allow the GDU to run for a set period of time with all processes running with the alarm level set to maximum and inhibited. The detector input should be recorded for analysis before setting the alarm level.

6 Fault finding

The GDU has been designed to perform in the harshest of conditions found offshore.

In the event of detector failure the signal drops below 4.1mA. The unit will need to be returned to Groveley to discover the cause of the fault.

In the event of no signal all cables should be checked along with the output of the power supply which should read approximately 24Vdc to ensure correct operation.



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8 Test Record Sheet

Client: _____

Site: _____

Product Supplied: _____

Serial Number(s): _____

Tag Number	Process Covered	GDU base (mA)	Mapping Tool mA @ GDU	Alarm Threshold (mA)	Test cylinder pressure / hole size	Time Delay (s)	Alarmed (Y/N)

	Tested by	Accepted by
Company		
Signature		
Print Name		
Date		