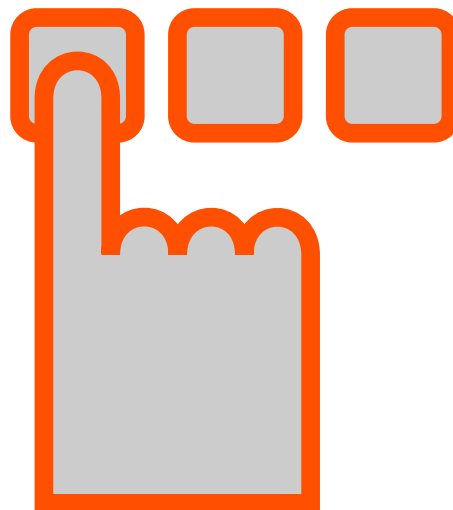


# LDS 3000 Operators Manual



Your  
eye  
in  
hell



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## 1. Introduction

The LDS 3000 is a system for on-line gas analysis providing continuous presentation of accurate measurements.

The gas concentration is measured using line absorption spectroscopy. Cross sensitivities to other gases are eliminated in the measurements due to the spatial purity of the laser enabling selective detection of individual absorption lines.

The LDS 3000 consists of a sensor pair (measuring head) and a central unit connected using optical fibre cables. The central unit and the sensor can be installed several hundred meters apart.

The light source is a diode laser whose wavelength can be tuned within a narrow spectral range. An optical fibre guides the light from the central unit to the sensor, where it is directed into the measuring section. The laser beam passes through the gas in the measuring section and is partially absorbed there. The light attenuated in this way is detected by the receiver and is returned to the central unit. The variation in the intensity of the laser light in the vicinity of the absorption line is measured, and the concentration of the gas being measured is calculated using the second harmonic of the detected signal.

The LDS 3000 can measure at up to three measurement locations simultaneously. To extend the number of measurement points an extra receiver board in the central unit, extra I/O modules and an extra sensor with cabling is added per channel.

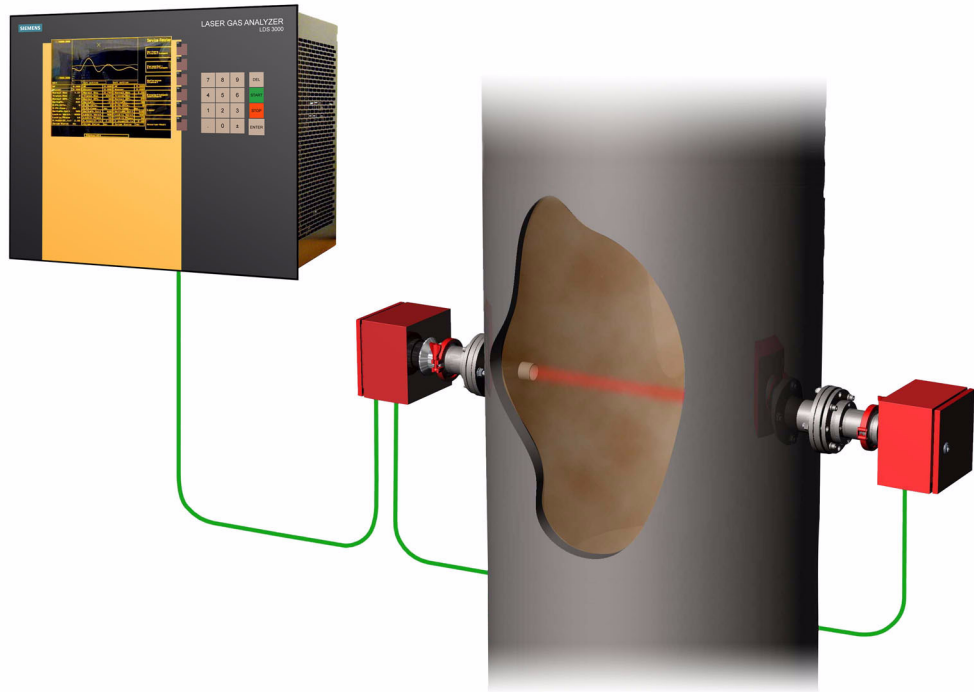
The LDS 3000 operates as an independent unit. An 85-264 VAC main power supply is all that is required. The gas concentration and instrument status are indicated on the graphical display. The gas concentration is also continuously given as an analog 4-20 mA output. As options, several other parameters such as transmission level and different alarms can be obtained.

