

## Installation Guide

# Danfoss Gas Sensor

## DGS

## ENGLISH

**Technician use only!**

This unit must be installed by a suitably qualified technician who will install this unit in accordance with these instructions and the standards set down in their particular industry/country.

Suitably qualified operators of the unit should be aware of the regulations and standards set down by their industry/country for the operation of this unit.

These notes are only intended as a guide and the manufacturer bears no responsibility for the installation or operation of this unit.

Failure to install and operate the unit in accordance with these instructions and with industry guidelines may cause serious injury including death and the manufacturer will not be held responsible in this regard.

It is the installer's responsibility to adequately ensure that the equipment is installed correctly and set up accordingly based on the environment and the application in which the products are being used.

**Please observe that DGS works as a safety device securing a reaction to a detected high gas concentration. If a leakage occurs, the DGS will provide alarm functions, but it will not solve or take care of the leakage root cause itself.**

**Regular Test**

To maintain product performance and comply with the local requirements the DGS must be tested regularly.

DGS's are provided with a test button that may be activated to validate the alarm reactions.

Additionally the sensors must be tested by either bump test or calibration.

Danfoss recommends the following minimum calibration intervals:

DGS-IR: 60 months

DGS-SC: 12 months

DGS-PE: 6 months

With DGS-IR it is recommended to do an annual bump test in years without calibration.

Check local regulations on calibration or testing requirements.

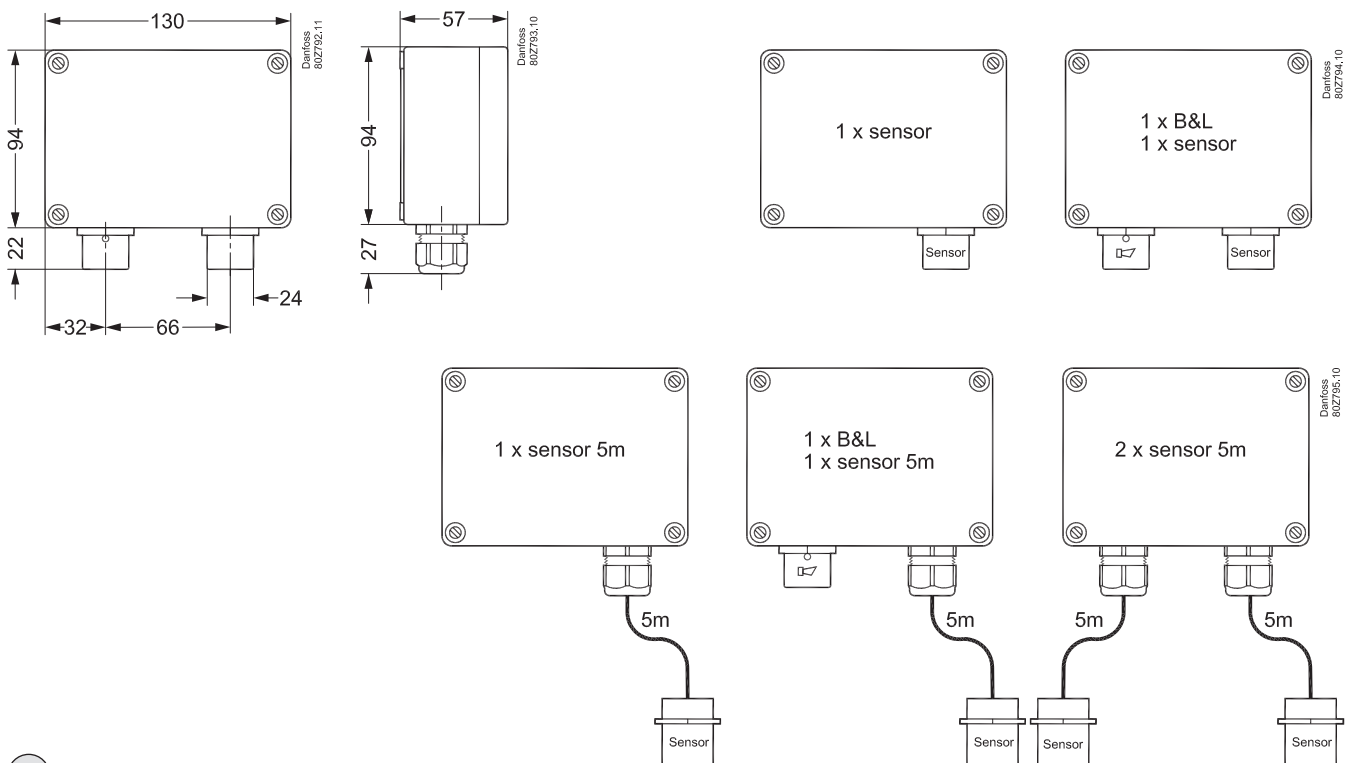
After exposure to a substantial gas leak, the sensor should be checked by bump test or calibration and replaced if necessary.

