ENGINEERING
TOMORROW

User Guide

Danfoss Gas Sensor

Type DGS
Modbus or Service Tool display operation

danfoss.com

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1 Intended use

The display of the handheld Service Tool and the Modbus interface for integration with Building Management Systems is used as interface for operation, commissioning and calibration of the DGS gas detection unit

2 Content

This user guide contains the maximum possible functionality of concerned display devices.

Depending on the DGS type some features described here are not possible and therefore the menu items may be hidden.

Some features are available from Modbus or handheld Service Tool interface only. Differences is highlighted in this document.

3 Operation

The configuration and service is made via the handheld Service Tool or in combination with the Modbus interface.
Security is provided via password protection against unauthorized intervention.

Handheld Service Tool: Operation is done via 6 buttons. 	***AK-SM 800 Front End:*** The configuration is done via the graphical display and buttons or via the PC tools StoreView Desktop or AK-ST 500.

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Operation with the handheld Service Tool is described in sections 3.1 and 3.2 and chapter 4.

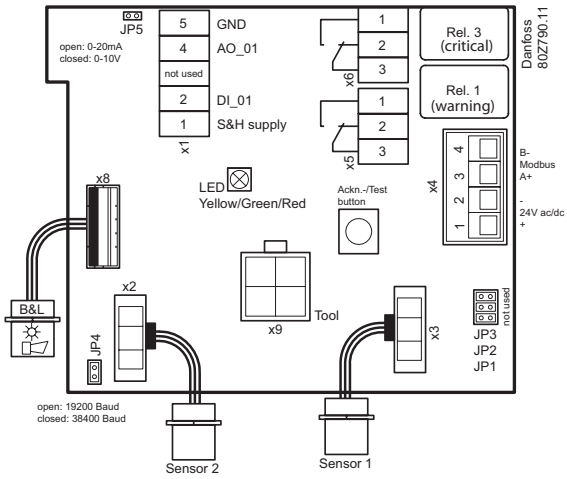
Operation with the Danfoss Front End is described in chapter 5.

2 functions are configured via jumpers on the DGS.

Jumper 4, JP 4, located on the bottom left is used to configure the Modbus baud rate.
As default the baud rate is 38.400 Baud. By removing the jumper the baud rate is changed to 19.200 Baud. Removing the jumper is required for integrating with Danfoss System Managers AK-SM 720 and AK-SM 350.

Jumper 5, JP5, located on the top left is used to configure the analogue output type.
As default this is Voltage output. By removing the jumper this is change to Current output.

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



3.1
Function of the keys and LEDs on the keypad

ESC Exits programming, returns to the previous menu level.

Enters sub menus, and saves parameter settings.

Scrolls up & down within a menu, changes a value.

Change of cursor position.

The status LEDs indicate the operating state.

- **Green**
  Continuous = Operating voltage
  Flashing = Maintenance message
- **Yellow**
  Continuous = Failure
  Slowly flashing = Warming-up
  Fast flashing = Special mode
- **Red** = Alarm

The backlight of the display changes from green to red when an alarm is active.

3.2
Setting / changing of parameters and set points

Open desired menu window.
Code input field opens automatically, if no code is approved.

After input of valid code the cursor jumps onto the first position segment to be changed.

Push the cursor onto the position segment, which has to be changed.

Set the desired parameter / set point with the keys.

Save the changed value, confirm storage (ENTER).

ESC Cancel the save / close editing / return to a higher menu level (ESCAPE function).

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3.3
Code Levels

All inputs and changes are protected by a four-digit numeric code (= password) against unauthorised intervention according to the regulations of all national and international standards for gas warning systems. The menu windows of status messages and measuring values are visible without entering a code.

