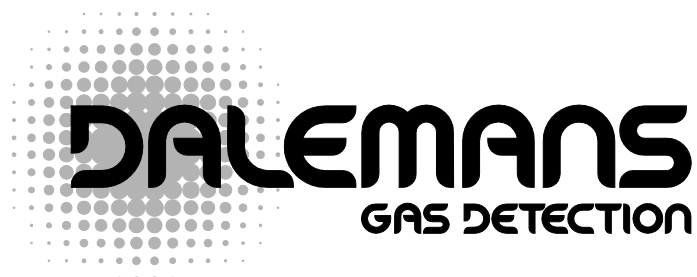


D•TEX3F

Gas detector



INSTRUCTION MANUAL



THE BELGIAN PIONEER IN GAS DETECTION

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Revision V1R2 • 07/2016

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WARNINGS



Declassify hazardous area PRIOR to carrying out installation, maintenance, or service operations on the gas detector. Ensure that no flammable gas or vapour is present in the surrounding atmosphere. Do not open the detector when explosion hazard is present. Only clean or wipe the detector surface with a damp cloth so as to avoid the risk of electrostatic sparks.



INSTALLATION, COMMISSIONING and MAINTENANCE must be carried out by DALEMANS or by an approved service centre only, and in any case by qualified personnel who has received a suitable training.

Gas detection equipment must be calibrated at least once a year to mitigate the possible loss of sensitivity of the sensor.

- This equipment must be installed, operated and maintained in strict accordance with these instructions, warnings and within the operational limits stated. If not, the warranty provided by DALEMANS will be voided.
- By respecting these instructions you ensure the proper operation of the equipment. Should you require any further information about the installation, the use or the maintenance of this equipment, do not hesitate to contact DALEMANS.
- Always follow the recommendations hereafter so as to avoid premature ageing of the sensor and to guarantee its optimal operation. These recommendations are general directives.
- Refer to local regulations in force before proceeding with installation works (i.e. standards IEC 60079-14 and IEC 60079-29-2). Local regulations have always precedence on the recommendations of the manufacturer.
- Maintenance must be performed according to the procedure given by DALEMANS or his local representative. Maintenance or service attempts without observing these instructions or without the assistance of DALEMANS may prevent the equipment from working properly and from ensuring the safety of the occupants of the monitored premises.
- Modification, disassembling and total or partial destruction of this equipment may invalidate the essential safety requirements of the whole plant.
- Use only DALEMANS original replacement parts. The use of non-original parts may invalidate the certification and warranty of the equipment.

LIMITATIONS

- Sensors may be cross-sensitive to other gases. Contact DALEMANS for further details.
- Catalytic sensors are not suitable for use in atmospheres with variable oxygen level, or with oxygen level over 21 % or below 15 %. Long-term exposure to atmospheres with flammable gas level over 100 % of the Lower Explosive Limit (LEL) may shorten the sensor life.
- Catalytic sensors might lose sensitivity in presence of poisons and inhibitors such as silicone, halogens, and heavy metals. Where these compounds are present continuously DALEMANS recommend the use of INFRARED flammable gas detectors which are immune to such poisons and inhibitors.
- Infrared sensors are not suitable for the detection of hydrogen.
- Gas detectors should be installed as late as possible in any program of construction operations (i.e. construction of a new plant, refitting or maintenance) but before the presence of gas or vapours in the system, so as to avoid damage to sensors resulting in particular from such activities as welding and painting. If already installed, detectors should be protected by an airtight seal to avoid contamination during construction works, and should be clearly marked as being non-operational.
- Gas detectors must be protected from direct sunlight, vibrations and mechanical impacts.

SAFETY INFORMATION

Flammable limits

Relationship between “percent of Lower Explosive Limit” (% LEL) and “percent by volume” (% v/v) differs from gas to gas. The IEC 60079-20-1 standard gives the method for the determination of flammable limits.

Examples include:

Gas	Formula	100 % LEL
Acetylene	C ₂ H ₂	2.3 % v/v
Butane	C ₄ H ₁₀	1.4 % v/v
Ethane	C ₂ H ₆	2.4 % v/v
Ethylene	C ₂ H ₄	2.3 % v/v
Hydrogen	H ₂	4.0 % v/v
Methane	CH ₄	4.4 % v/v
Pentane	C ₅ H ₁₂	1.1 % v/v
Propane	C ₃ H ₈	1.7 % v/v

Alarm set points

In a gas detection system, alarms must be set according to the Lower Explosive Limit (LEL) of the target gas. Typical alarm set points for combustible gas detection devices are 20 % LEL for the low alarm (A1) and 40 % LEL for the high alarm (A2).



Never use alarm set points over 60 % LEL.

The determination of the alarm set points must take the possible effects of the ambient climatic conditions into account:

Temperature effect The Lower Explosive Limit of a gas is affected by temperature. If temperature increases, the L.E.L. decreases, and the explosion hazard is higher.

