

User Guide

Danfoss Gas Detection Units

Type Basic, Premium and Heavy Duty
Direct display or Service Tool display operation



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1 Intended use The display of the Premium and Heavy Duty detection units and the display of the Service Tool is used as interface for operation, commissioning and calibration of the Basic, Premium and Heavy Duty gas detection units.

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

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







Heavy Duty software contain all menu items except for 4.1.1 Error Memory.

3 Operation The complete configuration and service is made via operating keys in combination with the LC display screen.

Security is provided via four password levels against unauthorized intervention.

<p>Premium GD Unit/ Service Tool: Operation is done via 6 buttons.</p>	<p>Heavy Duty: The display is located behind a glass panel and is operated from the outside by a light touch of the control symbols using the magnetic pen.</p>
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3.1
Function of the keys and LEDs
on the keypad








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

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 a code level is cancelled if no button is pushed within 15 minutes.

The code levels are classified in order of priority: Priority 1 has top priority.

Priority 1: (code 5468, not changeable)

Code level priority 1 is intended for the service technician or the installer to change parameters and set-points. This password allows working on all settings. For opening the parameter menus you must first activate the service mode after code release.

Priority 2: (code 4009, not changeable)

With code level 2, it is possible to lock / unlock sensors temporarily. This password is only given to the end user by the installer in problem situations. In order to lock / unlock the sensors you must first activate the service mode after code release.

Priority 3: (code 4321, is settable in the maintenance information menu)

It is only intended to use the test functions of the alarm relays and analog outputs. Normally the code is only known by the service technician who has last changed it since it can be changed individually via priority 1.

- Manual test function of the alarm relays (functional test of the connected units),
- Manual test function of the analog outputs (functional test of the connected units).

Priority 4: (password 1234) (code not changeable)

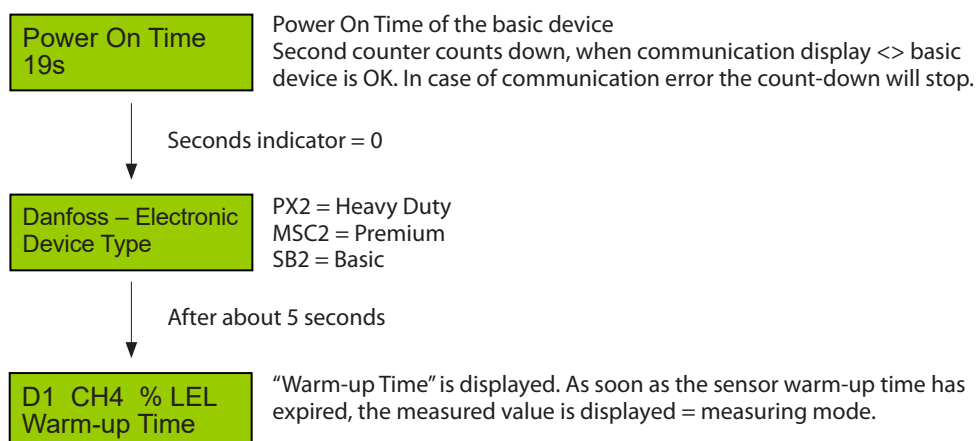
Code level priority 4 allows the operator after activation of the operation mode "Service Mode":

- to read all parameters.

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 MP 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
- Submenu 1 to 3



4
Menu Overview
 (Continued)

Starting menu

Main menu

Chapter #

<p>Error Status</p> <p>▲ ▼</p>		<p>Reading and acknowledgement of errors See chapter 4.1</p>
<p>Alarm Status</p> <p>▲ ▼</p>		<p>Display of the status of active alarms See chapter 4.2</p>
<p>Relay Status</p> <p>▲ ▼</p>		<p>Display of the relay status See chapter 4.3</p>
<p>Measuring Values</p> <p>▲ ▼</p>		<p>Display of measuring values See chapter 4.4</p>
<p>Maintenance Information</p> <p>▲ ▼</p>		<p>Maintenance information about connected devices See chapter 4.5</p>
<p>Display Parameters</p> <p>▲ ▼</p>		<p>General display parameters without safety relations See chapter 4.6</p>
<p>Installation & Calibration</p>		<p>Reading and change of the relay, measuring point and system parameters as well as test and calibration functions</p>

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!!



Relay Parameters

See chapter 4.7



MP Parameters

See chapter 4.8



System Parameters

See chapter 4.9



Operating Data

See chapter 4.10



Relay
Test Function

See chapter 4.11



Analog Output
Test Function

See chapter 4.12



Calibration

See chapter 4.13



Addressing

See chapter 4.14

4.1
Fault Management

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“.

Additionally a record of the faults occurs in the “Error memory”, which can only be read and reset by the service technician (code level 1).

4.1.1
Error Memory

The menu „Error Memory“ in the main menu “Error Status” can only be opened via the code level priority 1.

Attention:
This memory should always be read during maintenance, relevant faults should be tracked and entered in the service logbook, and finally the memory should be emptied.

In the error memory, the first 99 faults that have occurred and have already been acknowledged in the menu “Error Status” are listed for the service technician in a power failure safe way.

4.1.2
System Messages and System Errors

“DP 0X Sensor Element” (0x8001) Sensor element at the sensor head – diagnostic function reports an error.

Cause: Sensor pins broken, mechanical or electrical damage.

Solution: Exchange sensor head.

“DP 0X ADC Error” (0x8002) Monitoring of the amplifier and AD converter circuits at the input device reports an error.

Cause: Mechanical or electrical damage of the amplifiers.

Solution: Replace device.

“DP 0X Voltage” (0x8004) Monitoring of the sensor and/or process power supply, device reports an error.

Cause: Mechanical or electrical damage of the power supply.

Solution: Measure tension if too low, replace device.

“DP 0X CPU Error” (0x8008) Monitoring of the processor function – reports an error.

Cause: Mechanical or electrical damage of the processor

Solution: Replace device.

“DP 0X EE Error” (0x8010) Monitoring of the data storage – reports an error.

Cause: Electrical damage of the memory or configuration error

Solution: Check configuration, replace device.

“DP 0X I/O Error” (0x8020) Power ON or monitoring of the in/outputs of the processor - reports an error.

Cause: During restart, electrical damage of the processor or of circuit elements. Analog Output not connected properly.

Solution: Wait until Power On is over, Check Analog Output connection, replace device.

“DP 0X Overtemp.” (0x8040) Ambient temperature outside of temperature range; the sensor outputs the measurement value for a determined period and switches to error state after 24 hr.