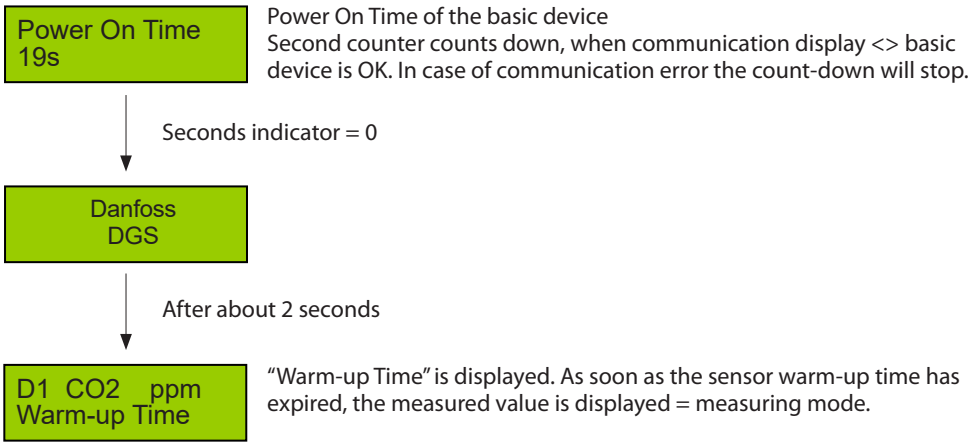
The access to the protected features is cancelled automatically if no button is pushed within 15 minutes.

The service technician access code to the protected features is '1234'

4 Menu Overview

Menu operation is done via a clear, intuitive and logical menu structure. The operating menu contains the following levels:

- Starting menu with indication of the device type if no Measuring Point is registered, otherwise scrolling display of the gas concentrations of all registered sensors in 5-second intervals. If alarms are active, only the values of the sensors currently in alarm status are displayed.
- Main menu
- 5 sub menus under "Installation and Calibration"



4
Menu Overview
(Continued)

Starting menu

Main menu	Chapter #
Error Status	Reading and acknowledgement of errors See chapter 4.1
Alarm Status	Display of the status of active alarms See chapter 4.2
Relay Status	Display of the relay status. Protected by password. See chapter 4.3
Measuring Values	Display of measuring values See chapter 4.4
Display Parameters	Read-out of handheld tool version, language and set-up of language. Partly protected by password See chapter 4.5
Installation & Calibration	Reading and change of the relay, measuring point and system parameters as well as test and calibration functions

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4
Menu Overview
(Continued)

Starting menu

Main menu	Chapter #
Service OFF	

The following menu items are only accessible with Service ON (password protected)
!! Service ON = Special mode = Fault message is active!!

MP Parameters	See chapter 4.6
System Parameters	See chapter 4.7
Operating Data	See chapter 4.8
Calibration	See chapter 4.9
Addressing	See chapter 4.10

4.1
Error status

A pending fault activates the yellow LED (Fault). The integrated fault management records the first 99 occurred faults with time stamps in the menu „System Errors“.

A number of error messages may be displayed related to the sensor; Out of Range, Wrong type, Removed, Calibration due, Voltage Error “Voltage Error” refers to the supply voltage. In this case the product will not go into normal operation until the supply voltage is within the specified range.

4.2
Alarm Status

Display of the currently pending alarms in plain text in the order of their arrival. Only those measuring points are displayed, where at least one alarm is active.

Alarms in latching mode (latching mode is only valid for certain DGS types, DGS-PE) can be acknowledged in this menu (only possible if the alarm isn’t active).

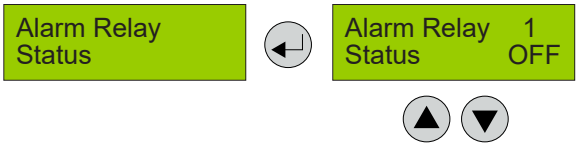
Symbol	Description	Function
DP 1	Measuring Point No.	1 = Relays 1 = Warning relay 2 = Buzzer 3 = Relay 3 = Critical relay
‘A1 “A1	Alarm status	‘A1 = Alarm 1 active “A1 = Alarm 1 in latching mode, can be acknowledged

4.3
Relay Status

Reading of the current status of alarm relays.

The actual relay status is displayed, depending on the relay mode (energized <> de-energized).