Pressure effect The Lower Explosive Limit of a gas is affected by pressure. The relationship between L.E.L. and pressure is very complex. However, a pressure increase usually lowers the LEL and thereby the explosion hazard is higher.

Humidity effect The Lower Explosive Limit of a gas is not significantly affected by the humidity fluctuations that may occur in the average industrial environment.

Climatic condition	Effect on gas L.E.L.	Effect on explosion hazard
Temperature ↗	↘	↗
Pressure ↗	↘	↗
Humidity ↗	-	-

DIRECTIVE 2014/34/EU (ATEX)

Hazardous areas

Zone	Definition
0	Area with continuous, long-term or frequent presence of explosive gas atmosphere.
1	Area where explosive gas atmosphere is likely to occur under regular operation.
2	Area where explosive gas atmosphere is not likely to occur under regular operation or, if it does occur, it will only be for short-period.

Equipment category

Category	Definition	Suitable for use in Zone
1	Equipment with a "very high" degree of safety	0
2	Equipment with a "high" degree of safety	1 and 2
3	Equipment with a "normal" degree of safety	2

Gas group

Group	Typical gas	Definition
I	Methane	Equipment intended for use in mines, above and below ground
IIA	Propane	
IIB	Ethylene	Equipment intended for use in other locations than mines
IIC	Hydrogen	

Temperature class

The equipment must be chosen so that its surface temperature does not exceed the ignition temperature of the explosive gas present. Below are some examples of flammable gases classification according to their ignition temperature (this list is not exhaustive).

Gas group			Temperature class and maximum surface temperature of the equipment					
			T1 450 °C	T2 300 °C	T3 200 °C	T4 135 °C	T5 100 °C	T6 85 °C
IIA	IIB	IIC	Methane	Butane	Kerosene	Acetaldehyde		
			Propane	Ethanol	Nonane			
			Toluene	Methanol	Octane			
			Xylene	Propanol	Pentane			
			City gas	Ethylene oxide		Ethyl ether		
			Hydrogen	Acetylene				Carbon disulphide

DISCLAIMER

DALEMANS cannot be liable for direct or indirect damages arising out of the non-observance of its instructions. Every effort has been made to ensure the accuracy of the information given in this document. Nevertheless, DALEMANS decline any responsibility in the event of errors or omissions in this document.

ENVIRONMENTAL COMPLIANCE

Waste Electrical & Electronic Equipment (WEEE Directive)



This symbol on the product and/or accompanying documents means that you are held to respect the regulation in force on the collection and recycling of Waste Electrical and Electronic Equipment (WEEE).

These provisions are intended to preserve the natural resources used for manufacturing this product and to avoid the dispersion of substances potentially harmful for the environment and human health.

Therefore, to dispose of your end-of-life product, you **MUST** hand it over to a designated collection point for the recycling of electrical and electronic equipment. For further information about the collection points in your area contact your local city authority.

QUALITY ASSURANCE



This product has been designed, manufactured and controlled within the framework of an ISO 9001 certified Quality Assurance system which has been assessed by a Notified Body according to Annex IV and VII of the Directive 2014/34/EU (ATEX).

1. INTRODUCTION

The **D•TEX3F** flammable gas detector is intended for monitoring flammable gases in industrial and commercial confined areas. **D•TEX3F** is suitable for use in hazardous areas of explosive atmospheres. It operates in association with a compatible control unit to provide early warnings of flammable gas hazard before the gas concentration reaches the Lower Explosive Limit (LEL). For more information about the list of detectable gases, please contact DALEMANS.

1.1. Certification

DALEMANS declare that the **D•TEX3F** gas detector is certified for zone 2 hazardous areas and that it fulfils the provisions of the following directives and standards:

- ATEX Directive 2014/34/EU
- EN 60079-0:2012 standard
- EN 60079-1:2007 standard
- EN 60079-15:2010 standard

The label below is affixed to the detector enclosure and allows the user to identify the type of product, the type of sensor fitted and the type of certification covering the equipment. If missing, the detector is not certified for use in hazardous areas.

