



GROVELEY DETECTION

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Ultrasonic Gas Leak Detector GDU-01 E xd Manual



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buying quality...*

Ultrasonic Gas Leak Detector

GDU-01 EX d Manual

Table of Contents

2 Introduction.....	3
3. Safety Guidelines.....	3
4. IS Certification Description.....	4
5. Installation of the GDU-01-EXD	5
6.0 Operation	11
7. Functional Test	11
8. Performance Test.....	12
9. System start up	12
10. Fault Finding.....	12
11. Maintenance.....	12
12. Technical Data	13
13. General Arrangement.....	14
14. Ordering Information	15
15. Accessories	15
16. Shipping Instructions.....	15
17. Storage Instructions.....	15
18. Help Us to Help You!	16

2. Introduction

The GDU-01-EXD 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-01-EXD will not detect specific values of LEL or ppm but instead responds instantaneously to sound generated by even small leaks. The GDU-01-EXD is not affected by extreme weather conditions.

The GDU-01-EXD consists of two main parts; the sensor housing, and the terminal enclosure. The sensor housing is constructed from 316 stainless steel mounting hardware and a semi-crystalline Polyphenylenesulphide (PPS) enclosure, IP66 certified. The terminal enclosure is copper free aluminium and is EEx 'd' certified.

The GDU-01-EXD uses Industry Standard 4-20mA output to interface to the plant control DCS, PLC or 4-20mA input card. Once connected the alarm level should be adjusted to a level higher than the general background noise to which the GDU-01-EXD is subjected. If general operations create spurious noise a suitable alarm delay should be implemented.

Typical applications include:

- Normally Unattended Installations
- Well bay areas
- Compressor Halls
- Aftercoolers
- Storage and Distribution Networks

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

The terminal enclosure satisfies ATEX II 2 G D EEx d IIC T6 and is certified by certificate number DEMKO 02 ATEX 131598

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-01-EXD 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-01-EXD should only be used with Groveley Detection approved accessories and mounting equipment.

3.4. Liability

All liability for the correct function of the GDU-01-EXD is irrevocably transferred to the owner / operator to the extent that the GDU-01-EXD is altered or installed incorrectly by personnel not authorised by Groveley Detection or if the GDU-01-EXD is used in a non conformance to its intended use.

4. IS Certification Description

The certification classification is listed as II (1) G D, EEx ia IIC for the barrier, II 1 G D, EEx ia IIC T4 for the sensor housing and EEx d IIC T6 for the terminal enclosure. Each of these designations has a meaning, which describes their usage in a hazardous environment. A hazardous environment, in the context of Intrinsic Safety and Flameproof protection, is an area where the presence or possible presence of a flammable gas/air mixture requires that special precautions be taken to avoid the possibility that any electronics placed within the hazardous area becomes a source of ignition.

The table below describes the certification in terms of the ATEX/CENELEC standards as well as what they mean in US terms.

ATEX Designation	ATEX Standards	US Equivalent
II	Group II equipment for use other than mines	Class other than Mining
1	Zone 0 locations where explosive gas/air mixtures are always present	Zone 0 locations where explosive gas/air mixtures are always present
2	Zone 1 locations where explosive gas/air mixtures are present <1000hrs/yr	Zone 1 locations where explosive gas/air mixtures are present <1000hrs/yr
G	Designation for gases, vaporous and mist	Not applicable
D	Designation for dusts	Not applicable
CENELEC Designation	CENELEC Standards	US Equivalent
EEx ia	Explosion protection is maintained with up to 2 faults. For use in Zone 0 locations where explosive gas/air mixtures are always present	Exceeds US standards which only requires explosion protection with up to 1 fault. Equivalent to Class I, Division 1
EEx d	Enclosure where explosion caused by electrical equipment inside is contained. Flame propagation is prevented and surface temp cannot cause ignition. Up to Zone 1 locations	Enclosure where explosion caused by electrical equipment inside is contained. Flame propagation is prevented and surface temp cannot cause ignition. Up to Zone 1 locations.
IIB	Group IIB covers for flammable gases including ethylene	Equivalent to Class 1, Group C
IIC	Group IIC includes Group IIB as well as the most easily ignited Hydrogen and Acetylene	Equivalent to Class 1, Group A and B

Table 1: Certification Description

This section is by no means a tutorial on Intrinsic Safety and it is recommended that anyone operating (or planning to operate) in an IS hazardous area understand clearly all aspects of IS requirements and procedures. Many texts exist on the subject. These should be studied carefully before delving into IS applications for the first time.