Cause: Too high/low ambient temperature

Solution: Protect the device from direct sunlight or check climatic conditions.

“DP 0X Overrange” (0x8200) Signal of sensor element at the sensor head is out of range.

Cause: Sensor not calibrated correctly (e.g. wrong calibration gas), defective

Solution: Recalibrate sensor, replace it.

“DP 0X Underrange” (0x8100) Signal of sensor element at the sensor head is out of range.

Cause: Wire break at sensor element input, sensor drift too high, defective.

Solution: Recalibrate sensor, replace it.

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.

DP 1
Acknowledged?

Alarms in latching mode can be acknowledged in this menu (only possible if the alarm isn't active).



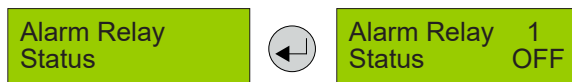
Symbol	Description	Function
DP 1	Measuring Point No.	Digital measuring point X = 1 - X, where an alarm is pending
'A1 "A1	Alarm status	'A1 = Alarm 1 active "A1 = Alarm 1 in latching mode, can be acknowledged

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
ON	Relay Status	Relay ON

4.4
Menu Measuring Values

In this menu, the display shows the measuring value with gas type and unit. If the alarm evaluation is defined via the average, the display additionally shows the average value (A) to the left of the current value (C).



Selection of the next measuring point

Symbol	Description	Function
DP 1	Meas. Point No.	Digital measuring point 1 = 1 - X
CH4	Gas type	Display of gas type (must comply with gas type of sensor head)
% LEL	Gas unit	Unit
51.0 C 48.0 A	Measured value	Current measured value (current value) of the gas concentration Arithmetic average of the gas concentration (only if average is active)
A!	Alarm indication	At least one alarm has been released at this MP.
#	Maint. info	Sensor head: maintenance due (maintenance date exceeded)
?	ConfigError	Gas type or meas. range doesn't agree with sensor head.
Comm. err.	Fault MP	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	MP locked	MP was temporarily locked by the operator.
Warm-up	Warm-up time	Warm-up time of the sensor active

4.5
Maintenance Information

Definition of an individual service password in the display for the execution of test functions: Changes are only possible if the code level 1 is released.



4.6
Display Parameters

In the menu Display Parameters you can find the general, security irrelevant parameters of the display. These parameters can be changed in operating mode.



4.6.1
Software Version

Software Version
XXXXX - YYYYY



Software version of the display and of the basic board (factory set).

Symbol	Description	Function
XXXXX	Software Version of the displays	XXXXX Software Version
YYYYY	Software Version of the basic board	YYYYY Software Version

4.6.2
Language

Language
English



Selection of the menu language (code level 4)

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

4.6.3
Service Phone Number

Service TEL:



The service phone no. can be individually defined.

Symbol	Description	Default	Function
0853...	Phone No.		Definition of the individual service phone no.

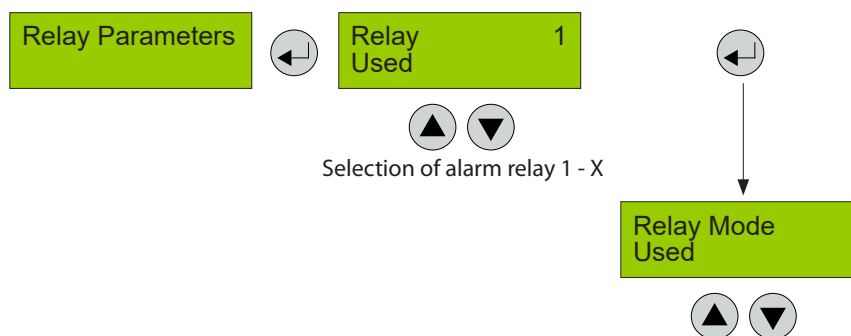
4.6.4
Error Time Delay

Error Time Delay
120s

Symbol	Description	Default	Function
s	Delay	120s	Definition of a delay time after a communication error Display <> Basic Board has occurred (only fault indication on the display, no effect on the function or outputs)

4.7
Menu Relay Parameters

Reading and changing of the parameters separately for each relay. Changes only possible via code level priority 1.

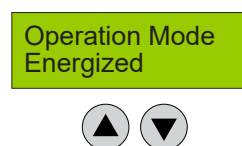


4.7.1
Relay Mode

Symbol	Description	Default	Function
Used	Mode	Used	Used = Relay is registered and can be assigned to an alarm Not Used = Relay is not registered

4.7.2
Relay Operation Mode

The terms energized / de-energized come from the terms energized / de-energized to trip principle (open-circuit / closed circuit principle) used for safety circuits. The terms refer to the activation of the relay coil, not to the relay contacts (as they are executed as a changeover contact and available in both principles).



The LEDs at the modules show the state in analogy. (LED off -> relay coil current-free).

Symbol	Description	Default	Function
De-energ.	Mode	De-energ.	De-energ. = Alarm OFF = Relay (and LED) current-free Alarm ON = Relay (and LED) energized
Energ.			Energ. = Alarm OFF = Relay (and LED) permanently energized Alarm ON = Relay (and LED) current-free

4.7.3
Relay Function Static / Flashing

The function "Flashing" offers a connection option for warning devices to improve visibility. The frequency is about 1 second with an impulse / pause rate of 1:1.



If "Flashing" is set, the output circuit mustn't be used as a safe output any more.

The combination of relay mode energized with flashing operation makes no sense and is therefore suppressed.

Symbol	Description	Default	Function
No	Function	No	Yes = Relay function flashing when alarm No = Relay function static when alarm

4.7.4
Signal Source

The signal source determines whether the relay is triggered by an alarm in the I/O board (local) or from the central (remote).



Symbol	Description	Default	Function
Local	Signal Source	Local	Local = The relay activation is based on local settings and alarms. Remote = The relay is activated by the central unit.

4.7.5
Alarm Trigger Quantity

In some applications it is necessary that the relay switches only at the nth alarm. Here you can set the number of active alarms necessary for relay tripping. For security applications, the relay must always switch on the 1st alarm.



Symbol	Description	Default	Function
1	No. of Alarms	1	1 = Number of pending alarms for triggering the alarm relay

4.7.6
Horn Function

The horn function of the alarm relay is activated if at least one of the two parameters (time or assignment to digital input) is set. The horn function retains its functionality even for alarms in latching mode.



This feature is not allowed for safety-related alarm messages because the output is resettable.