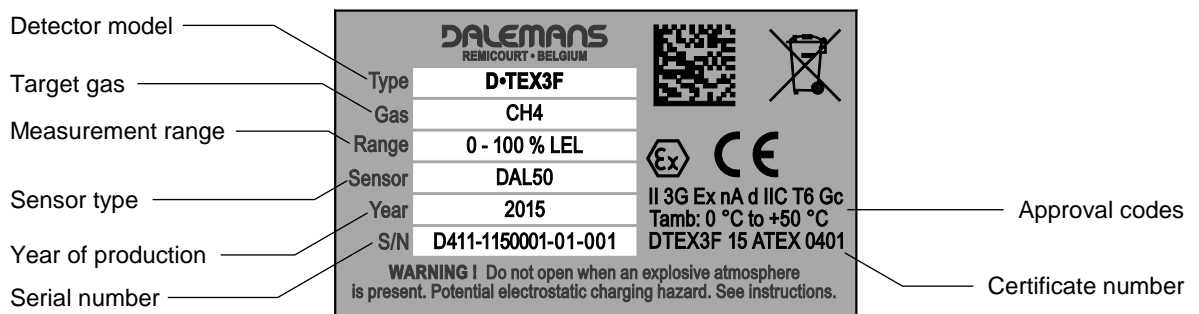


Figure 1: identification and certification label

Approval codes	Definition (see “Directive 2014/34/EU” for further details)
II	Non-mining electrical equipment group for potentially explosive atmospheres.
3G	Category 3 equipment intended for use in areas where an explosive gas atmosphere is not likely to occur under regular operation or only for short-period (zone 2).
Ex nA d	Equipment intended for use in explosive gas atmospheres, having a combined non-sparking “nA” and flameproof “d” type of protection.
IIC	Equipment group II subdivision according to the nature of the explosive gas atmosphere (methane, propane, ethylene, hydrogen, acetylene).
T6	Temperature class according to the maximum surface temperature of the equipment in explosive gas atmosphere (T6=85 °C).
Gc	Equipment for explosive gas atmospheres, having an “enhanced” level of protection, which is not a source of ignition in normal operation and which may have additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences
Tamb	Ambient temperature range according which the temperature class has been rated.

2. DESCRIPTION

2.1. Overview

The **D•TEX3F** gas detector is designed to detect flammable gas present in ambient air at concentrations up to 100 % of the Lower Explosive Limit (LEL). It operates using CATALYTIC or INFRARED sensors and provides a 3-wire millivolts output signal. The **D•TEX3F** can be connected to a control unit as part of a Wheatstone bridge measuring circuit.

The **D•TEX3F** gas detector comprises of a flame retardant plastic enclosure, a certified cable gland, a flameproof sensing head and a terminal block fitted on a PCB. The sensing head and the **D•BASE 3F** circuit board are designed to allow easy plug-in replacement.

The **D•TEX3F** is suitable for:

- Use in areas other than mine (ATEX group II - equipment category 3)
- Use in gas explosive atmospheres of Zone 2 hazardous areas
- Operating at temperature from 0 °C up to +50 °C