5. Installation of the GDU-01-EXD

Performance of the GDU-01-EXD depends on the position chosen for installation; the following should also be noted:

- Regulations governing the installation of gas detection systems
- Regulations concerning connection and routing of Ex cabling

Consideration should be given regarding maintenance and testing routines.

5.1. Detection coverage

Detection coverage for the GDU-01-EXD depends upon four factors:

- Background noise at proposed installation point
- Gas pressure
- Gas type
- Leak rate to be detected

5.2. Offshore Coverage

Offshore installations tend to install detectors pointing vertically downwards at a height of approximately 3 m, coverage is summarised as:

Sensitivity radius: 12m (0.1 Kg/s) <74dB ambient
 8m (0.1 Kg/s) <84 dB ambient

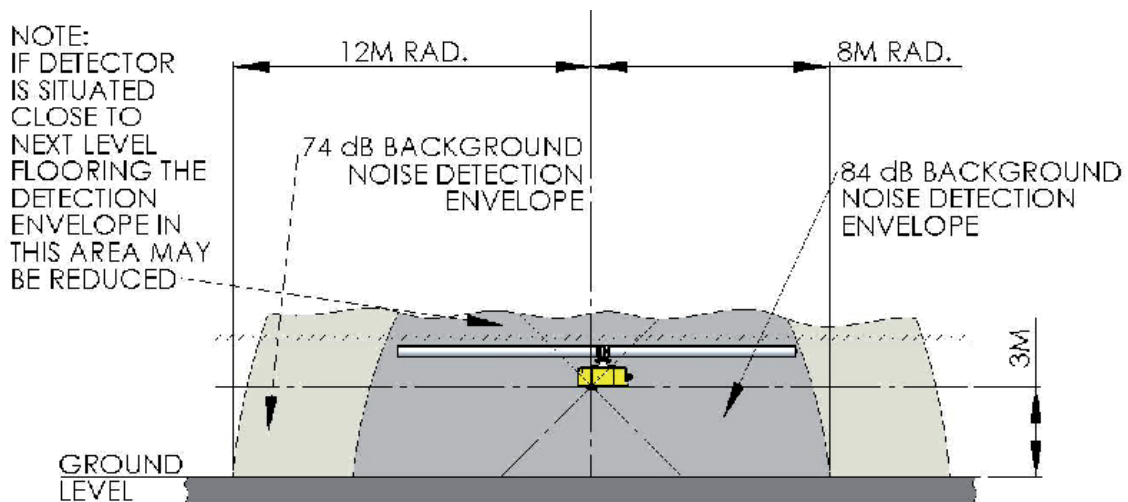


Figure 1. Offshore Installation - Vertical Installation

Consult Groveley if the background noise level can achieve 84dB or above.