**Location:**

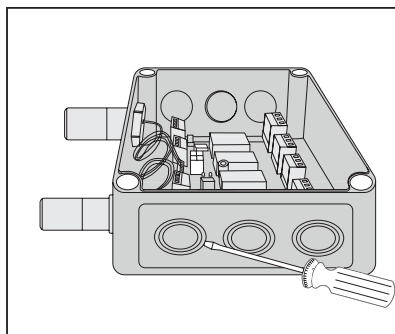
For all gas' heavier than air, Danfoss recommends locating the sensor head app. 30cm (12") above the floor and if possible in the air flow. All gas' measured with these DGS-sensors are heavier than air: HFC grp 1, HFC grp 2, HFC grp 3, CO<sub>2</sub> and Propane.

For further details on Test and Location please see the Danfoss Gas Detection application guide, DKRCI.PA.S00.A-.02

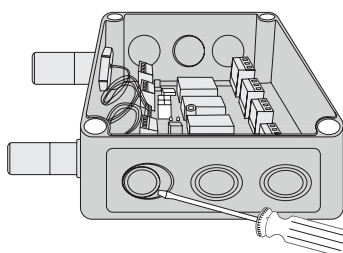
## Dimensions and appearance



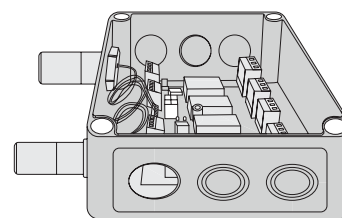
## Cable Gland opening



**Hole punching for Cable gland:**  
1. Select the location for the safest cable entry.  
2. Use a sharp screwdriver and a small hammer.  
3. Place the screwdriver and hammer with precision while moving the screwdriver within a small area until the plastic is penetrated.



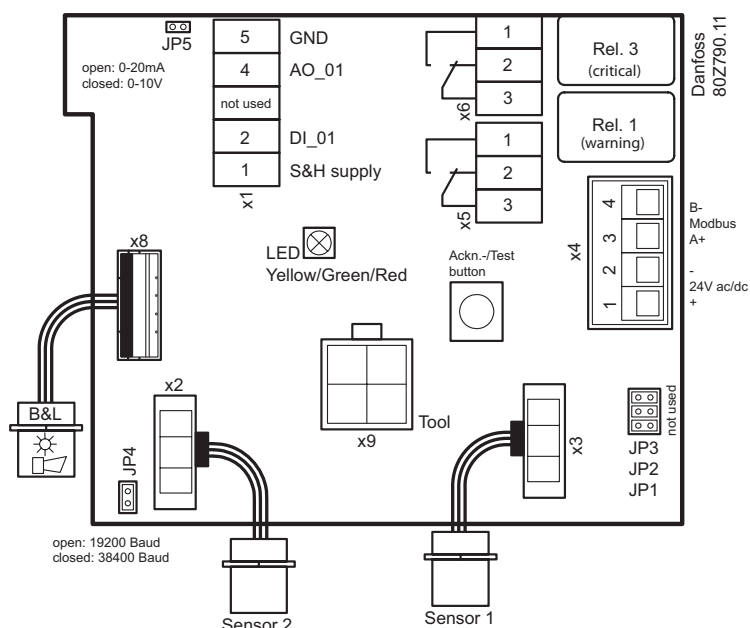
Continue precision punching with small movements until the round piece can be pulled out by your fingers.