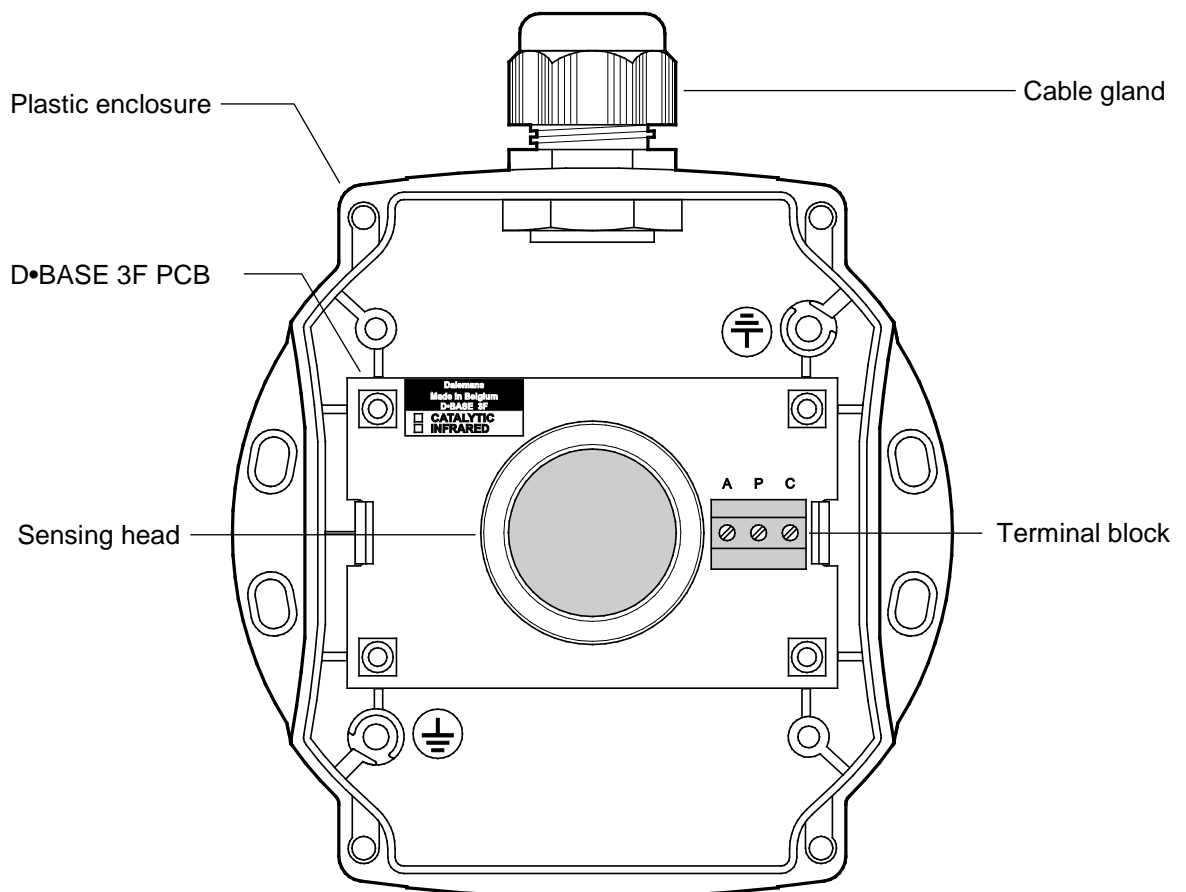


Figure 2: D•TEX3F overview

2.2. Dimensions

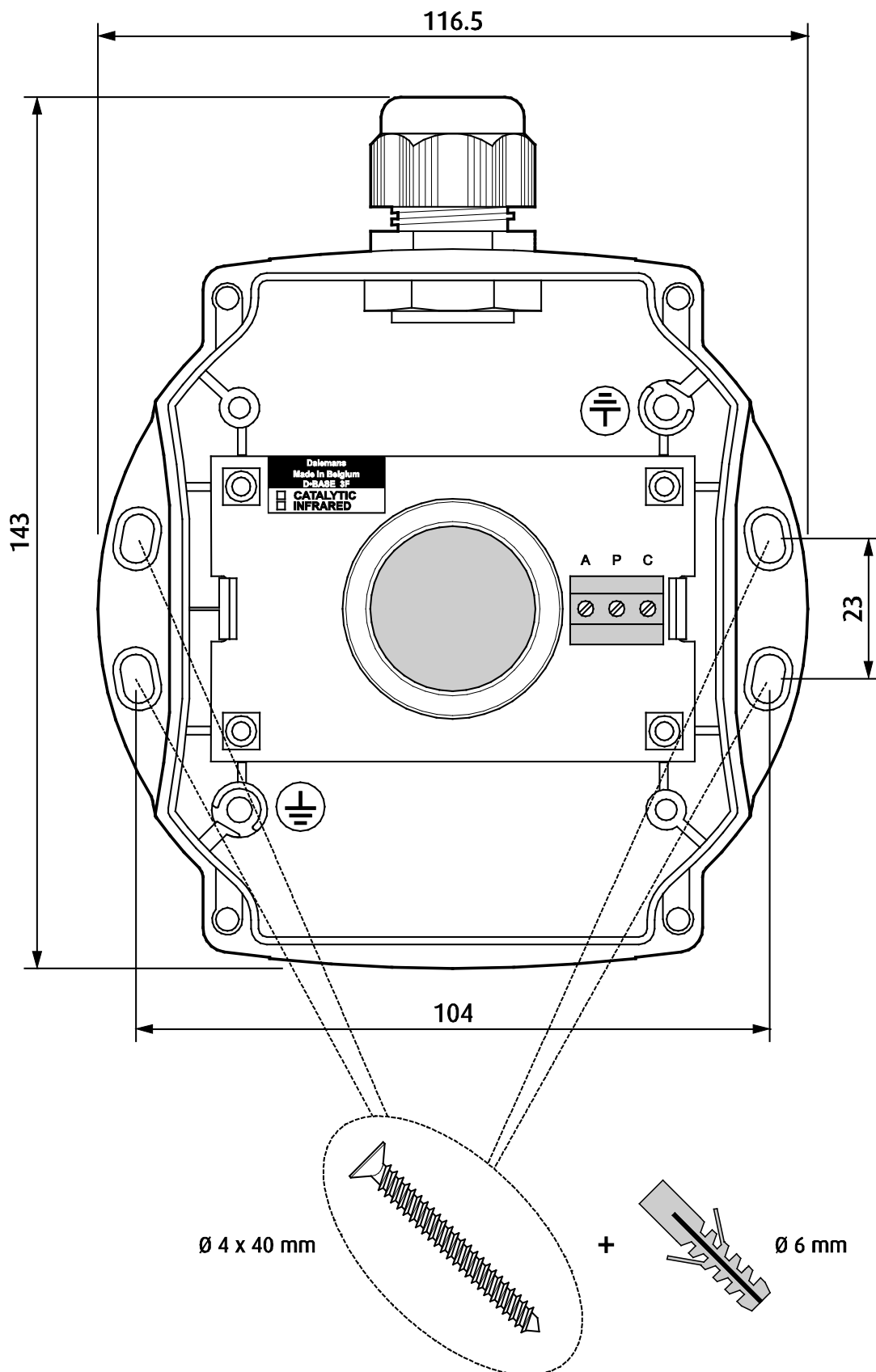


Figure 3: D•TEX3F dimensions in mm

3. INSTALLATION

3.1. Location

Gas detectors must be placed so that potential gas accumulations are detected before they create a significant hazard. Inappropriate location of a detector can nullify the effect and the integrity of the gas detection system.

The placement of the detectors should be determined in consultation with experts having specialist knowledge of gas dispersion, with those who have knowledge of process plant system and equipment involved, and with safety and engineering personnel. Should you require any further guidance or assistance please contact DALEMANS or his local representative.