Symbol	Description	Default	Function
Recurrence	Mode	No	No = Automatic reset of the relay after time has expired. Yes = Recurrence function
Time		120	Enter time for automatic reset function or recurrence function in s 0 = No reset function
DI		0	0 - X = Assignment, which digital input resets the relay

Horn function resettable:

The activated horn can be permanently reset with this function.

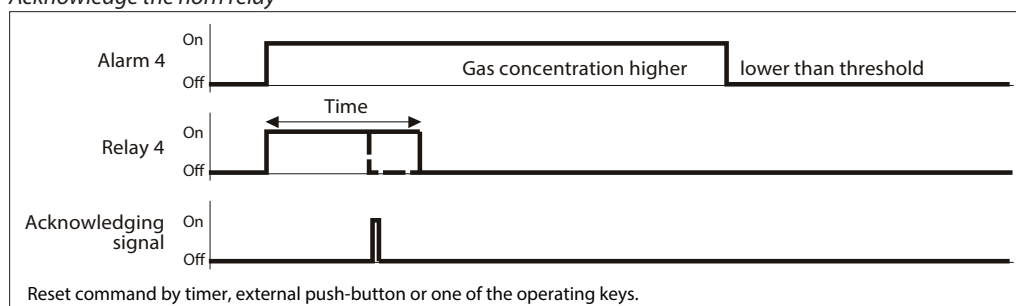
The following possibilities to acknowledge are available for the alarm relay as horn relay:

- By pressing the left button (ESC). Only available in starting menu.
- Automatic reset at the end of the preset time (active, if value > 0).
- By an external pushbutton (assignment of the appropriate digital input DI: 1-n).

Due to fixed polling cycles, external buttons must be pressed for a few seconds before the reaction occurs.

After successful acknowledgment the horn remains permanently reset until all assigned alarms for this relay function are inactive again. Only then it is triggered a new in case of an alarm.

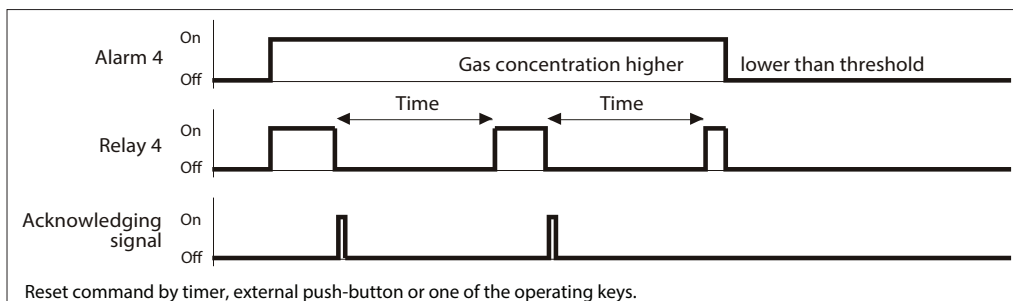
Acknowledge the horn relay



4.7.6
Horn Function
(Continued)

Recurrence of the horn relay
After an alarm has been triggered, the horn will remain active until a reset action is done. After acknowledgment of the horn relay/s (clicking a button or via external input) a timer starts. When this time has run out and the alarm is still active, the relay is set again.

This process is repeated endlessly as long as the associated alarm remains active.



4.7.7
External Override

This menu (function) is not available for Heavy Duty device series.

External function
↗ DI 0 ↘ DI 0



Symbol	Description	Default	Function
↗ DI 0	External ON	0	As long as DI 1-X is closed, relay switches ON
↘ DI 0	External OFF	0	As long as DI 1- X is closed, relay switches OFF.

Manual operation of the alarm relays via DI does not start the “special mode”, as this is a deliberate and configured functionality. The use of the override should be used with caution, particularly the function of setting “External OFF”.

If External ON and External OFF are configured simultaneously to the same relay and both are active at the same time, so in this state, only the External OFF command is executed. In this mode, too, the relays work respecting the parameter settings “Static / Flashing” and “Energized / De-energized”.

Assignment of a digital input (DI) for the external switching on and off of the alarm relay. This function has priority to gas alarm.

4.7.8
Delay Mode of Alarm Relay

Definition of the time for switch-on and switch-off delay of the alarm relays. The menu (function) of switch-on delay is not available for Heavy Duty device series.

On Delay Time
0 s



Off Delay Time
0 s



Symbol	Description	Default	Function
0 sec.	Switch-ON Delay Time	0	Alarm relay is only activated at the end of the defined time. 0 = No delay
0 sec.	Switch-OFF Delay Time	0	Alarm relay is only deactivated at the end of the defined time. 0 = No delay

4.7.9
Assignment to Fault

In case of a device fault the alarm relay is triggered in addition.

Exceptions are all errors of the measurement point because the MPs can be assigned to each alarm separately in the menu MP Parameters.

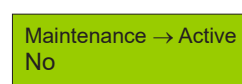
This relay output must not be used as a Safe Error Output.



Symbol	Description	Default	Function
No	No assignment	No	Alarm relay is not activated in case of a device fault.
Yes	Assignment to fault	Yes	Alarm relay is activated in case of a device fault.

4.7.10
Assignment to Maintenance Message

In case of a pending maintenance the alarm relay is triggered in addition.



Symbol	Description	Default	Function
No	No assignment	No	Alarm relay is not activated in case of a maintenance message.
Yes	Assignment to fault	Yes	Alarm relay is activated in case of a maintenance message.

4.8
MP Parameters

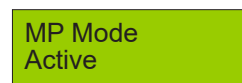
Reading and changing (only via code level 1) of the parameters for each measuring point.

Selection of measuring point (1 – X)



4.8.1
Activate – Deactivate MP

The physically present sensor head is registered at the basic device for its evaluation. After activation the measured gas signal is evaluated and the sensor head specifications are monitored. Existing alarms and faults are cleared with deactivation of the sensor.



Attention: Deactivation of a sensor head does not cause a fault message.

Symbol	Description	Default	Function
Active	MP Mode	Not active	Active = Measuring point activated in the controller. Not active = Measuring point not activated in the controller.

4.8.2
Lock MP

This menu (function) is not available for Heavy Duty device series.

In the temporary Lock Mode, the function of the registered sensors is put out of service, which means that there is no alarm or fault message at this measuring point. Existing alarms and faults are cleared with the locking. The message "Locked" appears in the menu Measuring Values.

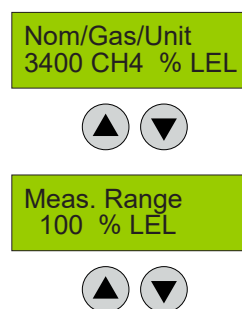


When the sensor is unlocked, the controller starts the measuring operation again.