Remove potential burrs and secure flat surfaces. Install the Cable gland according to the enclosed guide.

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## Danfoss Gas Sensor DGS



### Status LED / B&L:

GREEN is power on.  
- flashing if maintenance needed

YELLOW is an indicator of Error.  
- the sensor head is disconnected or not the expected type  
- AO configured as 0-20mA but no current is running  
- flashing when sensor is in special mode (e.g. when changing parameters with the service tool)  
- Supply voltage out of range

RED is an indication of alarm due to gas concentration level.

The Buzzer & Light behaves identical to the status LED.

### Ackn. -/Test button / DI\_01:

**TEST** - The button must be pressed for 8 sec.  
- Critical and warning alarm is simulated and AO goes to max. (10V/20mA), stop on release.

**ACKN.** - if pressed during critical alarm, as default\* the relays and buzzer goes out of alarm condition and goes back on after 5 minutes if the alarm situation is still active.  
\* the duration and whether to include the relay status with this function or not is user defined

DI\_01 (terminals 1 and 2) is a dry-contact (potential-free) behaving identically to the Ackn./Test button.

### DC-supply for external Strobe&Horn

Whether the DGS is powered by 24Vdc or 24Vac, a 24Vdc power supply (max. 50mA) is available between terminals 1 and 5 on connector x1

### Jumpers

\* JP4 open → 19200 Baud  
JP4 closed → 38400 Baud (default)

\* JP5 open → AO 0-20 mA  
JP5 closed → AO 0-10 Volt (default)

Note: the DGS must be power cycled before any change to JP4 take effect.

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## DGS Installation Instructions

The DGS is available with one sensor or two sensors and B&L (Buzzer and Light) as option (see figure 1). For sensors that can be poisoned by e.g. silicones like all semiconductor and catalytic bead sensors, it is imperative to remove the protective cap only supplied only after all silicones are dry, and then energize the device. The sensor protection cap must be removed before taking the DGS into operation

### Mounting and Wiring

To wall mount the DGS, unscrew the lid by releasing the four plastic screws in each corner and remove the lid. Mount the DGS base to the wall by fitting screws through the holes which the lid screws were fastened by. Complete the mounting by re-applying the lid and fastening the screws. The sensor head must always be mounted to point downwards. The DGS-IR sensor head is sensitive to shock – special attention should be paid to **protect the sensor head from shocks** during installation and operation. Observe the recommended location of the sensor head as stated on page 1. Extra cable glands are added by following the instruction in figure 2. The exact position of the terminals for the sensors, alarm relays, digital input and analogue output is shown in the connection diagrams (see figure 3). The technical requirements and regulations for wiring, electrical security, as well as project specific and environmental must be met.

### Configuration

For convenient commissioning, the DGS is pre-configured and parameterized with factory-set defaults. See Menu Survey. Jumpers are used to change the analogue output type and the Modbus baud rate. See fig. 3. For DGS with Buzzer & Light, alarm actions are given according to following table:

### System integration

To integrate the DGS with a Danfoss system manager or general BMS system set the Modbus address using the DGS Service Tool, using password "1234" when prompted. See the DGS User Guide for details on operating the DGS Service Tool. The Baud Rate is adjusted by jumper JP4. As default the setting is 38.4kBaud. For integration with AK-SM 720/350 change the setting to 19.2kBaud. For more information about data communication see document RC8AC--

### Sensor replacement

The sensor is connected to the DGS via a plug connection enabling simple sensor exchange instead of an on-site calibration. The internal X-change routine recognizes the exchanging process and the exchanged sensor and re-starts the measurement mode automatically. The internal X-change routine examines the sensor for actual type of gas and actual measuring range. If data does not match the existing configuration, the built in status LED indicates an error. If everything is OK the LED will light up green.

As an alternative, the on-site calibration via the DGS Service Tool can be performed with the integrated, user friendly calibration routine. See the DGS User guide for details on operating the DGS Service Tool.