The location of every detector must be recorded and available to the safety personnel.

Consider the following points when positioning a gas detector:

- The detector should be readily accessible for maintenance and electrical safety inspection.
- It must be possible to fit all accessories or test equipment for maintenance and servicing.
- Hazard level and potential sources of gas leak must be taken into account.
- Consider the combination of sources of gas release with propagation effects.
- The detector should be protected against operational hazards of the plant.
- The detector should be protected against vibrations and mechanical impacts.
- The detector should never be positioned directly above or below a water point.
- For outdoor installation, a protection against rain and/or sun exposition shall be installed.
- The detector should not be mounted in air currents.
- Always observe the operational temperature range of the sensor (refer to “Specifications”).
- To detect a gas which is lighter than air, place the detector at a high level.
- To detect a gas which is heavier than air, place the detector at a low level.
- If the gas density is close to air density, place detectors at both high and low levels.
- Gas density increases when temperature decreases.
- When mounting the detector at a high level, DALEMANS recommend using a “**D•LINE collecting cone**” accessory (see “Spare parts and accessories” for part number).

The following table gives examples of detector locations depending on the gas to detect:

Gas *	Formula	Density (air = 1)	Position
Cracked gas	-	0.47	High
Hydrogen	H ₂	0.07	
Methane	CH ₄	0.55	
Natural gas	-	0.68	
Butane	C ₄ H ₁₀	2.05	Low
Ethylene oxide	C ₂ H ₄ O	1.52	
Isobutane	(CH ₃) ₃ CH	2.00	
Propane	C ₃ H ₈	1.56	
Acetylene	C ₂ H ₂	0.90	High and low
Propane-air	-	± 1.15	

* This list is not exhaustive

3.2. Mounting

The **D•TEX3F** gas detector should be mounted flat on a wall or a ceiling. Mounting details are given on Figure 3.

- Attach the detector using suitable screws and plugs.
- Ensure that dust will not block the sintered and that water will not run into the sensing head.
- The **D•TEX3F** may be mounted horizontally or vertically.
- For vertical mounting, the enclosure can be mounted with the cable gland pointing upwards or downwards but the detector lid must always be in the position shown below.