Selection of the alarm relay 1 – X



Selection of the next alarm relay

Symbol	Description	Function
1	Alarm Relay	Alarm relay = 1 - X
OFF	Relay Status	Relay OFF = coil de-energised
ON	Relay Status	Relay ON = coil energised

Note:
Relay 3 is Normally Closed with a fail-safe function at power loss, i.e. in normal operation without any errors or alarms, the coil is energised (Relay ON)

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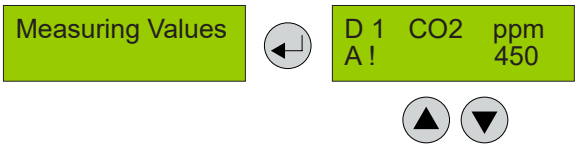
4.4
Menu Measuring Values

In this menu, the display shows the measuring value with gas type and unit.



Selection of the next measuring point

Symbol	Description	Function
D1	Actual Modbus address	D1: Modbus address = 1
CO2	Gas type	Display of gas type (must comply with gas type of sensor head)
ppm	Gas unit	Unit
51.0 C	Measured value	Current measured value (current value) of the gas concentration
A!	Alarm indication	At least one alarm has been released at this Measuring Point
#	Maint. info	Sensor head: maintenance due (maintenance date exceeded)
?	ConfigError	Gas type or meas. range doesn't agree with sensor head.
Comm. err.	Fault Measuring Point	Communication error, sensor head <> I/O board
Underrange Overrange	Meas. range monitoring	Meas. signal < admissible range (< zero point – 6 %) Meas. signal > admissible range (> full scale value + 6 %)
Locked	Measuring Point locked	Measuring Point was temporarily locked by the operator.
Warm-up	Warm-up time	Warm-up time of the sensor active

4.5
Display Parameters

In the menu Display Parameters you can find the general parameters of the display.

4.5.1
Software Version

Software version of the handheld Service Tool and of DGS.

Symbol	Description	Function
XXXXX	Software Version of the Service Tool	XXXXX Software Version
YYYYY	Software Version of the DGS	YYYYY Software Version

4.5.2
Language

Language
English

Selection of the menu language (password protected)

Symbol	Description	Default	Function
English	Language	English	English USA English German French Spanish

4.5.3
LCD Function Check

Function for testing the LCD function (password protected) All LEDs light up for about two seconds. The backlight is yellow. (Green and red are activated at the same time). All points are displayed on the LCD

LCD Function
check ?

4.6
Measuring Point Parameters

Reading and changing of the parameters for each measuring point.

Selection of measuring point (1 – X)

MP Parameters

MP 1
Active

4.6.1
Alarm limits

For each measuring point two alarm thresholds are available for free definition. If the gas concentration is higher than the set alarm threshold, the associated alarm is activated. If the gas concentration falls below the alarm threshold inclusive hysteresis the alarm is reset again.

The hysteresis of both alarm is 5% of the default alarm threshold (e.g. with 5000pmm this corresponds to 250ppm)

Warning limit
C 5000 ppm

Critical limit
C 5000 ppm

4.6.2
Alarm delay

For setting the alarm delay for Critical and Warning alarms

Delay Alarm ON
0 s

Symbol	Description	Default	Function
0 sec.	Delay Alarm	0 sec	Gas concentration > alarm threshold + set time = Alarm ON Gas concentration < alarm threshold – hysteresis = Alarm OFF

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4.7
Menu System Parameters

System Parameters

4.7.1
AO Function

The configuration of the analog outputs.
The analog output checks the current signal for validity. Signal deviations of more than 5% from the nominal value will entail an error message (causes: short circuit or interruption of cable, actuator not connected).

If more than one measuring points is present, the maximum value of the two measurement is assigned to the output.

Using this function, it is possible to configure the output signal.
The CO2 sensor with a range of 0-20.000ppm has an output signal of 0-10V corresponding to 0-10.000ppm as default
In example this may be changed to say 2-10V for 0-20.000ppm by changing settings to "100%" and "2V".

AO Function

Analog Output 1
50 % -- min=0V.

Symbol	Description	Default	Function
Analog Output 1	Selection of channel		Selection of the analog output 1 - X
50% 100 %	Selection of input range for maximum output signal	50 %	50% = at a concentration of 50% of the measuring point range the output will be set to 10V (20mA without JP5 mounted) 100% = at a concentration of 100% of the measuring point range the output will be set to 10V (20mA without JP5 mounted)
- -	DANFOSS ONLY SETTING	--	Do not change – If doing so a small "noise signal" (step form) on top of the measured ppm-value with a duty-cycle of app. 180s is activated.
0V 2V	Selection of minimum output signal	0 V.	0V = at the minimum measuring signal of the sensor, the output will be set to 0V (0mA without JP5 mounted) 2V = at the minimum measuring signal of the sensor, the output will be set to 2V (4mA without JP5 mounted)

4.8
Operating Data

This menu is for retrieving relevant operational data of the sensor head.
No changes or modifications are possible.