5.3 Onshore Coverage

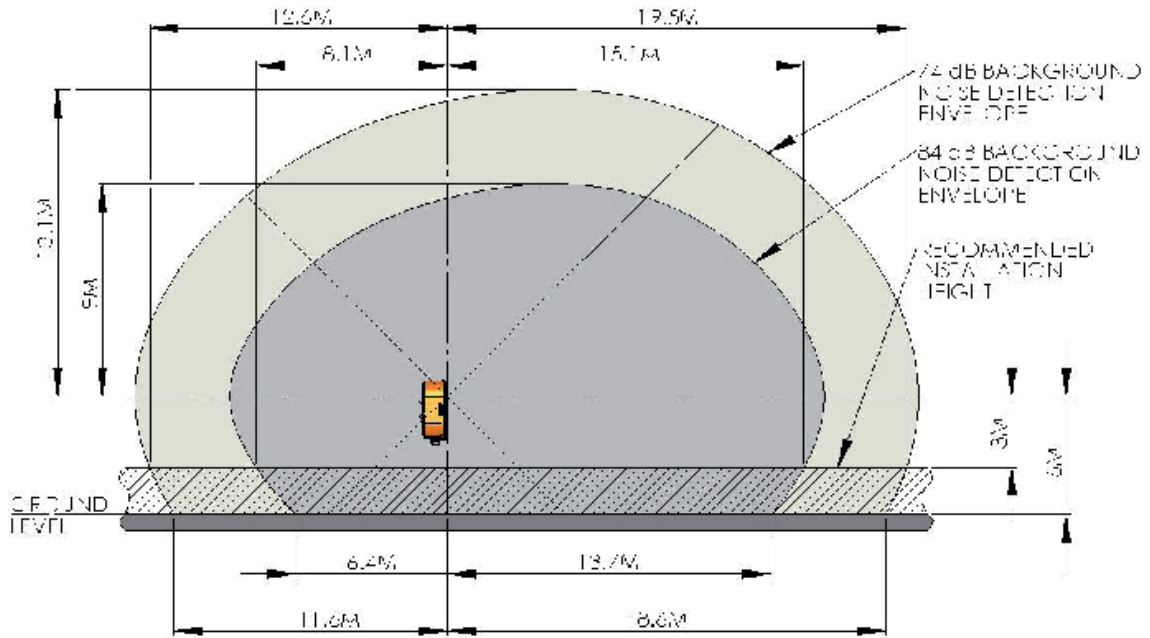


Figure 2. Horizontal Mount at 3m, 74dB, 0.1 Kg/s

5.4. Environment considerations

The GDU-01-EXD should not be installed in areas where the ambient temperature can exceed the specified operating and storage ranges.

Extreme care must be taken if the GDU-01-EXD 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.

Groveley recommend a deluge/heat cover if the GDU-01-EXD is to be installed in an area which is subject to very extreme weather conditions.

5.5. Mechanical Installation

The GDU-01-EXD is a sealed unit and, with the exception of the terminal enclosure lid; 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.

The GDU-01-EXD can be mounted simply and quickly in any orientation using Groveley mounting brackets for wall, pipe or a free-standing pole.

As the GDU-01-EXD has more sensitivity when used facing the area of detection Groveley recommend installation with the adjustable range of brackets.

Obstructions to the GDU-01-EXD line of sight may lead to a loss of sensitivity.

For areas with the potential for multiple leak points or with very high background noise please consult Groveley before installation.