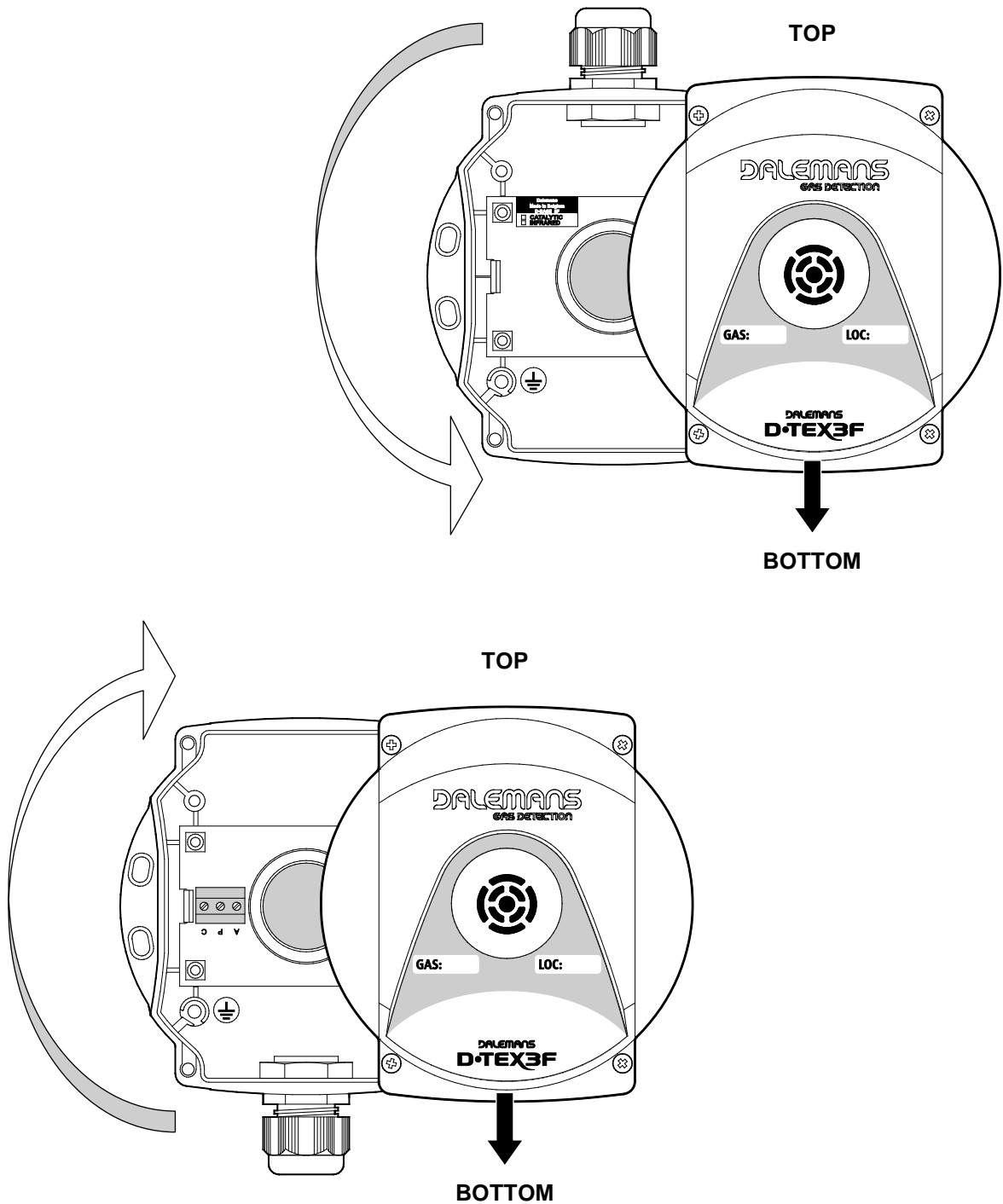


Figure 4: D•TEX3F vertical mounting

3.3. Field wiring

Field wiring must comply with local regulations and standards in force and meet the electrical requirements of the **D•TEX3F** detector.

- DALEMANS recommend using colour coded cable with solid wires.
- The acceptable cross sectional area of the cable is 1.5 to 2.5 mm² and depends on the type of sensor fitted and the distance between the detector and the control unit. For more information about the cross sectional area of the cable and the maximum cable length, please refer to the instruction manual of the control unit.
- The overall cable diameter must be within the range given below.

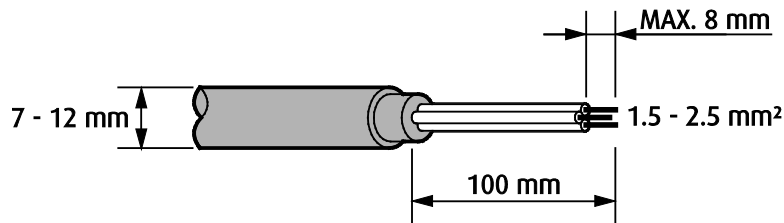


Figure 5: D•TEX3F cable requirement

3.4. Electrical connections



Always ensure that the capability of the associated control unit meets the electrical requirements of the D•TEX3F gas detector (see “Specifications”).

Electrical connections are made by means of the “A P C” terminal block mounted on the D•BASE 3F PCB in the detector enclosure. The cable wires must be stripped and plugged so that the gap between insulation and the metal edge of the terminal connection does not exceed 1 mm.

To connect the detector:

- Unscrew the four metal screws of the detector lid and remove the lid.
- Unscrew the cable gland cap nut.
- Insert the cable into the cable gland and tighten to ensure a good sealing.
- Connect the wires to the “A P C” terminal block according to the diagram below.
- Put the lid back onto the detector and screw the four metal screws of the lid back on again.

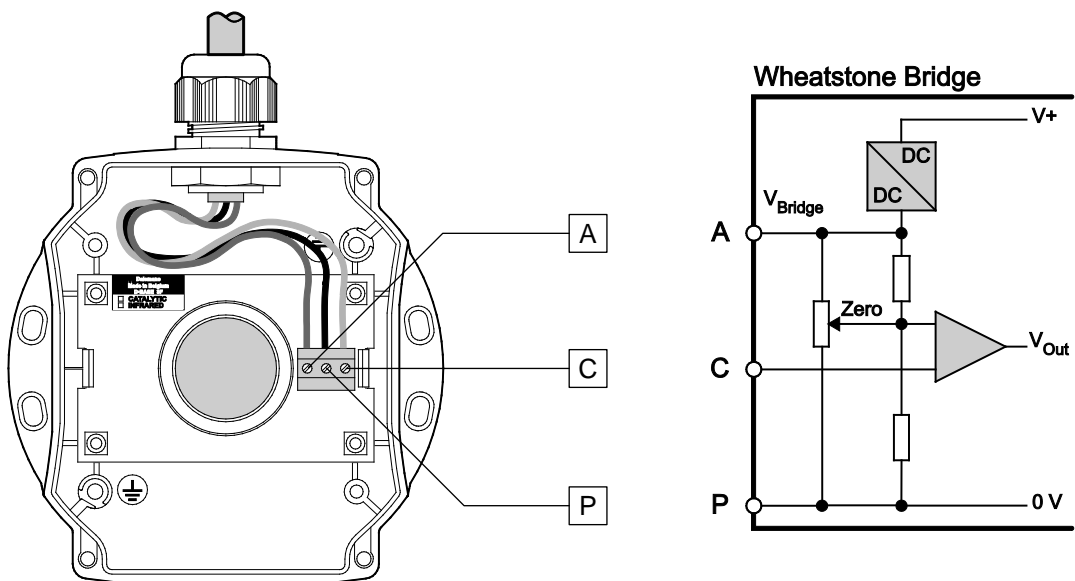


Figure 6: D•TEX3F electrical connection

4. COMMISSIONING



Prior to carrying out commissioning of the gas detector, inhibit the safety function of the detector on the associated control unit and secure any output device connected to the system to prevent false alarms and unintended actuations.