With a PC running Windows 95/98/ME or Windows NT/2000. LDS 3000 can also be operated remotely via the serial port, either directly (local mode) or via modem. This requires the optional software LDSComm installed on the remote computer. All aspects of LDS 3000 can be controlled in this way. An interface to LabView™ (National Instruments) is also available.



## 2. Overview

The LDS 3000 consists of a central unit CU 3000, hybrid cables and a sensor. The hybrid cable contains optical fibres and a low voltage electrical cable (24 V), and connects the different types of sensors available with the central unit.



*System setup with cross duct sensors*

## 2.1 Central unit CU 3000

CU 3000 incorporates a control panel with display, built-in keyboard, control computer, laser, reference cell, control electronics for the laser and slots for up to three receiver channels. A PC-card (PCMCIA card) is used hold the software and necessary files for the operation. This simplifies the software updating which is done remotely through the serial port or simply just be changing PC-card. No moving media like hard drives are used.



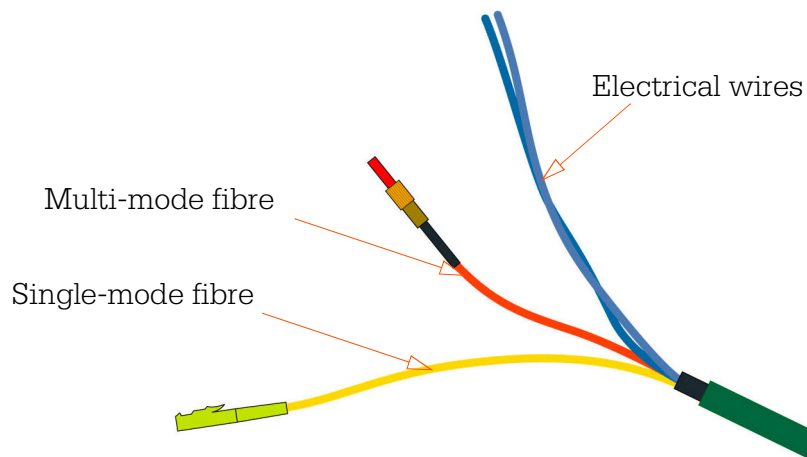
*Central unit CU 3000*

The control computer (an industrial X86 PC) is mounted in a computer housing together with a display driver, a data acquisition card and a TPU (Time Processing Unit). The last two units are handling the timing and acquisition of data. In a fully equipped system the control computer measures at three points at a speed of 24 times/second. Depending on the measurement situation, a response time down to 0.1 s is achievable. The central unit also handles a large number of I/O-units for 4-20 mA input/output and relay output. The I/O setup is completely flexible and can be configured to the customers specification. As an example LDS 3000 can present concentration and transmission values (4-20 mA) give alarms on system fault (summary alarm) and transmission drop (relay) and read process temperature (4-20 mA). It is also possible to connect to the serial port on LDS 3000, either directly or via modem. With sufficient privileges all aspects of LDS 3000 can be controlled this way. This option is preferably used before service visits to diagnose the status of LDS 3000.



## 2.2 Hybrid Cable FC 3000

The hybrid cable is constructed for very harsh environments and consists of two optical fibres, one for transmission of the laser light to the measurement volume and one for the return of the detected signal. Two electrical wires are used for powering the electronics in the sensor (24 VDC).