Symbol	Description	Default	Function
Unlocked	Lock mode	Unlocked	Unlocked = MP free, normal measuring operation Locked = MP locked, special mode

4.8.3
Selection of Gas Type and Measuring Range

The gas type to be monitored and the range are set in the two menus. The basic unit continuously checks the set gas type and the measuring range if they match with the gas type and the measuring range of the connected digital sensor head. If they don't match, an error messages is output.



Symbol	Description	Default	Function
E1125-A	Internal type	----	Selection of gas type from internal list (must correspond with the sensor head)
NH ₃	Formula of gas type	----	Formula (gas type) is firmly assigned to the type
ppm	Unit of gas type	----	Unit is definitely assigned to the type
100	Measuring range	----	Set measuring range (must correspond with the sensor head)

Select the internal type; then the type of gas and the associated unit will appear on the right next to it.

It should be noted that for some gases there are various sensor technologies and units, therefore the associated sensor head types are listed in the table column.

The presentation of measured values, alarm thresholds and hysteresis depends on the measuring range. If the measuring range is <10, there are three, if <100, two, if <1000, there is one decimal place. If => 1000, the display is without decimal place. The resolution and accuracy of the calculation is not affected by the different measuring ranges.

Sensor	Internal type	Measuring range	Unit
Basic and Premium			
Ammonia EC 100	E1125-A	0-100	ppm
Ammonia EC 300	E1125-B	0-300	ppm
Ammonia EC 1000	E1125-D	0-1000	ppm
Ammonia SC 1000	S2125-C	0-1000	ppm
Ammonia EC 5000	E1125-E	0-5000	ppm
Ammonia SC 10000	S2125-F	0-10000	ppm
Ammonia P LEL	P3408-A	0-100	% LEL
CO2 IR 20000	I1164-C	0-2	% Vol
CO2 IR 50000	I1164-B	0-5	% Vol
HCFC R123 SC 2000	S2064-01-A	0-2000	ppm
HFC R404A, R507 SC 2000	S2080	0-2000	ppm
HFC R134a SC 2000	S2077	0-2000	ppm
HC R290 / Propane P 5000	P3480-A	0-5000	ppm
Premium remote			
Ammonia EC 100	E1125-A	0-100	ppm
Ammonia EC 1000	E1125-D	0-1000	ppm
Ammonia EC 5000	E1125-E	0-5000	ppm
Ammonia SC 10000	S2125-F	0-10000	ppm
Heavy Duty			
Ammonia EC 1000	E1125-D	0-1000	ppm
Ammonia EC 5000	E1125-E	0-5000	ppm
Ammonia SC 10000	S2125-F	0-10000	ppm
Ammonia P LEL	P3408-A	0-100	% LEL

4.8.4
Alarm Thresholds / Hysteresis

For each measuring point four 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. In the mode "Alarm at falling" the corresponding alarm is set in case of falling below the set alarm threshold and reset again when exceeding the threshold plus hysteresis.

The presentation of the alarm thresholds depends on the set measuring range: see chapter Gas Type and Measuring Range.

Unused alarm thresholds have to be defined with 0, in order to avoid undesired alarms. Higher-level alarms automatically activate the lower-level alarms.

Lowest hysteresis: 12% of the lowest alarm threshold

Highest hysteresis: 50% of the lowest alarm threshold

Symbol	Description	Default	Function
C	Evaluation	C	C = Alarm evaluation with current value of MP A = Alarm evaluation with average value of MP
10 % LEL	Threshold 1 Threshold 2 Threshold 3 Threshold 4 Hysteresis	XX XX XX XX XX	Gas concentration > Threshold 1 = Alarm 1 Gas concentration > Threshold 2 = Alarm 2 Gas concentration > Threshold 3 = Alarm 3 Gas concentration > Threshold 4 = Alarm 4 Gas concentration < (Threshold X - Hysteresis) = Alarm X OFF
↗		↗	↗ = Alarm release at increasing concentrations ↘ = Alarm release at falling concentrations

4.8.5
Delay for Alarm ON and/or OFF

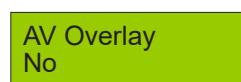
Menu (function) Delay for Alarm ON not available for Heavy Duty series.

Function only active in Current Value Mode.

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

4.8.6
Average Overlay

Menu (function) average overlay not available for Heavy Duty device series.

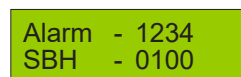


The alarm evaluation of the operation mode "Average" is overridden by the current value, if this one exceeds the alarm threshold and delay time defined in the menu "System Parameters AV Overlay". The overlay is delayed by the time factor entered in the local menu. The function of the average overlay is only activated for the gas type CO.

Symbol	Description	Default	Function
No	Overlay of alarm release by current value	No	No = Average overlay not active. Yes = Average overlay active

4.8.7
Latching Mode Assigned to Alarm

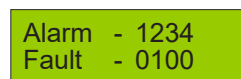
In this menu you can assign the latching mode to each alarm.



Symbol	Description	Default	Function
Alarm			Presentation of the alarms 1 to 4; under each alarm you can activate the latching with 1.
SBH	Assignment of latching function yes/no	0 0 0 0	0 = no latching; alarm resets automatically if gas concentration again < alarm threshold 1 = latching; alarm remains active, if gas concentration < alarm threshold and must be reset by the operator

4.8.8
MP Fault Assigned to Alarm

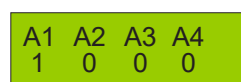
In this menu you can define, which alarms should be activated by a fault at the measuring point. If the fault is remedied, the alarm is automatically reset.



Symbol	Description	Default	Function
Alarm			Presentation of the alarms 1 to 4; you can define with 1 for each alarm that the alarm should be activated in case of MP fault.
Fault	Assignment of MP fault to alarm	0 0 0 0	0 = Alarm isn't activated in case of MP fault. 1 = Alarm is activated in case of MP fault.

4.8.9
Alarm Assigned to Alarm Relay

Each of the four alarms can be assigned to any alarm relay 1 – X registered in the menu Relay Parameters by entering the relay address right under the alarm. One alarm relay can be assigned to multiple alarms. Unused alarms are not assigned.



The number of physically present alarm relays depends on the device type. For Heavy Duty devices there is only one alarm relay (address 1).

The fault relay can also be used for alarm message (address 2). The fault message function, however, remains unaffected.