Action	Reaction Buzzer	Reaction Light	Warning relay 1 SPDT NO (Normally Open)	Critical relay 3 SPDT NC (Normally closed)
Loss of power to DGS	OFF	OFF		X (closed)
Gas signal < warning alarm threshold	OFF	GREEN		
Gas signal > warning alarm threshold	OFF	RED Slow flashing	X (closed)	
Gas signal > critical alarm threshold	ON	RED Fast flashing	X (closed)	X (closed)
Gas signal > critical alarm threshold, but ackn. button pressed	OFF (ON after delay)	RED Fast flashing	X (closed)*	(open)*
No alarm, no fault	OFF	GREEN		
No fault, but maintenance due	OFF	GREEN Slow flashing		
Sensor communication error	OFF	YELLOW		
DGS in special mode	OFF	YELLOW flashing		

Alarm thresholds can have the same value, therefore the relays and/or Buzzer and Light can be triggered simultaneously. The alarm thresholds have a hysteresis of app. 5%  
\* whether to include the relay status with the acknowledge function or not is user defined

## DGS Installation test

As DGS is a digital device with self-monitoring, all internal errors are visible via the LED and Modbus alarm messages. All other error sources often have their origins in other parts of the installation.

For fast and comfortable Installation test we recommend proceeding as follows.

### Optical Check

Right cable type used.

Correct mounting height according to definition in Mounting.

LED status – see DGS trouble shooting.

### Functional test (for initial operation and maintenance)

Functional test is done by pressing the test button for more than 8 sec and observing all connected outputs (Buzzer, LED, Relay connected devices) are working properly. After deactivation all outputs must automatically return to their initial position

### Zero-point test (if prescribed by local regulations)

Zero-point test with fresh outdoor air.

A potential zero offset can be read out by use of the Service tool.

### Trip test with reference gas (if prescribed by local regulations)

The sensor is gassed with reference gas (for this you need a gas bottle with pressure regulator and a calibration adapter).

In doing so, the set alarm thresholds are exceeded, and all output functions are activated. It is necessary to check if the connected output functions are working correctly (e.g. the horn sounds, the fan switches on, devices shut down). By pressing the push-button on the horn, the horn acknowledgment must be checked. After removal of the reference gas, all outputs must automatically return to their initial position.

Other than the trip testing, it is also possible to perform a functional test by means of calibration. For further information, please refer to the User Guide.

### Comparing sensor gas type with DGS specification

The replacement sensor specification must match the DGS specification.

The DGS software automatically reads the specification of the connected sensor and compares with the DGS specification.

This feature increases the user and operating security.

New sensors are always delivered factory-calibrated by Danfoss.

This is documented by the calibration label indicating date and calibration gas. A re-calibration is not necessary during commissioning if the device is still in its original packaging (is not air-tight protection by the red protective cap) and the calibration certificate has not expired.