*Hybrid cable FC 3000*

## 2.3 Sensor CD 3002

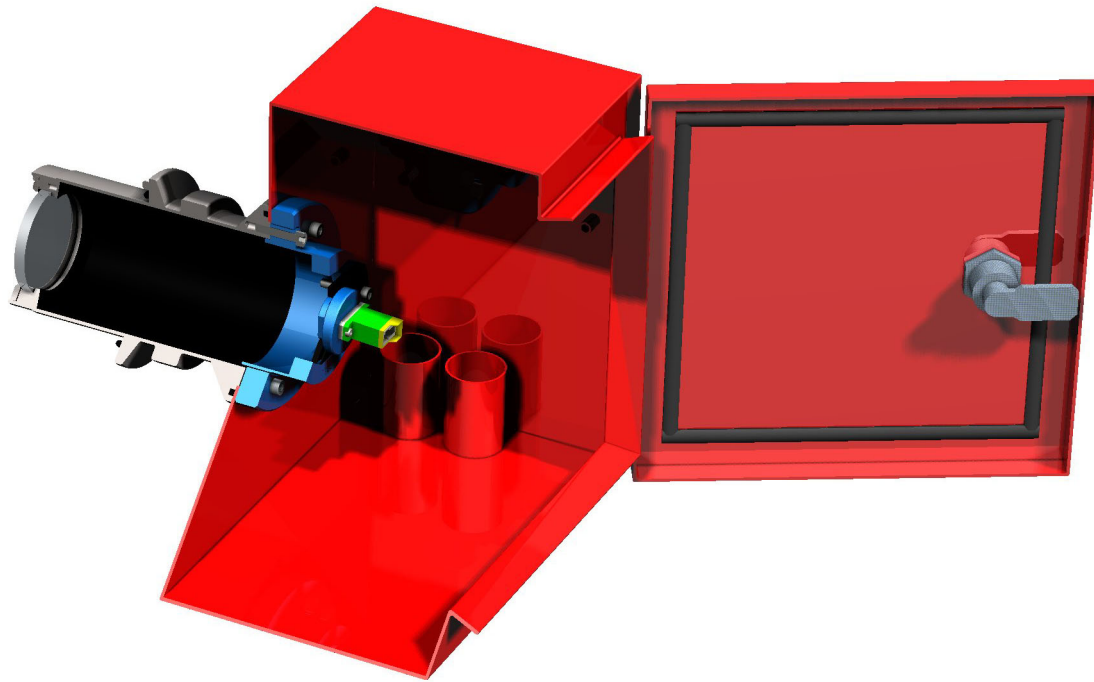
There are several sensor designs available for the LDS 3000 system. The choice of sensor depends on the measuring situation. For reactive gases, such as ammonia, in-situ measurement is a necessity and the cross duct sensor seen below, is a suitable sensor.

The standard sensor is CD 3002 and it consists of a transmitter and a receiver intended to work Cross Duct. In the transmitter there are provisions for connection of a fibre optic connector and in the receiver there are a photo detector and some electronics.

The sensor is also available in an EX-version.

Normally the sensor optics needs to be protected from the measurement environment. There is a number of ways to accomplish this. The standard approach is to use pressurized instrument air at a flow of up to approximately 120 ltr/min. The sensor can be equipped with a number of options such as heater for the instrument air, in line calibration path, fan purging, steam purging, etc. If the sensor needs maintenance it is easily removed from its flange by means of a quick connect. The removal and relocation of the sensor does not require realignment. Thus the sensor optics can very easily be cleaned if needed.

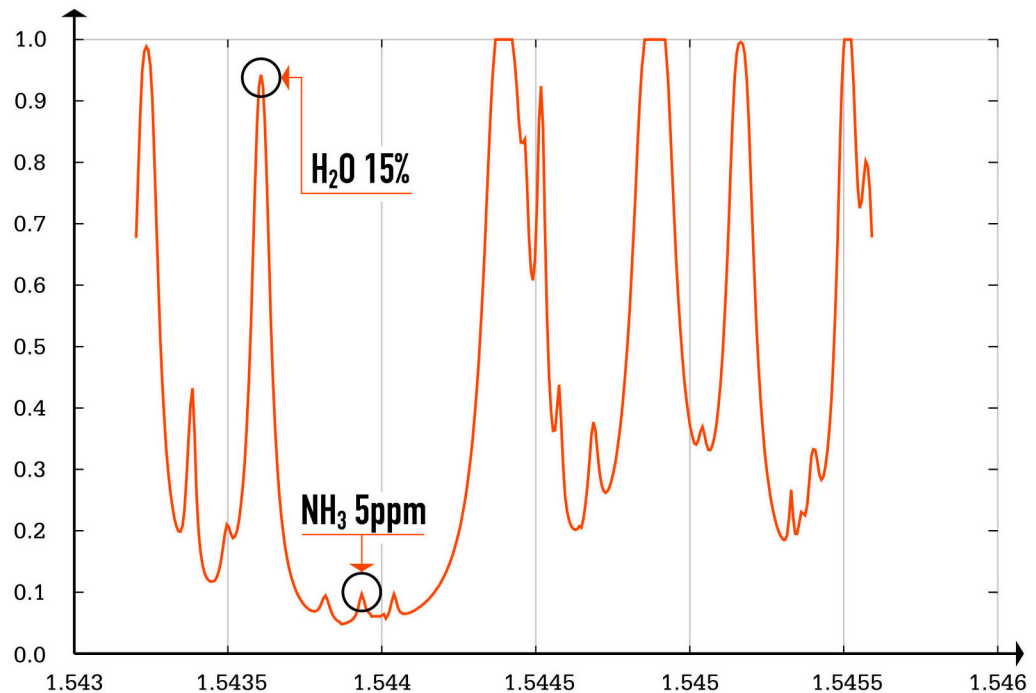
For more information on the sensor delivered with this instrument, see the separate *Sensor Manual*.