Operating Data

Operating Data
SC

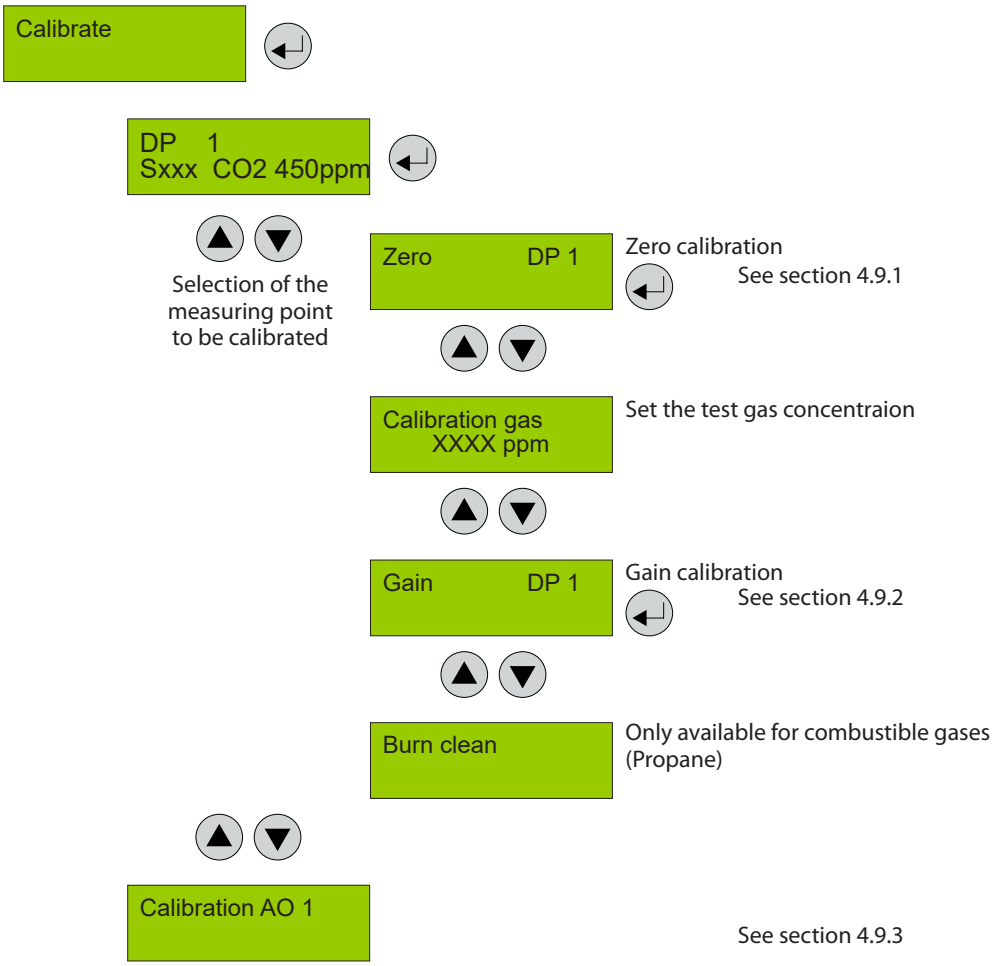
If more than one sensor head is connected to the DGS, the selection is done at X.