Symbol	Description	Default	Function
Alarm	A1 A2 A3 A4		Presentation of the alarms 1 to 4; you can assign an alarm relay to each alarm by setting a relay address.
	Assignment of alarm relay	A1 = X A2 = X A3 = X A4 = X	X = Assignment of an alarm relay (relay address) to an alarm

4.8.10
MP Assigned to Analog Output

The measuring signal can be assigned to an analog output by entering the address of the analog output instead of x.



The analog output are configured in the menu System Parameters, AO Function.

Symbol	Description	Default	Function
x	Address AO		X = Assignment of an analog output by entering the AO address

If the value is 0, then no analog output is assigned and the AO is deactivated.

4.9
Menu System Parameters



Selection of the device, the sensor head or the basic device whose data should be processed.

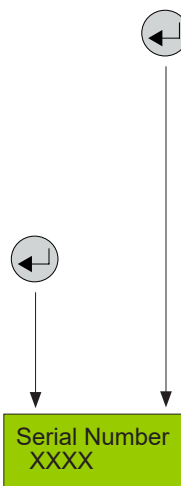
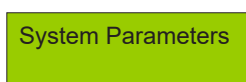
- SB2 - Basic
- MSC - Premium
- PX2 - Heavy Duty

- SC - Sensor head basic and premium
- SX1 - Sensor head Heavy duty

The display automatically recognized the connected basic unit.



If more than one SC are connected to the basic unit, the selection is done at X.



4.9.1
System Information

Symbol	Description	Default	Function
XXXX	Serial Number		Serial number (factory set)
XX.XX.XX	Date of Production		Date of production (factory set)

4.9.2
Maintenance Interval

Input of the maintenance interval in days
The maintenance interval can be entered individually in the basic unit and in each sensor head. Therefore the complete unit can have multiple maintenance messages.

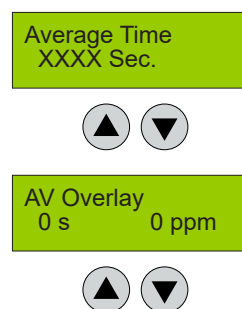


Symbol	Description	Default	Function
XXXX	Days	365	Maintenance interval

4.9.3
Average Function

Menu (function) not available for Heavy Duty devices.

In the menu "Average Time" you can define the time base for the calculation of the arithmetic average value (30 measurements within the time base). This average value can be used for alarm evaluation as an alternative to the current value. The selection which value should be used for evaluation is defined separately for each alarm in the menu "Alarm Threshold X". In the average mode, the average value is indicated in the menu "Measuring Values" next to the current value.



Symbol	Description	Default	Function
XXXX	Seconds	900	Time base for average calculation
0 s	Seconds	120	Delay time in case of overlay by the current value
0 ppm	Alarm Threshold	100	Alarm threshold that triggers the overlay by the current value

The alarm evaluation of the operating mode "Average Value" is superimposed by the current value, when the current value exceeds the alarm threshold defined in the menu "AV-Overlay". The overlay is delayed by the time factor defined in this menu. The average overlay function is only available for the gas type CO.

Both menus are available and operable in the basic device. The menu "Average Time" is also available in the sensor head for reading the time base.

4.9.4
Power On Time

Gas sensors need a running-in period, until the chemical process of the sensor reaches stable conditions. During this running-in period the sensor signal can lead to an unwanted triggering of a pseudo alarm. Therefore the Power On time is started at each basic unit and each sensor head after power-on or voltage recovery. While this time is running out, the device is in special mode and doesn't activate alarms.



The Power On time appears in the starting menu. During this phase the sensor head transmits "Warm-up time" instead of the measured value.

Symbol	Description	Default	Function
XX	Seconds	30	Power On time

The Power On Time of the individual components may be different. Only when the longest time has expired, the system starts the measuring operation.

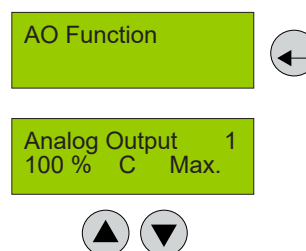
4.9.5
AO Function

This menu is for the configuration of the analog outputs.

After registration each analog output checks the current signal for plausibility. 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).

The analog output can be activated by the local device as well as by a higher-level controller. The steepness of the current signal can be adjusted in the range of 10 to 100% in case of local control.

If a plurality of measuring points is assigned, you can define whether the minimum, the maximum or the average of all the assigned signals is output. It is likewise possible to define which signal of the measuring points (source) is output.



Symbol	Description	Default	Function
Analog Output 1	Selection of channel		Selection of the analog output 1 - X
0 1 10-100 %	Selection of output signal	100 %	0 = Analog output is not used, no monitoring of the feedback 1 = Control by central controller ≥ 10 = Local control and definition of the signal slope 10 = 10 % gas signal = 20mA (high sensitivity) 100 = 100 % gas signal = 20mA (standard signal)
C	Selection of source	C	C = Source is current value A = Source is average value CF = Source is current value and additional fault message at AO AF = Source is average value and additional fault message at AO
Max.	Selection of mode	Max.	Min. = Displays the minimum value of all assigned MP Max. = Displays the maximum value of all assigned MP Average = Displays the average value of all assigned MP

Heavy Duty units are not allowed to change the following default parameters:

- Output signal: 100%
- Source: CF (current value + fault message)
- Mode: Max.

4.9.6
Deadband

The unwanted noise of the measured value around the zero point, caused by the drift of the sensor, can be suppressed by activating a Deadband.

For Heavy Duty devices, the deadband is adjustable within ± 5 %.

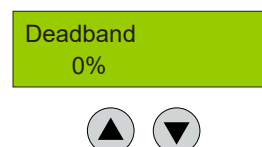
For Basic and Premium devices, the deadband is adjustable up to ± 10 %.

If the default value is 0, the suppression is switched off.

If the measured value is within the set % value, the display shows 0. Natural zero-point fluctuations of sensors downwards or upwards can thus be suppressed in the display. If the measured value is smaller than the deadband but still larger than -10 % of the measuring range, the measured value is displayed and the corresponding analog value is output. If the measured value is greater than -10 % of the measuring range, the fault message is triggered.

The suppression also affects the analog output, because the measured value must not have a different display depending on the output.

When the calibration(special) mode is opened, the dead band function switches off automatically.