*Cross duct sensor CD 3002*

### 3. Measurement principle

The LDS 3000 measures the gas concentration by using line absorption spectroscopy. If the absorption of a gas mixture is plotted versus the wavelength, it can be seen that absorption only takes place at certain wavelengths in the spectral region. These extremely narrow absorption peaks are referred to as absorption lines, see figure below.



*Absorption lines*

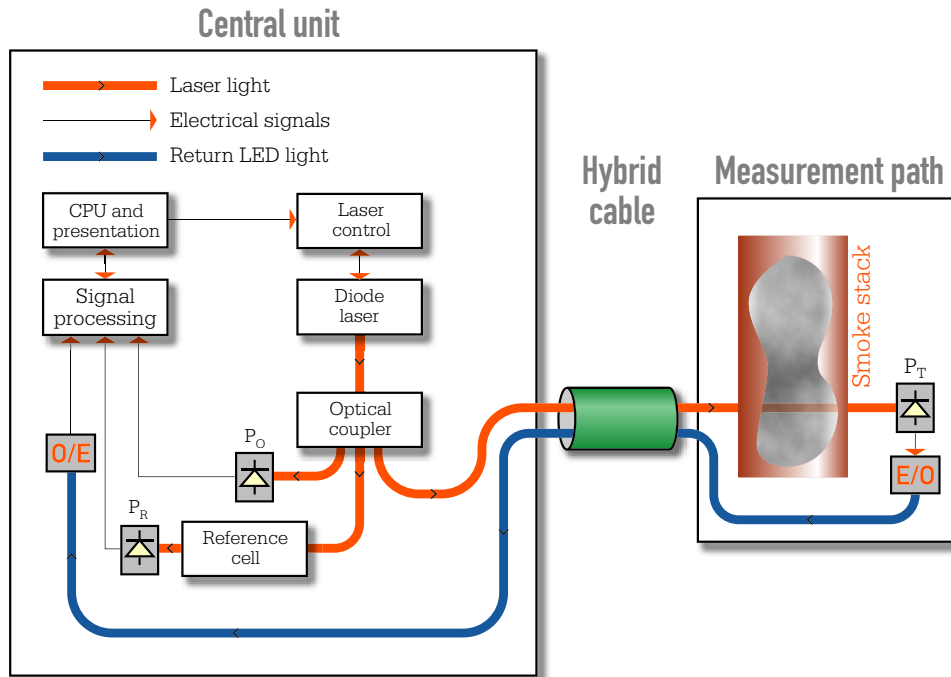
The measured gas (here ammonia) is identified by comparing with the spectrum from a built in reference cell. To perform line absorption spectroscopy, the LDS 3000 uses a diode laser as light source since its spectral width is much narrower than the width of the absorption line.

Furthermore, the wavelength of the laser can be selected to be near one absorption line of the gas to be measured. By varying the current and temperature the laser wavelength is tuned to cover the required narrow spectral range which includes the absorption line. When tuning the laser light over the absorption line it is partially absorbed. From the received laser signal the area beneath the absorption line can be extracted, which is a measure of the gas concentration.

The light emitted from the laser is split into three beams. The first beam passes through a reference gas and is then detected. This reference signal is used for continuous self-calibration and zero point determination of the system, taking temperature and pressure into account. The second beam is used for measuring the intensity of the laser and provides the control unit with information relating to the state of the laser. The third beam is conducted via the optical fibre with the E2000 connectors to the sensor head, where it enters the measuring section. When the laser light passes through the gas in the measuring section it is partially absorbed.

The light is detected by the receiver and after signal conditioning the signal is converted to an optical signal and returned to the central unit using the multimode optical fibre (with the SMA connectors).

A block diagram of LDS 3000 is shown below.