Prior to operating the **D•TEX3F** gas detector, the bridge voltage to apply to the detector must be set properly. The correct bridge voltage to apply to the detector depends on the type of sensor fitted. Refer to “Sensor” on the identification label of the detector (see Figure 1) and check the proper sensor voltage in the following table:

Sensor voltage	Catalytic sensor DAL50	Infrared sensor DIR-x
V_{SENS}	$2.5 \pm 0.2 \text{ Vdc}$	from 3.2 to 5.0 Vdc

Perform the following commissioning procedure to get the **D•TEX3F** operational:

- Unscrew the four metal screws of the detector lid and remove the lid.
- Check that electrical connections have been made properly according to diagram on Figure 6.
- Measure the sensor voltage across the “A” and “P” terminals of the D•BASE 3F PCB, and adjust the bridge voltage at the associated control unit in order to have the correct sensor voltage, according to the table above, at the detector (see Figure 7 below).
- Put the lid back onto the detector and screw the four metal screws of the lid back on again.
- Power on the detector and allow stabilization for at least 15 minutes.
- Perform a full calibration of the detector according to the procedure given by DALEMANS or his local representative.
- Restore the detector safety function on the associated control unit.

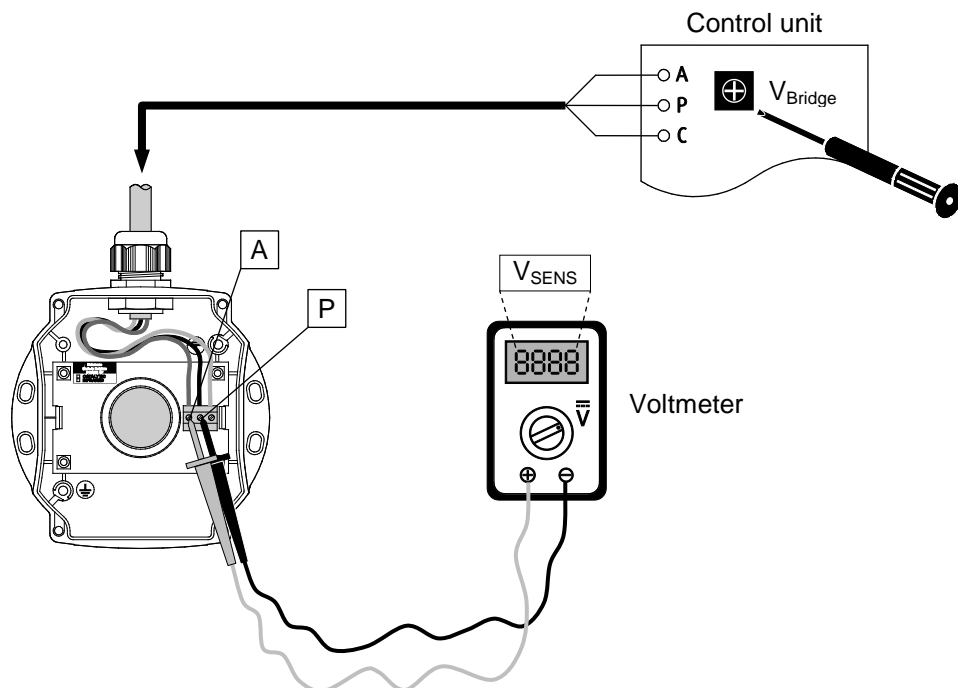


Figure 7: adjusting the D•TEX3F supply voltage

5. MAINTENANCE



Prior to carrying out maintenance or service operations on the gas detector, inhibit the safety function of the detector on the associated control unit and secure any output device connected to the system to prevent false alarms and unintended actuations.

Never open the detector when flammable gas is present.

Regularly remove dust from the detector WITH A DAMP CLOTH ONLY to avoid the risk of electrostatic sparks.

If contamination of the sintered metal filter by solvent, gas or vapour has occurred, the sensing head must be replaced and the inspection frequency should be increased twofold.

Gas detectors must be calibrated at least once a year to mitigate the loss of sensitivity of the sensor. This calibration must be performed according to the procedure given by DALEMANS or his local representative, and in any case by qualified personnel who will have received a suitable training.

5.1. Sensor replacement

Sensors are supplied fitted into a D•BASE 3F PCB to allow easy plug-in installation.

5.1.1. Catalytic sensor

- Unscrew the four metal screws of the detector lid and remove the lid.
- On the “A P C” terminal block, fully disconnect and remove the cable.
- Unclip and remove the D•BASE 3F PCB.
- Fit the replacement PCB and restore electrical connection according to diagram on Figure 6 .
- Put the lid back onto the detector and screw the four metal screws of the lid back on again.
- Power on the detector and allow stabilization for at least 15 minutes.
- Perform a full calibration of the detector according to the procedure given by DALEMANS or his local representative.
- Restore the detector safety function on the associated control unit.