4.10
Operating Data

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

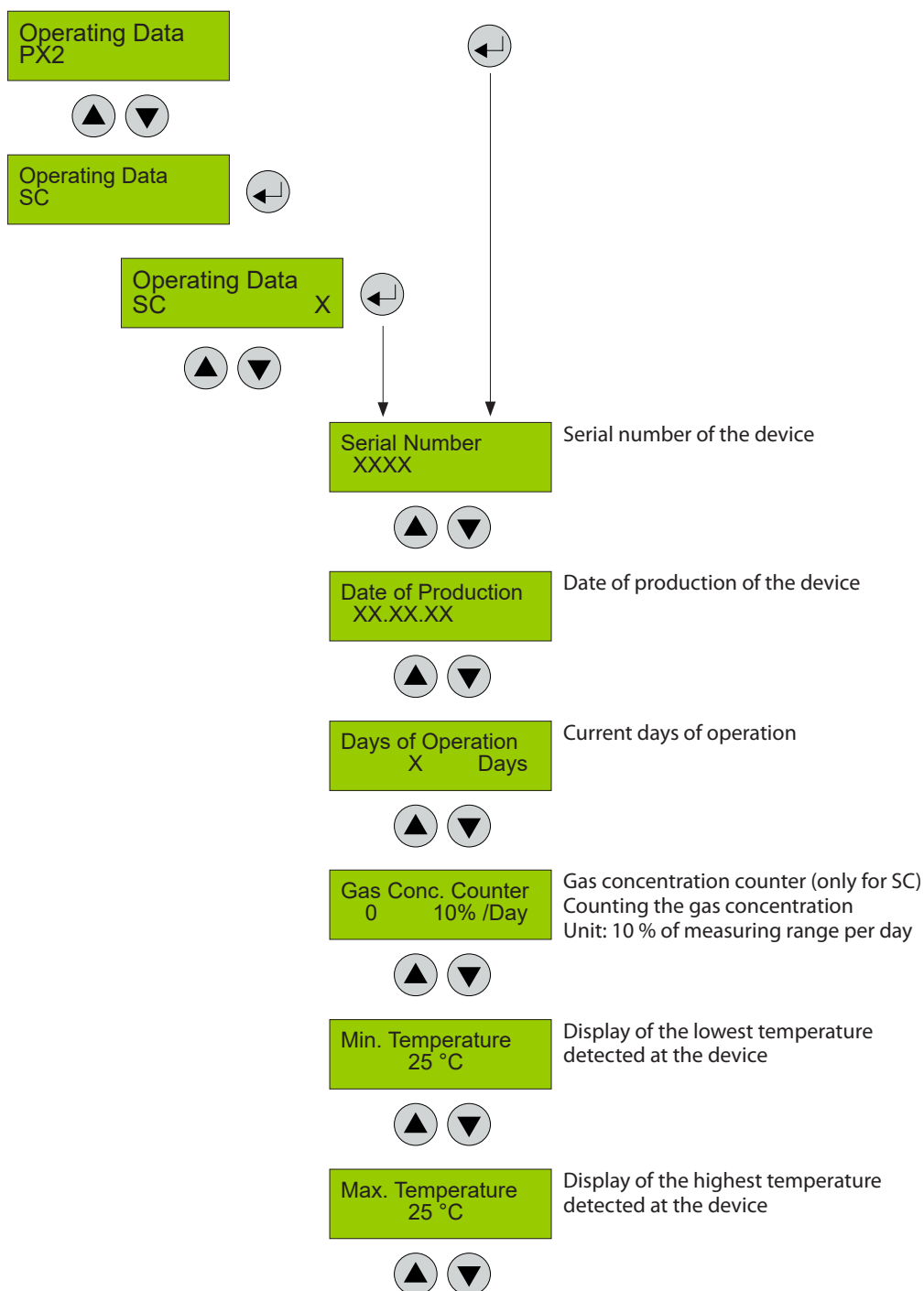
Operating Data

Selection of the device, sensor head or basic device the data should be read from.

SB2 - Basic
MSC - Premium
PX2 - Heavy Duty

SC - Sensor head basic and premium
SX1 - Sensor head Heavy duty

The display recognizes the connected basic unit automatically.



4.10
Operating Data
(Continued)

Last Tool No. Displays the tool number the last access was performed with



Analog Outp. Offset 1 295 Display of the zero offset of analog output 1 (internal value)



Analog Outp. Offset 2 295 Display of the zero offset of analog output 2 (if available)



MP 1

Number of Calibr. 1 Number of calibrations performed



Zero Gain xxxxx yyyyy Current zero offset and gain



Sensitivity 100% Sensitivity of the sensor at the last calibration compared to new sensor



Maintenance Days Last xxx Display of the days differing from the nominal maintenance date at the last maintenance / calibration (fixed value)



Days of operation Last xxx Days of operation at the last calibration (fixed value)



Maintenance Days Currently xxx Current remaining days until next maintenance date (down counter)



Max. Current Value 0 Maximum measured current value of the sensor head

4.11
Test Function for Alarm Relays

In this menu, the alarm relays can be manually turned on and off in order to test their function.

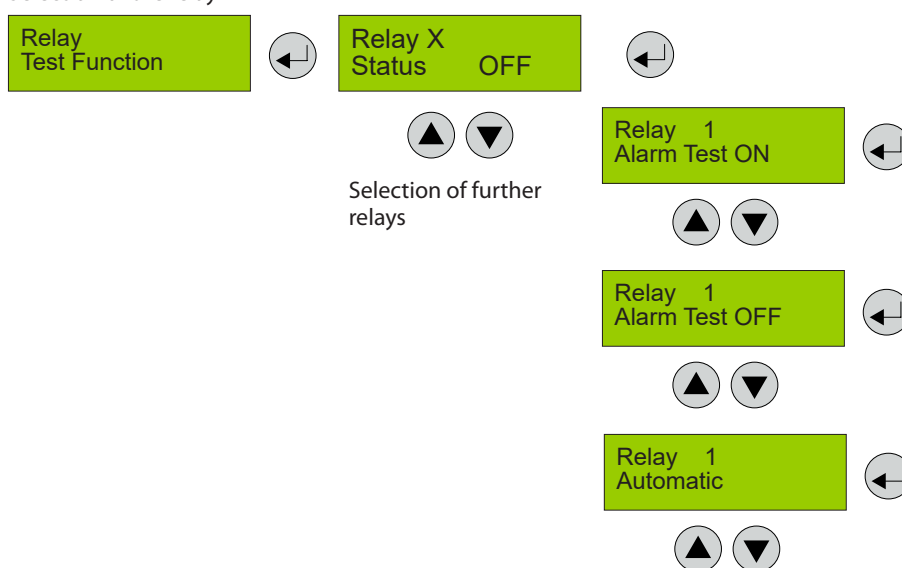
This manual intervention is reset automatically 15 minutes after the last menu entry; therefore don't use this feature for safe disconnection of equipment for repair work. During the test phase the device is in Special Mode.