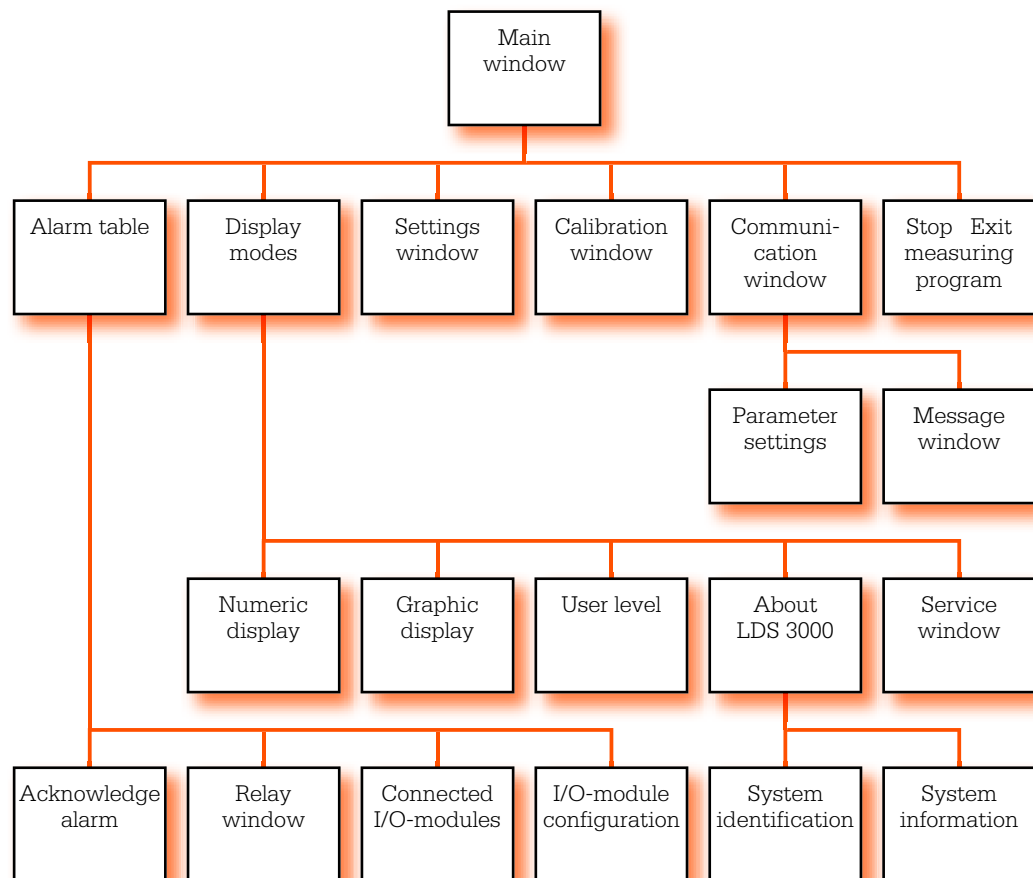


Block diagram of LDS 3000

The concentration of the measured gas is calculated from the absorption spectrum for the measurement channel ( $P_T$ ). Any change in the measurement conditions, for example as a result of a higher dust load in the flue gas or contamination of the optical components, is compensated for automatically to guarantee accuracy of the measurement results under a wide range of operating conditions.