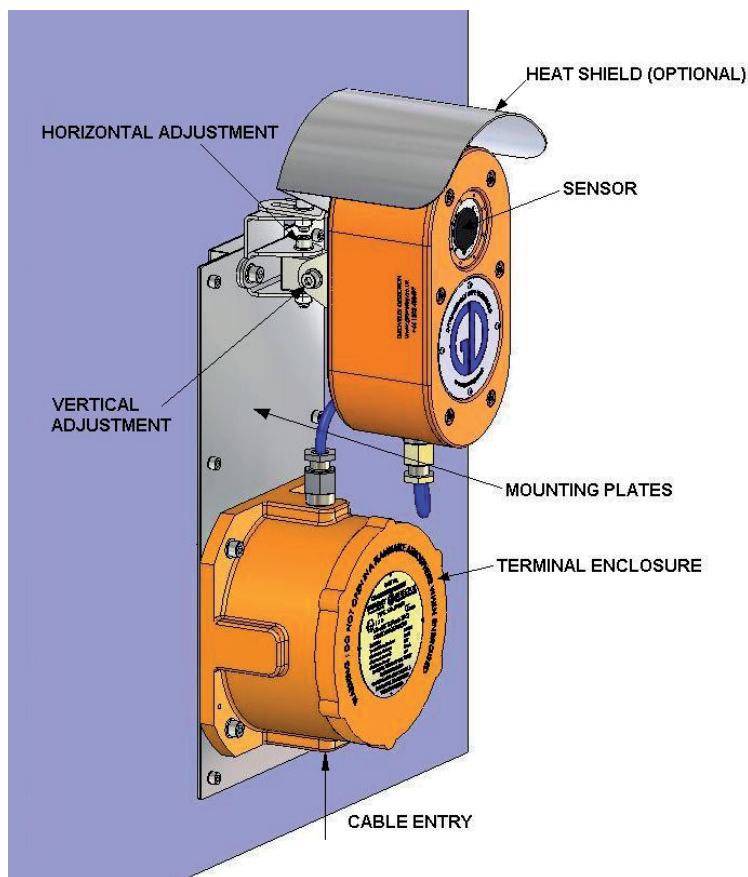


Figure 3. Adjustable Wall Bracket

5.6 Installation Notes

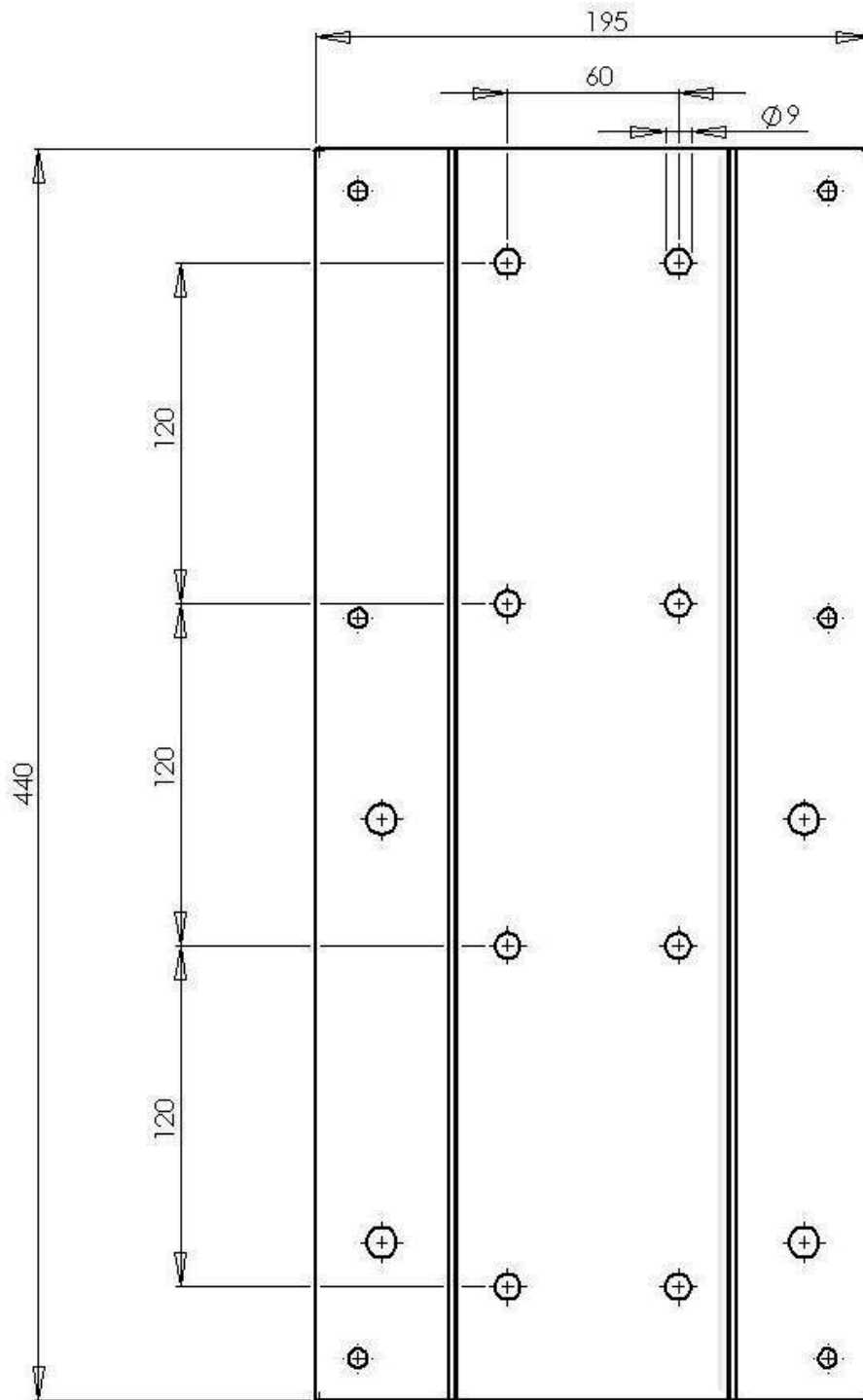


Figure 4. Backplate Footprint

Drill holes for M8 or equiv. fixing bolts. Bolts should be appropriate for fixing surface using manufacturers' instructions. Ensure bolts will be secure before mounting GDU-01-EXD. **A minimum of 4 mounting bolts are required** although holes are provided for more.