## Menu Survey

SW 1.1x

Function	Min	Max	Factory	Unit	AKM name
<b>Gas level</b>					
Sensor 1 Actual gas level in % of range	0.0	100.0	-	%	Gas level %
Sensor 1 Actual gas level in ppm	0	FS <sup>2</sup>	-	ppm	Gas level ppm
Sensor 2 Actual gas level in % of range	0.0	100.0	-	%	2: Gas level %
Sensor 2 Actual gas level in ppm	0	FS <sup>2</sup>	-	ppm	2: Gas level ppm
<b>Alarms</b>					
<b>Alarm settings</b>					
Indication of critical alarm (critical alarm of Gas1 or Gas2 active) 0: No active alarm(s) 1: Alarm(s) active	0	1	0	-	GD alarm
Common indication of both critical and warning alarm as well as internal and maintenance alarms 0: No active alarm(s), warning(s) or errors 1: Alarm(s) or warning(s) active	0	1	0	-	Common errors
Gas 1 Alarm limit in %. Alarm limit in % (0-100), not lower 1: Warn Limit allowed	0.0	100.0	HFC: 25 CO2: 25 R290: 16	%	Crit. limit %
Gas 1 Alarm limit in ppm Alarm limit in ppm; 0: Warning Signal deactivated	0	FS <sup>2</sup>	HFC: 500 CO2: 5000 R290: 800	ppm	Crit. limit ppm
Gas 1. Warning limit in % (0-100)	0	100.0	HFC: 25 CO2: 25 R290: 16	%	Warn. limit %
Gas 1 Warning limit ppm 0: Warning Signal deactivated	0.0	FS <sup>2</sup>	HFC: 500 CO2: 5000 R290: 800	ppm	Warn. limit ppm
High (critical and warning) alarm delay in seconds, if set to 0: no delay	0	600	0	sec	Alarm delay s
When set to 1, the audible sounder are reset (and the relays if defined: Relay reset enable) to no alarm indication. When the alarm is reset or the time out duration is exceeded, the value is reset to 0. Note: The alarm condition is not reset only the output indication is reset. 0: Alarm outputs not reset 1: Alarm outputs reset –buzzer muted and relays reset if configured	0	1	0	-	Reset alarm
Duration of alarm reset before automatic re-enable of alarm outputs. A setting of 0 disables the ability to reset alarm.	0	9999	300	sec	Reset alarm time <sup>1</sup>
Relay reset enable: Relay reset with alarm acknowledge function 1= (default) Relays will be reset if the alarm acknowledge function is activated 0: Relays remains active until the alarm condition clears	0	1	1	-	Relay rst enable <sup>1</sup>
Gas 2 Alarm limit in %. Alarm limit in % (0-100), not lower 1: Warn Limit allowed	0.0	100.0	CO2: 25	%	2:Crit. limit %
Gas 2 Alarm limit in ppm Alarm limit in ppm; 0: Warning Signal deactivated	0	FS <sup>2</sup>	CO2: 5000	ppm	2:Crit. limit ppm
Gas 2. Warning limit in % (0-100)	0	100.0	CO2: 25	%	2:Warn. limit %
Gas 2. Warning limit ppm 0: Warning Signal deactivated	0.0	FS <sup>2</sup>	CO2: 5000	ppm	2:Warn. limit ppm
High (critical and warning) alarm delay in seconds, if set to 0: no delay	0	600	0	sec	2:Alarm delay s
<b>Service</b>					
Status of the sensors warm up period 0:Ready 1: Warming Up 1 or more sensors	0	1	0	-	DGS Warm-up

Read out the attached Gas sensor type. 1: HFC gr.1 R1234ze, R454c, R1234yf R1234yf, R454a, R452A R454b, R513a 2: HFC gr.2 R407F, R416a, R417a R407A, R422a, R427a R449A, R437a, R134A R438a, R422D 3: HFC gr.3 R448A, R125 R404A, R32 R507A, R434a R410A, R452b R407C, R143b 4: CO2 5: Propane (R290)	1	5	N	-	Sensor type
Full scale range	0	32000	HFC: 2000 CO2: 20000 R290: 5000	ppm	Full scale ppm
Gas 1 Days until next calibration	0	32000	HFC: 365 CO2: 1825 R290: 182	days	Days till calib
Gas 1 Shows how many % of Sensitivity remaining Note: Value only updated after calibration	0	100	100	%	Rem.sensitivity
Status of the critical alarm relay 1: ON = No alarm signal, Coil under Power - normal 0: OFF = alarm signal, Coil depowered, Alarm Situation	0	1	0	-	Critical Relay
Status of the Warning Relay 0: OFF= inactive, no Warning active 1: ON = active Warning, Coil under Power	0	1	0	-	Warning Relay
Status of the buzzer 0: inactive 1: active	0	1	0	-	Buzzer
Gas 2 Days until next calibration	0	32000	HFC: 365 CO2: 1825 R290: 182	days	2:Days til calib
Gas 2 Shows how many % of Sensitivity remaining Note: Value only updated after calibration	0	100	100	%	2:Rem.sensitivity
Activates a mode which simulates an alarm. Buzzer, LED and relays all activate 1:-> Test function - no alarm generation possible now Automatically falls back to Off after 15 min. 0: back to Normal mode	0	1	0	-	Test Mode
Analog Output Selction Sensivity 0: zero to full Scale (e.g (Sensor 0-2000ppm) 0-2000ppm will give 0-10V) 1: zero to Half Scale (e.g (Sensor 0-2000ppm) 0-1000ppm will give 0-10V)	0	1	1	-	AOmax = half FS
Analog Output Selection Zero start 0: select 0-10V or 0-20mA Output signal 1: select 2-10V or 4-20mA Output signal	0	1	0	-	AOmin = 2V/4mA
<b>Alarms</b>					
Critical Limit alarm 0: Alarm not active 1: Alarm, gas limit exceeded and delay expired	0	1	0	-	Critical limit
0: OK 1: Fault. Out of range under test –Overrange or Underrange	0	1	0	-	Out of range
0: OK, sensor no errors 1: Fault, Sensor and Head failures	0	1	0	-	Wrong SensorType
0: OK, sensor in place 1: Fault, Sensor out or removed, or wrong sensor placed in	0	1	0	-	Sensor removed
0: OK, Sensor not due for calibration 1: Warning, Due for calibration	0	1	0	-	Calibrate sensor