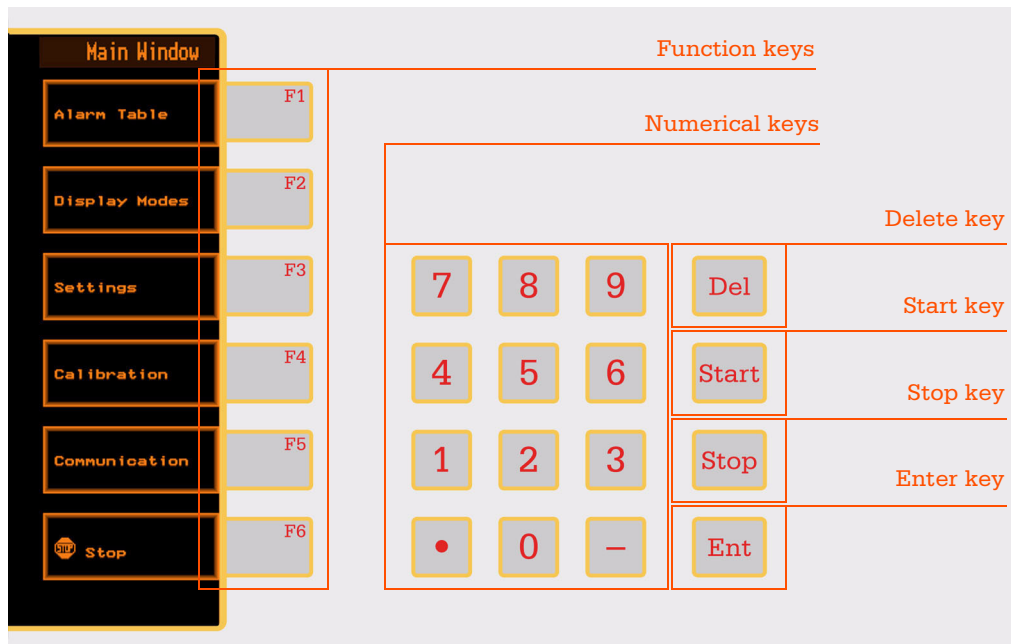
## 4. Basic functions

The system software is built up as a hierarchy structure. Normally the instrument is operated from the Main window. The Main window is the top level in the structure. From here you use the function keys, F1 to F6, to reach the other windows/levels in the structure. The top level can be reached from the other windows using the lowest function key, which is labelled Return to Main window. The following figure shows the menu structure available for the operator. However, some windows are not available for low-level users. The figures in this chapter are taken from a system with the user level Normal. All levels in the system are described in the *Reference Manual*.



Menu tree

## 4.1 The built-in keyboard



Keyboard

### Function keys

The function keys are mainly used to enter the different windows/levels in the menu structure.

### Numerical keys

The numerical keys are used to enter values in a menu or dialogue field.

### Delete key

The delete key is used to delete entered characters. When numerical fields are cleared they will be set to the previous value.

### Start key

Starts the measuring program.

### Stop key

Stops the measuring program and exits to the *Start-up window*.

### Enter key

The enter key is used to confirm settings made.

## 4.2 The screen

LDS 3000 is equipped with an 11" plasma VGA-screen. It is very bright and has a viewing angle of more than 160°. The outline of the screen is shown below.



Screen outline

### Main screen

Here is where text input and measurement values are presented. There are several different appearances on this part of the screen.

### System time

Current time is displayed. This is the time that will be stored in the system log every time an event is stored.

### Window name

The name of the actual window. Use this when you consult the manual.

### User on-line

This text line continuously shows the name of any externally logged on user.

### Status line

Here the systems reports the status of the measurements. Here you can see errors, alarms, etc. For more information on status codes see **Status messages** on LDS 3000 on page 47.

### Message line

In this line you see a number of different messages from LDS 3000. You see for instance system responses on illegal key sequences, activity on the serial port, etc. The table below shows the different messages.

<b>Message</b>	<b>Meaning</b>
No Session!	User of LDS 3000 is trying to communicate with a remote user when no one is connected
No Modem Response!	LDS 3000 fails to initialize the modem
“User” On Line	Indicates that an external user logged on
“User” LogOff!	Indicates that an external user logged off
SMS Successfully Sent!	LDS 3000 informs that a SMS message was successfully transmitted
Not Allowed!	User of LDS 3000 is trying to send a text message when the serial line is busy. Try again later!
Packet Csum Error!	LDS 3000 received a packet with a check-sum error. This can indicate a bad phone line.
Message Sent!	LDS 3000 informs that a text message was successfully transmitted
Receiving File...	LDS 3000 informs that a file presently is being received
Sending File...	LDS 3000 informs that a file presently is being transmitted
Transfer Stopped	The transfer was stopped by the external user.
“Incoming text message“	Incoming text messages can be shown here if this option is chosen by the external user
Message Received!	A text message has been received from an external user and is available in the communication window
Got Unknown Packet!	LDS 3000 received a packet that was unknown. This could be a compatibility problem