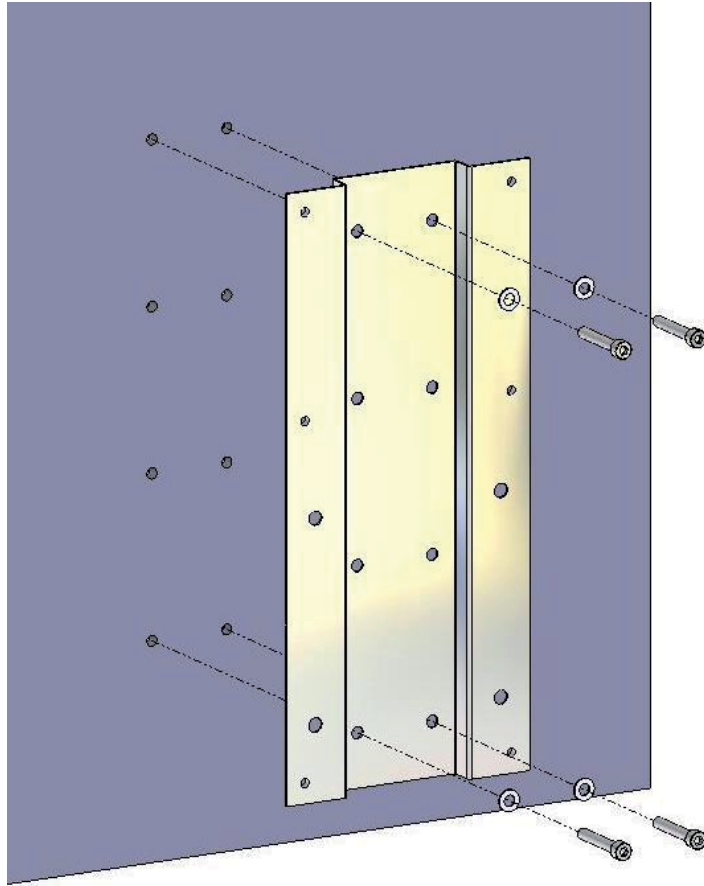


Figure 5. Backplate installation

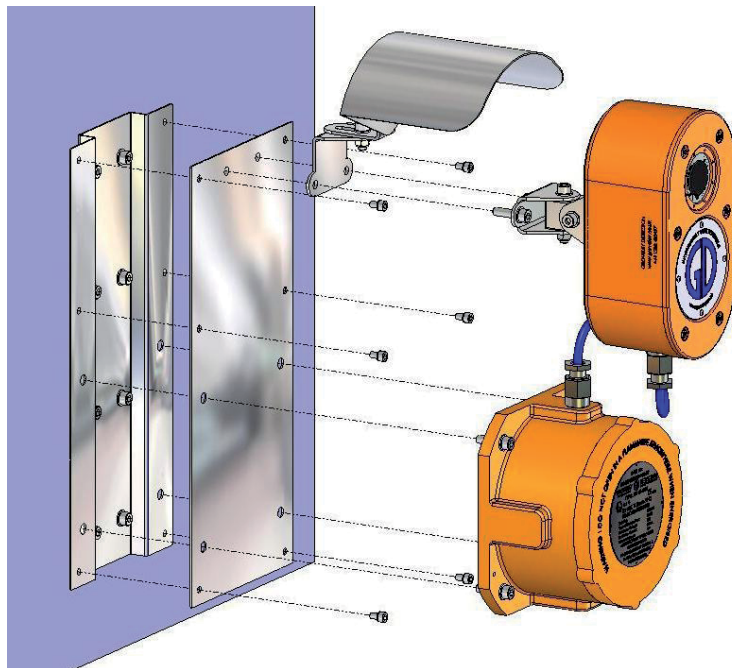


Figure 6. Detector installation

The sensor housing can be adjusted to achieve line of sight for proposed detection area using horizontal and vertical adjustment bolts. Ensure the horizontal and vertical adjustment bolts are securely fixed in position before operation of the GDU-01-EXD.

Do not alter or remove any part of the mounting bracket.

Ensure that the GDU-01-EXD is free from vibration, obstructions and any item that is not properly secured (cable etc).

If the GDU-01-EXD is to be left mounted before wiring, ensure the cable gland is sealed against water and dust ingress.

Ensure that the terminal cover is fixed and secured.

5.7 Electrical Information

WARNING: DO NOT POWER THE GDU-01-EXD UNTIL ALL CONNECTIONS HAVE BEEN MADE. THE POWER SUPPLY SHOULD BE SET AS CLOSE TO 24VDC AS POSSIBLE FOR MAXIMUM PERFORMANCE

The GDU-01-EXD is provided with an approved Galvanic Isolator to prevent excess current and voltage passing to the sensor head.

The certified barrier meets the following criteria:

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

The connecting cable between the terminal enclosure and the sensor head is of individually shielded pair construction meeting the following requirements:

The capacitance not to exceed 0.057µF and the inductance to resistance ratio not to exceed 60µH/Ω.

5.8 GDU Termination Details 6. Operation

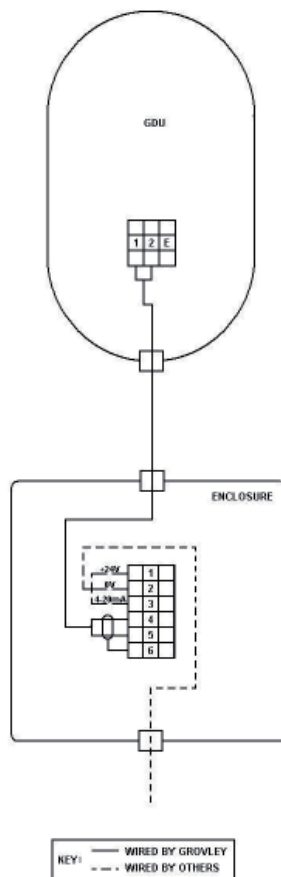


Figure 7. Wiring Diagram

6.0 Operation

The key for correct operation of the GDU-01-EXD is in its installation, the previous section provides detailed information on the correct installation and set-up to ensure it is within the guidelines of the ATEX certification.

The GDU-01-EXD has no adjustable controls and is therefore set up by the controlling software giving the end user ultimate flexibility.

6.1. System Start Up

On system start up it is recommended to allow the GDU-01-EXD 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.

6.2. Recommended Alarm Settings

After background noise analysis it is recommended the alarm level be set as follows:

- Background < 10mA, 2mA background offset
- Background > 10mA, 1mA background offset

This offset is called the "safety margin." Time delays must be employed, typically in the region 15-60 seconds. It is worth noting that each detector is tailored to its local environment, hence the alarm set point (mA threshold) will vary throughout the plant.

6.3. Time delayed alarm activation

In order to minimise unwanted alarms it is essential the control system be capable of time delayed activation. (Delay to alarm – not delay of alarm).