Operating Data
SC X

Software version XXXX	Software version of the measuring point
Days of Operation X Days	Current days of operation
Operating days expected XXX	Expected lifetime (in days) of a new measuring point
Min. Temperature 25 °C	Display of the lowest temperature detected at the device
Max. Temperature 25 °C	Display of the highest temperature detected at the device
Number of Calib. X	How many times the measuring point has been calibrated
Sensivity XXX%	Remaining sensitivity of the sensor. Must be replaced when at 35%
Operating Days last XXX	Days of operation when the last calibration happened
Maintenance Days remaining XXXX	Days until the next calibration is due

4.9
Calibration

This section gives an overview of the calibration menu.
The calibration description can be found on the following pages.
For HFC, remember to use the specified calibration gas.
(HFC grp1 = R1234yf, grp.2 = R134a, grp.3 = R407c)



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4.9.1
Zero Calibration

The stepwise calibration process is described below.
Note: The specified warm-up times etc. must be strictly observed before starting the calibration process.

```
Zero        DP 1
```

```
Zero        DP 1
      100 ppm
```

Step 1: Display of the current value

Apply test gas according to instructions.

Start calibration process.

```
Zero        DP 1
_     90 ppm
```

Step 2: Calculation of the new zero point
During calculation an underscore in line 2 runs from left to right and the current value drops to zero.

When the current value is stable, press for finishing the calculation of the new value.

```
Zero        DP 1
      SAVE
```

Step 3: Save the newly calculated zero point
„SAVE“ is displayed, as long as the function is executed.

```
Zero        DP 1
      0 ppm
```

After the value has been successfully stored, a square appears on the right for a short time = Zero point calibration is finished and new zero offset has been stored with success.

```
Zero        DP 1
      0 ppm
```

The display automatically goes to step 1: Display of new zero point.

During the calculation phase, the following messages may occur:

Message	Description
Current value too high	Wrong gas for zero point calibration
Current value unstable	Appears when the sensor signal does not reach the zero point within the target time. Disappears automatically when the sensor signal is stable.
Time too short	The message “value unstable” starts an internal timer. Once the timer has run out and the current value is still unstable, the text is displayed. The process starts over again. If the value is stable, the current value is displayed and the calibration procedure is continued. If the cycle is repeated several times, an internal error has occurred. Stop the calibration process and replace the sensor head.

If aborting the zero-offset calibration, the offset value there will not be updated. The sensor head continues to use the “old” zero offset. A full calibration routine must be conducted to save any calibration change.

4.9.2
Gain Calibration

The stepwise calibration process is described below.
Note: The specified warm-up times etc. must be strictly observed before starting the calibration process.

```
Test Gas
      XX.X ppm
```

Enter concentration of the test gas used.
This value isn't cleared when exiting the menu, therefore before calibrating always check the value if correct.

```
Gain          DP 1
```

```
Gain          DP 1
100 ppm       100%
```

Step 1: Display of the current value and of the sensitivity from the last calibration

Apply test gas according to instructions.

Start calibration process.

```
Gain          DP 1
_90 ppm
```

Step 2: Calculation of the new gain
During calculation an underscore in line 2 runs from left to right and the current value converges to the set test gas concentration. The sesitivity is recalucated, too.

When the current value is stable, press for finishing the calculation of the new value.

```
Gain          DP 1
      SAVE
```

Step 3: Save the newly calculated gain
‚SAVE' is displayed as long as the function is executed.

```
Gain          DP 1
 0.0 ppm       □
```

After the value has been successfully stored, a square appears on the right for a short time.= Gain calibration is finished and new gain offset has been stored with success.

```
Gain          DP 1
0.0 ppm
```

The display automatically goes to step 1: Display

During the calculation phase, the following messages may occur:

Message	Description
Current value too high	Test gas concentration > than set value Internal error → Replace sensor head
Current value too low	No test gas or wrong test gas applied to the sensor
Test gas too high Test gas too low	The set test gas concentration must be between 30% and 90% of the measuring range.
Current value unstable	Appears when the sensor signal does not reach the calibration point within the target time. Disappears automatically when the sensor signal is stable.
Time too short	The message "value unstable" starts an internal timer. Once the timer has run out and the current value is still unstable, the text is displayed. The process starts over again. If the value is stable, the current value is displayed and the calibration procedure is continued. If the cycle is repeated several times, an internal error has occurred. Stop the calibration process and replace the sensor head.
Sensitivity <	Sensitivity of the sensor head < 30 %, calibration no longer possible → Replace sensor head.
Internal error	Internal , unrecoverable error → Replace sensor head.