The manual operation has priority over activation by a gas alarm. However, the external activation of the alarm relays via a digital input has priority over the manual test function.

The test mode simulates an alarm for the relay and the relay accepts the alarm status.

Changes are only possible via code level 3.

Selection of the relay 1 - X



Symbol	Description	Default	Function
Status	Relay No. X		X = 1 – X Select the relay
OFF	Relay Status	OFF	Status OFF = Relay off (no gas alarm) Status ON = Relay on (alarm)
Test ON	Test of the alarm message	Autom	Alarm Test ON = Relay manually set in alarm status Alarm Test OFF = Relay manually set in "no alarm" status Automatic = Reset of manual intervention, relay in automatic mode

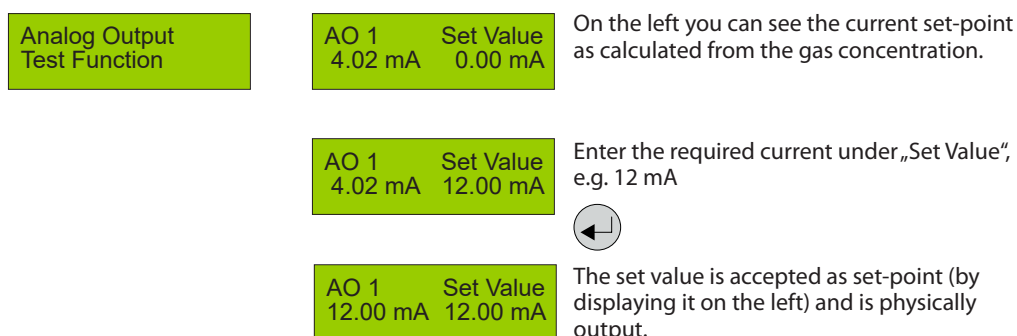
4.12
Test Function for Analog Output

In this menu, you can define a desired value in mA for the analog output in order to test the function. This value then is directly available at the output. During the test phase the device is in Special Mode. The manual intervention is reset automatically 15 minutes after the last menu entry or when exiting the menu.

The manual operation has priority over the activation by the gas concentration.

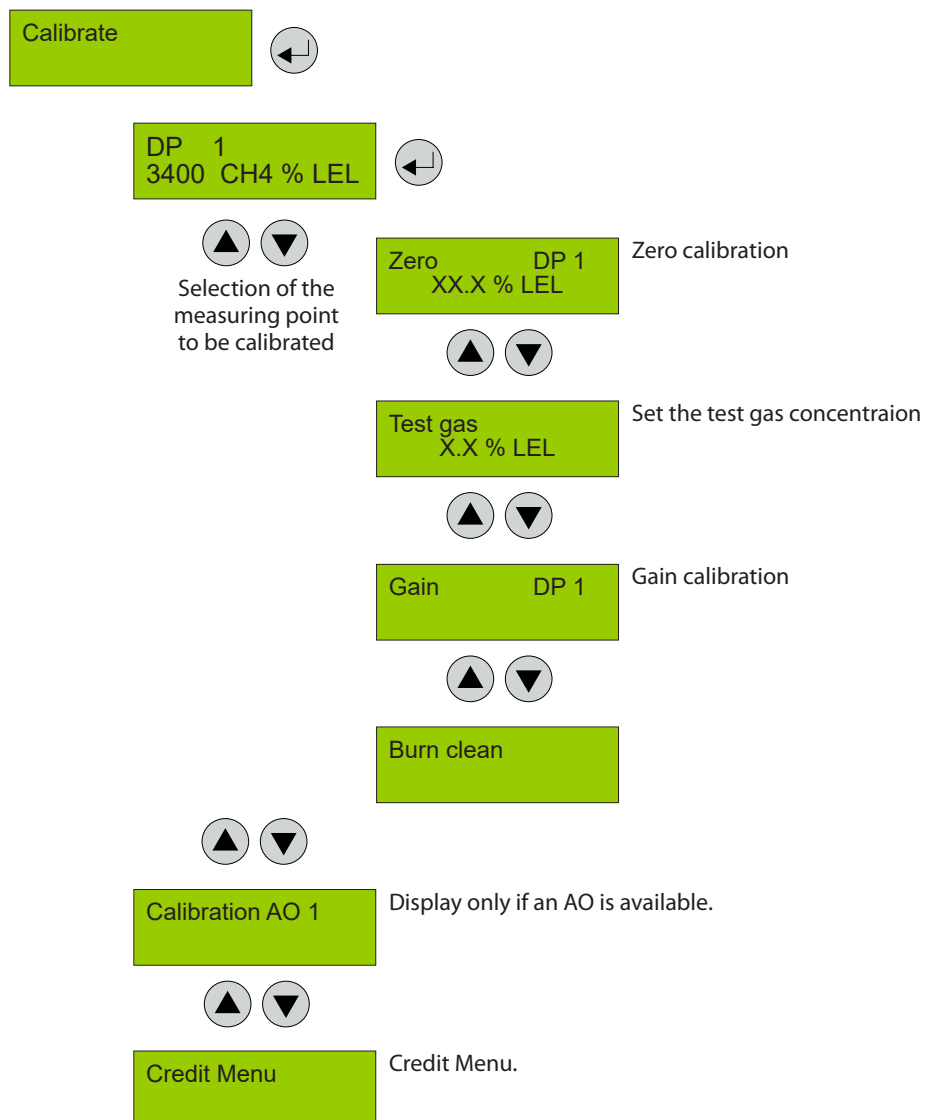
Changes are only possible via code level 3.

The test function is only possible for an active analog output.



4.13
Calibration

On this page there is the menu overview of the calibration.
The calibration description can be found on the following pages.



4.13.1
Zero Calibration

The gas application with the defined calibration adapter, the allowable gas pressure and flow rate and the zero gas to be used can be found in the operating instructions of the sensor head. The specified warm-up times etc. must be strictly observed.



Step 1: Display of the current value

Apply the test gas and wait until the current value reach a stable reading.



Start calibration process (once the current value is stable)

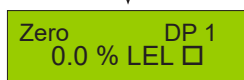


Step 2: Calculation of the new zero point
During calculation an underscore in line 2 runs from left to right and the current value drops to zero.

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



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



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.



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.

When aborting the zero-offset calibration, the offset value there will not be updated. The sensor head continues to use the "old" zero offset.

4.13.2
Gain Calibration

The gas application with the defined calibration adapter, the allowable gas pressure and flow rate and the test gas to be used can be found in the operating instructions of the sensor head. The specified warm-up times etc. must be strictly observed.