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 reduce the delay period.

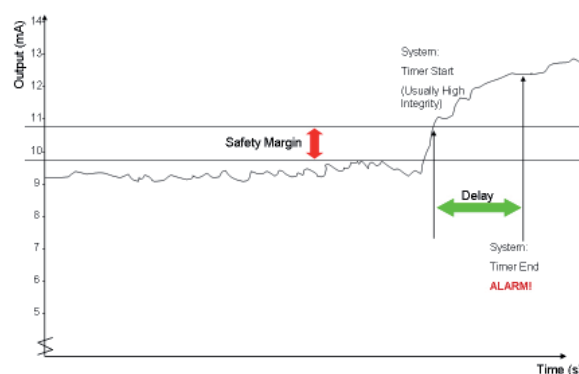


Figure 8. Time Delay - ALARM

7. 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.

8. 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.

9. System start up

On start up it is recommended the GDU-01-EXD be allowed to run for a set period 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.

10. Fault Finding

The GDU-01-EXD has been designed to perform in the harshest of conditions found offshore.

In the event of detector failure, i.e. the detector output $<4.1\text{mA}$, verify the power at the detector, if there are no problems with the power supply return the unit to Groveley.

11. Maintenance

The GDU-01-EXD is a sealed unit which prevents any adjustments or repairs being carried out.

It is recommended that the GDU-01-EXD is tested on a regular basis, in line with installation guidelines to ensure that the sensing face has not been obstructed from the detection area.

12. Technical Data

- Power Required 20 to 30 Vdc
- Power Consumption 10W
- Output Signal Two wire 4-20mA– max. load 500Ω
- ASL Dynamic Range >60dB (~35 to 100dB)
- Frequency Range(s) 30kHz to 80 kHz (Ultrasonic only)
- Certification

Part	Certification	Sensor Number
Sensor Head	ATEX II 1 G D EEx ia IIC T4	DNV-2005-OSL-ATEX-0327X
Isolated Barrier	ATEX II 1 G D EEx ia IIC T4	BAS 99 ATEX 7060
Terminal Enclosure	ATEX II 2 G D EEx d IIC T6	DEMKO 02 ATEX 131598

- Dimensions 571mm x 200mm 238mm
- Ingress protection IP66
- Shipping weight 11.2 kg
- Enclosure material
- Sensor head Semi-crystalline modified Polyphenylenesulphide & AISI 316 Stainless Steel mounting bracket
- Terminal Enclosure Aluminium Alloy
- Cable entry M20 x 1.5 as standard
- Operating Temperature -20° C to 60°C
- Storage Temperature -20° C to 85° C
- Humidity 0 to 100% RH