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4.9.3
Zero-point Calibration of Analog Output

With this menu item you can adjust the zero-point of the analog output (4mA). The zero-point correction is only possible when the minimum output is 2V or 4mA, i.e. not possible when minimum output is 0V or 0mA".

The error message of the output monitoring is suppressed as long as the menu Calibration AO is open. Therefore, connect the amperemeter (measuring range 20 mA DC) to the analog output only after having opened the menu.

```
Calibration   AO 1
```

Connect amperemeter to the analog output.

```
Calibration      AO 1
320                0
```

Display of the current zero offset on the left.

```
Calibration      AO 1
320              323
```

Adjust the zero offset on the right by changing the offset value slowly, until the amperemeter shows the desired value.

```
Calibration      AO 1
        SAVE
```

Save the adjusted zero offset.

```
Calibration      AO 1
323              323
```

Return to the display of the current zero offset.

4.10
Addressing

```
Addressing
```

Assignment of the modbus address of the device for system integration, e.g. with Danfoss front end type AK-SM 800

```
Set Address
        4
```

Define the modbus address

Symbol	Description	Default	Function
4	modbus Address	0	0 = Device is not addressed, bus not used. Max value is 96

5
Modbus menu survey

Function	Min	Max	Factory	Unit	AKM name
Gas level					
Sensor 1 Actual gas level in % of range	0.0	100.0	-	%	Gas level %
Sensor 1 Actual gas level in ppm	0	FS[2]	-	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[2]	-	ppm	2: Gas level ppm
Alarms					**Alarm settings**
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[2]	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[2]	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 rest 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 [1]
Relay reset enable: Relay reset with alarm acknowledge function 1: (default) Relays wil be reset if the alarm acknowledge function is activated 0: Relays remains active until the alarm condition clears	0	1	1	-	Relay rst enable [1]
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[2]	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[2]	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
Service					
Status of the sensors warm up period 0: Ready 1: Warming Up 1 or more sensors	0	1	0	-	DGS Warm-up

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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.sensivity
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.sensivity
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
Alarms					
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

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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

[1] "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.
[2] The max alarm limit for CO_2 is 16.000ppm / 80% of full scale. All other values equal the fullscale range of specific product

6 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.

6.1 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.

6.2 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, CO2 and Propane.

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

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Ordering

DGS Sensors		
Product Description	**Code no.**	
DGS-SC HFC gr. 1*	080Z2803	
DGS-SC HFC gr. 2*	080Z2804	
DGS-SC HFC gr. 3*	080Z2805	
DGS-PE Propane	080Z2806	
DGS-IR-CO2	080Z2800	
DGS-IR-CO2 5 m	080Z2801	
DGS-IR 2 * CO2 - 5 m	080Z2802	
DGS-SC HFC gr.1* + B&L	080Z2809	
DGS-SC HFC gr.2* + B&L	080Z2810	
DGS-SC HFC gr.3* + B&L	080Z2811	
DGS-PE Propane + B&L	080Z2812	
DGS-IR CO2 + B&L	080Z2807	
DGS-IR-CO2 5 m + B&L	080Z2808	

Spares and accessories			
Product Description		**Code no.**	
Spare sensor HFC gr.1*	Spare	080Z2815	
Spare sensor HFC gr.2*	Spare	080Z2816	
Spare sensor HFC gr.3*	Spare	080Z2817	
Spare sensor Propane	Spare	080Z2818	
Spare sensor CO2	Spare	080Z2813	
Spare sensor CO2 - 5 m	Spare	080Z2814	
Hand Held Service Tool	Accessory	080Z2820	
Strobe & Horn	Accessory	080Z2819	
Splash guard	Accessory	148H6226	
Duct set	Accessory	148H6236	
Calibraton adaptor for SC2	Accessory	148H6232	
Remote kit	Accessory	148H6238	
Power Supply AK-PS075	Accessory	080Z0053	

*HFC gr.1:: R1234ze, R454c, R1234yf, R454a, R452A, R454b, R513a
HFC gr.2: R407F, R416a, R417a, R407A, R422a, R427a, R449A, R437a, R134A, R438a, R422D
HFC gr.3: R448A, R125, R404A, R32, R507A, R434a, R410A, R452b, R407C, R143b

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