Test Gas XX.X % LEL

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
48.0 % LEL 89.0%

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

Apply the test gas and wait until the current value reach a stable reading.

Start calibration process (once the current value is stable)

Gain DP 1
50.1 % LEL 82%

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 sensitivity is recalculated, 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
50.1 % LEL 89% □

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
50.1 % LEL 89%

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 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.
Sensitivity <	Sensitivity of the sensor head < 30 %, calibration no longer possible → Replace sensor head.
Internal error	Internal , unrecoverable error → Replace sensor head.

Calibration flow required for the different type of sensors

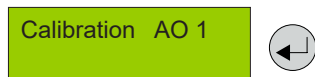
Basic and Premium plastic sensor head	Electrochemical, Semiconductor and Pellistor	0.15 l/min
	Infrared	1.5 l/min
Heavy duty and Remote stainless sensor steel head	Electrochemical, Semiconductor and Pellistor	0.5 l/min

Recommendation for calibration / test gas	Balanced in air
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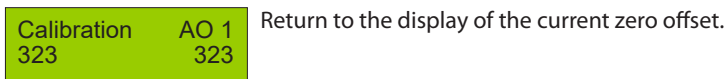
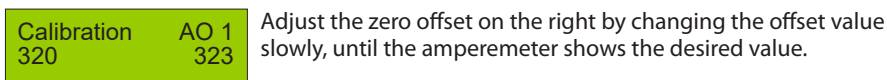
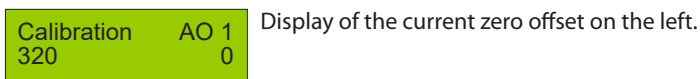
4.13.3
Zero-point Calibration of Analog Output

With this menu item you can adjust the zero-point of the analog output (4mA). The zero-point correction is only possible when the analog output is in active mode.

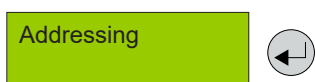
The error message of the output monitoring is suppressed as long as the menu Calibration AO is open. Therefore, connect the amperemeter (measuring range 20 mA DC) to the analog output only after having opened the menu.



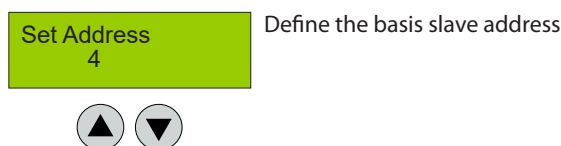
Connect amperemeter to the analog output.



4.13.4
Addressing

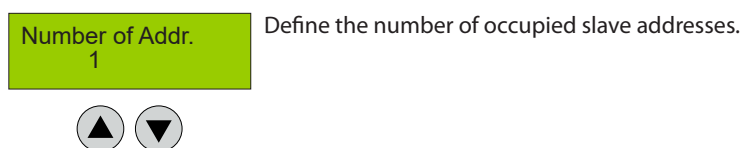


Assignment of the basis slave address of the device for field bus operation



The data of the sensor head assigned at input 1 are sent with this basis slave address to the gas controller via the fieldbus.

The base unit requires / occupies a slave address for each connected sensor head. In the next menu, you can enter the number of occupied addresses. When the number is > 1, the address(es) following the basis address is / are automatically occupied.

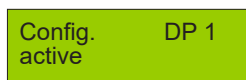


Symbol	Description	Default	Function
4	Basis Slave Address	0	0 = Device is not addressed, bus not used. The admissible address range depends on the device to be addressed. Basic, Premium, Heavy Duty = 1 – 96 Expansion module = 1 – 7
1	Number of Occupied Addresses	1	The number of addresses depends on the number of connected sensor heads. Permitted number max. Basic = 1 Premium = 2 Heavy Duty = 1 Expansion module = 4

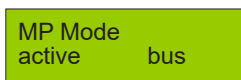
Example:
Premium with two sensor heads (sensor xxxx at Input 1 and sensor yyyy at Input 2).
Slave address 4 was assigned to the Premium Board. The number of occupied addresses is 2. Thus, the sensor xxxx occupies Address 4 and sensor yyyy Address 5. The next available address of the system is Address 6.
No intervention is possible for devices with fixed number of occupied addresses (e.g. Basic with only one sensor head).
The system doesn't prevent the addresses to be assigned twice.

4.13.4
Addressing
(Continued)

Registration of the sensor head at the basic device and definition of the communication (bus or analog)



This menu appears for each set address.
From example above: DP4 = Sensor xxxx
DP5 = Sensor yyyy

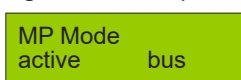


Define the MP mode.

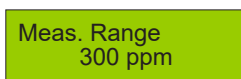


Symbol	Description	Default	Function
active	MP mode	inactive	active = Measuring point is activated on the device. inactive = Measuring point is not activated on the device.
bus	Connection mode	bus	bus = Measured value comes from the connected SC. analog = Measured value comes from 4 – 20mA input.

Selection gas type and range (see also chapter 4.8.3)



Define the MP mode.



Define measuring range.
See 4.7.9.5



If the number of addresses is less than the number of possible measurement points, the remaining measuring points are displayed as 'not available'. No intervention is possible here.

5
Notes and General Information

For the installation and the use, it is important to read the respective user manual carefully. The Basic, Premium and Heavy Duty System (further mentioned as system) may only be used for applications in accordance to the intended use.

The appropriate operating and maintenance instructions and recommendations must be strictly followed.

Due to permanent product developments, Danfoss reserves the right to change specifications without notice. The information contained herein is based on data considered to be accurate. However, no guarantee or warranty is expressed or implied concerning the accuracy of these data.

5.1
Intended Product Application

The system is designed and manufactured for monitoring specific gas concentrations in ambient air and react with alarm when predefined thresholds are exceeded.

5.2
Installer's Responsibilities

It is the installer's responsibility to ensure that the system is installed in compliance with all national and local regulations and OSHA requirements. All installation shall be executed only by technicians familiar with proper installation techniques and with codes, standards and proper safety procedures for control installations and the latest edition of the National Electrical Code (ANSI/NFPA70).

The equipotential bonding required (also e.g. secondary potential to earth) or grounding measures must be carried out in accordance with the respective project requirements. It is important to ensure that no ground loops are formed to avoid unwanted interference in the electronic measuring equipment. It is also essential to follow strictly all instructions as provided in the user manual.

5.3
Maintenance

We recommend checking the system regularly. Due to regular maintenance differences in efficiency can easily be corrected. Re-calibration and replacement of parts can be realised on site by a qualified technician with the appropriate tools.