5.1.2. Infrared sensor

- Unscrew the four metal screws of the detector lid and remove the lid.
- On the “A P C” terminal block, fully disconnect and remove the cable.
- Unclip and remove the D•BASE 3F PCB.
- On the PCB, unscrew the two screws retaining the sensor housing and remove it.
- Remove the infrared sensor and fit the replacement sensor on the D•BASE 3F PCB.
- Check that the sintered is not blocked or contaminated. If need be, replace the sensor housing (see “Spare parts and accessories” for part number).
- Put the sensor housing over the sensor and screw the two retaining screws back on again.
- Re-fit the D•BASE 3F PCB and restore connections according to diagram on Figure 6.
- Put the lid back onto the detector and screw the four metal screws of the lid back on again.
- Power on the detector and allow stabilization for at least 15 minutes.
- Perform a full calibration of the detector according to the procedure given by DALEMANS or his local representative.
- Restore the detector safety function on the associated control unit.


5.2. Troubleshooting

Problem	Possible cause(s)
Non-zero reading on the control unit	<ul style="list-style-type: none"> ▪ Presence of gas in the detector area.
Non-zero reading when no gas is present	<ul style="list-style-type: none"> ▪ Detector needs calibration.
Reading too high or too low	
Zero reading in presence of gas	<ul style="list-style-type: none"> ▪ Wrong or defective electrical connection. ▪ Sensor voltage (through "A" and "P" terminals) out of allowed range. ▪ Sintered blocked with dirt or dust. ▪ Sintered or sensor contaminated. Replace sintered AND sensor.
"Fault" signal on the control unit	<ul style="list-style-type: none"> ▪ Wrong or defective electrical connection. ▪ Sensor disconnected or out of order. ▪ Sensor voltage (through "A" and "P" terminals) out of allowed range.

5.3. Spare parts and accessories

Part or accessory	Part number
D•TEX3F complete enclosure for catalytic & infrared sensor	B0100000228
Retainer for plastic enclosure lid	B0100000226
M20 Polyamide Ex e cable gland - Black 7 - 12 mm	PRE00000018
M20 metric plastic nut	PRE00000046
D•BASE 3F circuit board + catalytic sensing head	BASDLINE001
D•BASE 3F circuit board + infrared sensor for Methane	BASDLINE002
D•BASE 3F circuit board + infrared sensor for Propane	BASDLINE003
D•BASE 3F circuit board + infrared sensor for Butane	BASDLINE004
Aluminium sensing head for infrared sensor	MEC00000046
Screws for plastic enclosure lid	VISVIS00077
Screw for sensing head - M2.5 x 6 mm	VISVIS00076
D•LINE kit for remote gas injection	ACCKIT00006
D•LINE IP65 weatherproof protection kit	ACCKIT00007
D•LINE collecting cone	ACCKIT00008
D•LINE kit for remote gas tight sampling	ACCKIT00009

6. SPECIFICATIONS

MODEL	D•TEX3F	
Material	Flame retardant (UL-94V0) and UV stabilized plastic	
Dimensions	147 x 119 x 51 mm	
Weight	285 g	
Output	3-wire mV Wheatstone bridge	
Measurement principle	Catalytic (DAL50)	Infrared (DIR-x)
Measurement range	<i>Other gases/ranges upon request</i>	
Butane (C ₄ H ₁₀)	0 - 100 % LEL	0 - 100 % LEL
Methane (CH ₄)		
Natural gas		
Propane (C ₃ H ₈)		
Operating voltage	2.5 ± 0.2 Vdc	3.2 - 5.0 Vdc
Current consumption	170 ± 10 mA	15 mA
Power consumption	0.5 W max.	0.8 W max.
Operating temperature	0 °C to +50 °C	0 °C to +50 °C
Response time (T90)	< 30 s	< 30 s
Accuracy	± 3 % range < 60 % LEL	± 0.5 % range < 50 % LEL
	± 5 % range > 60 % LEL	± 1 % range > 50 % LEL
Expected operating life	> 2 years	> 5 years
Humidity (non-condensing)	0 - 95 % RH	
Cable entry	1 x M20	
Wiring	3 x 1.5 - 2.5 mm ² (solid wires)	
Maximum cable length	<i>Refer to the associated control unit instruction manual</i>	
Ingress protection	IP65 (with accessory)	
ATEX approval codes	 II 3G Ex nA d IIC T6 Gc Tamb: 0 °C to +50 °C	
Hazardous area	Zone 2	
Gas group	IIC (methane, propane, ethylene, hydrogen, acetylene)	
Standards	EN 60079-0:2012, EN 60079-1:2007, EN 60079-15:2010	
Certificate number	DTEX3F 15 ATEX 0401	



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