0: OK, Gas level below warning level 1: Warning, Gas level above warning level and delay expired	0	1	0	-	Warning limit
Indication if the normal alarm function is inhibited or in normal operation 0: Normal operation, i.e. alarms are created and cleared 1: Alarms inhibited, i.e. alarm status is not updated, e.g. due to DGS in test mode	0	1	0	-	Alarm inhibited
Critical Limit alarm 0: Alarm not active 1: Alarm, gas limit exceeded and delay expired	0	1	0	-	2:Criti. limit
0: OK 1: Fault. Out of range under test –Overrange or Underrange	0	1	0	-	2:Out of range
0: OK, sensor no errors 1: Fault, Sensor and Head failures	0	1	0	-	2:Wrong SensType
0: OK, sensor in place 1: Fault, Sensor out or removed, or wrong sensor placed in	0	1	0	-	2:Sens.removed
0: OK, Sensor not due for calibration 1: Warning, Due for calibration	0	1	0	-	2:Calibrate sens
0: OK, Gas level below warning level 1: Warning, Gas level above warning level and delay expired	0	1	0	-	2:Warning limit

<sup>1</sup> “Reset alarm time” and “Relay rst enable”: These two parameters related to the alarm reset/acknowledge function are not accessible with the hand-held tool.

<sup>2</sup> The max alarm limit for CO<sub>2</sub> is 16.000ppm / 80% of full scale. All other values equal the fullscale range of specific product

## DGS - Troubleshooting

Symptom	Possible Cause(s)
LED off	<ul style="list-style-type: none"> <li>• Check power supply. Check wiring.</li> <li>• DGS Modbus was possibly damaged in transit. Check by installing another DGS to confirm the fault.</li> </ul>
Green flashing	<p>The sensor calibration interval has been exceeded or the sensor has reached the end of life.</p> <p>Carry out calibration routine or replace with a new factory calibrated sensor.</p>
Yellow	<ul style="list-style-type: none"> <li>• AO configured but not connected (only 0-20 mA output). Check wiring.</li> <li>• Sensor type does not match DGS specification. Check gas type and measuring range.</li> <li>• Sensor may be disconnected from printed circuit board. Check to see sensor is properly connected.</li> <li>• The sensor has been damaged and needs to be exchanged. Order replacement sensor from Danfoss.</li> <li>• Supply voltage out of range. Check power supply.</li> </ul>
Yellow flashing	<ul style="list-style-type: none"> <li>• The DGS is set to service mode from the hand held service tool. Change setting or await time out within 15 minutes.</li> </ul>
Alarms in the absence of a leak	<ul style="list-style-type: none"> <li>• If you experience alarms in the absence of a leak, try setting an alarm delay.</li> <li>• Perform a bump test to ensure proper operation.</li> </ul>
The zero-measurement drifts	<p>The DGS-SC sensor technology is sensitive to the environment (temperature, moist, cleaning agents, gas' from trucks, etc). All ppm measurements below 75ppm should be disregarded, i.e. no zero-adjustment made.</p>