13. General Arrangement

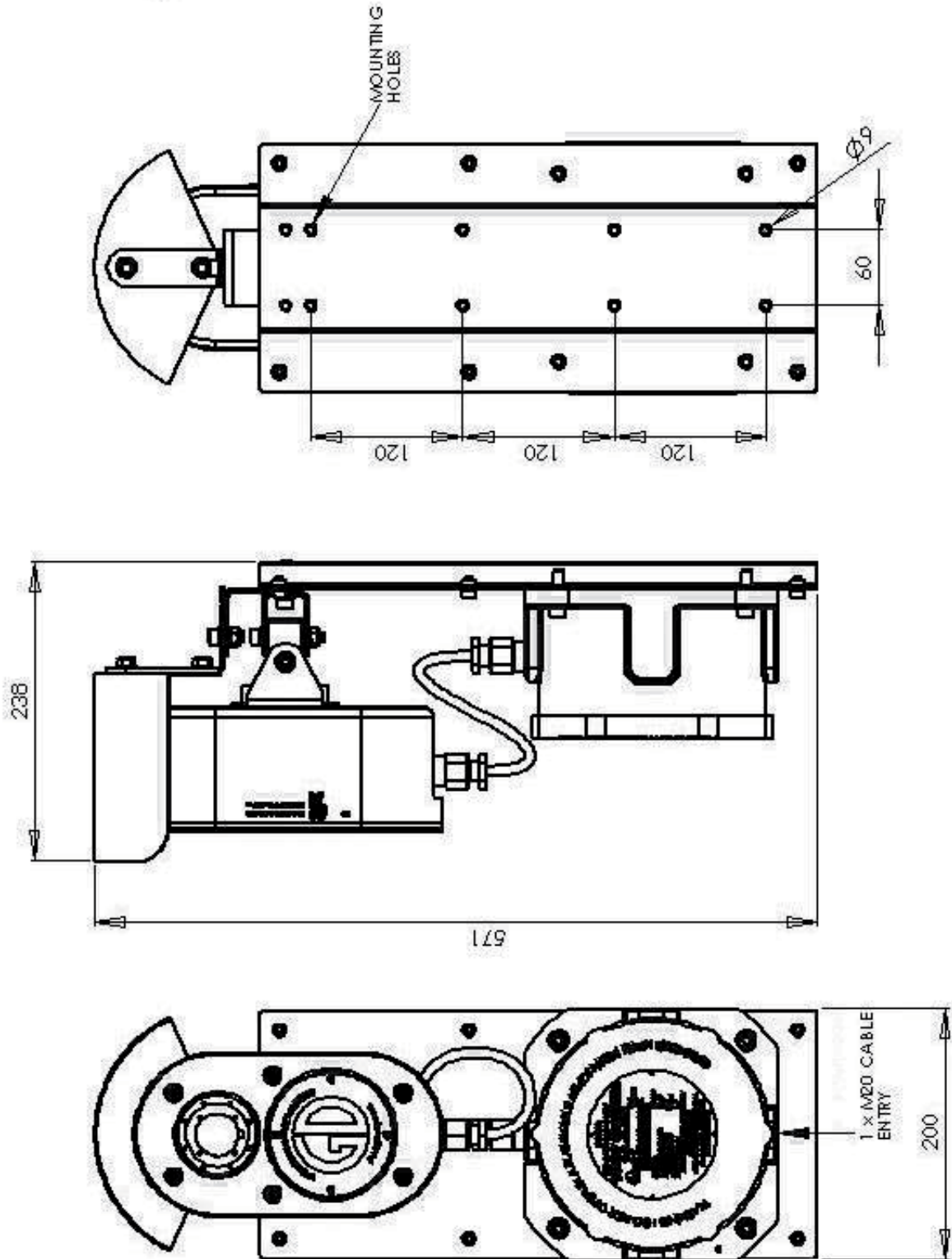


Figure 9. GDU General Assembly

14. Ordering Information

The GDU-01-EXD is available in different versions with regards to operating frequency range.

14.1. Detector Variations

Part Number	Description	Temperature Range
GDU-01-EXD-U (Standard unit)	Ultrasonic Gas Leak Detector 30 – 80 kHz 2 wire 24 VDC input, ATEX	-20 to +60°C
GDU-01-EXD-B	Broadband Gas Leak Detector 3 – 80 kHz 3 wire 12 VDC input, ATEX	-20 to +60°C

15. Accessories

- Mapping Tool (GDU-01-MT)
- Test Transmitter (GDU-01-TT)
- Performance Verification Kit (GDU-PVT-01)
- Isolated Barrier
- Wall Mounting Bracket
- Pipe Bracket

16. Shipping Instructions

This procedure is to inform the customer of the shipping details for delivery of the GDU-01-EXD.

The GDU-01-EXD will be delivered individually packed in boxes. The box must be unloaded carefully from the transportation due to the delicate instrumentation inside. Remove the lid and inspect the contents for any damage caused during transportation.

Any visual damage must be reported to the vendor immediately. Secure the box and despatch to the storage location.

17. Storage Instructions

Storage must be in a covered, dry, clean and safe environment - storage temperature should be between -20° C to 85°C.

Relative Humidity to be a maximum of 99% non-condensing.

Periodic inspection of the stored box must be carried out to ensure no tampering or deterioration has occurred.

All components to be kept in their original packaging as far as possible until required for installation.