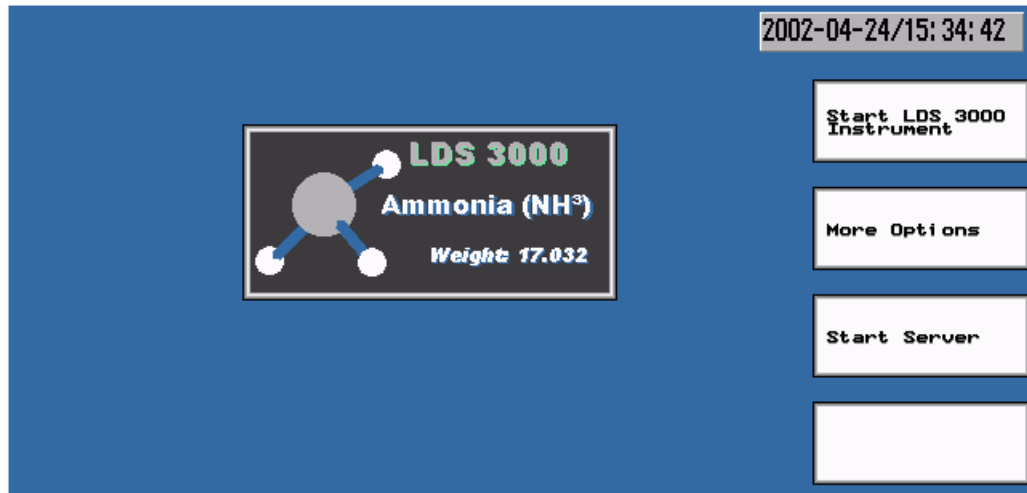
### **Adapting key labels**

There are six function keys immediately to the left of the screen. These keys change function depending on what the operator is working with at the moment. This function is labelled on the adapting key labels.

## **4.3 Start LDS 3000**

After installation, the power to LDS 3000 is turned on with the main power switch at the rear. After power up, which takes about 30 seconds, the Start-up window is displayed.



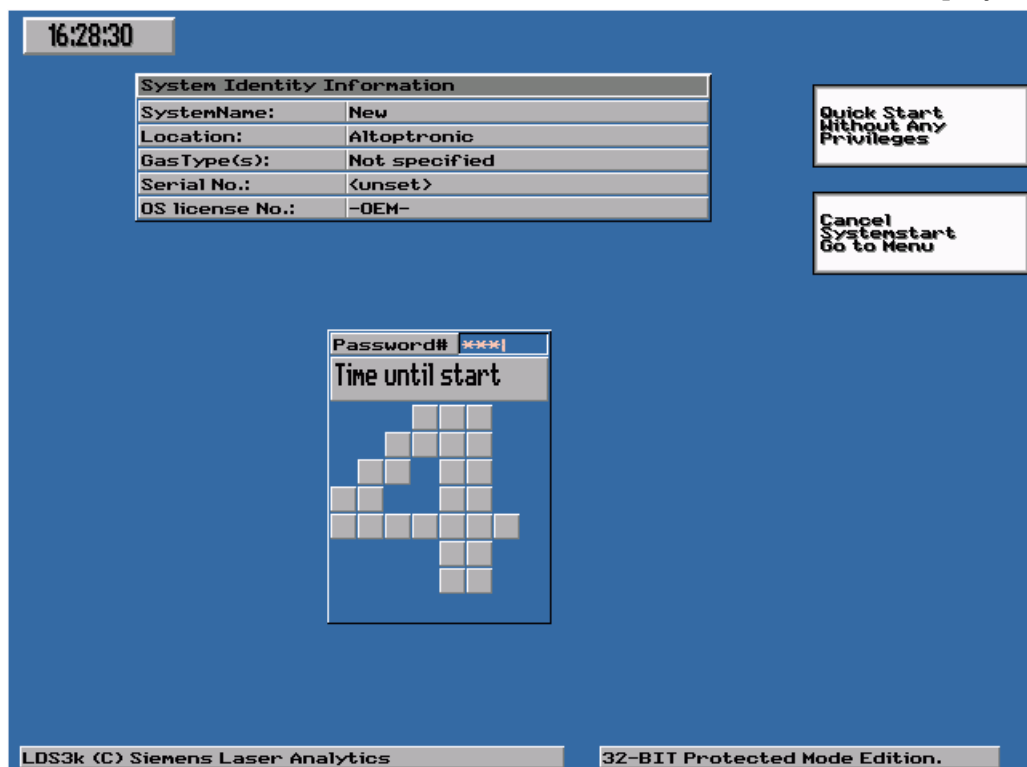


*Start-up window*

In the *start-up window* you have two alternatives.

### **Start LDS 3000 instrument**

Press [F1], Start LDS 3000 instrument. A new window is now displayed.



Enter the first character in your password within five seconds otherwise the system automatically starts up at the lowest level. You have 10 seconds to enter the password. Information about user levels can be found in **User level** on page 15.

Press [F1], Quick start. The system will start at the lowest user level.

At this level you do not have the possibility to change any setting.

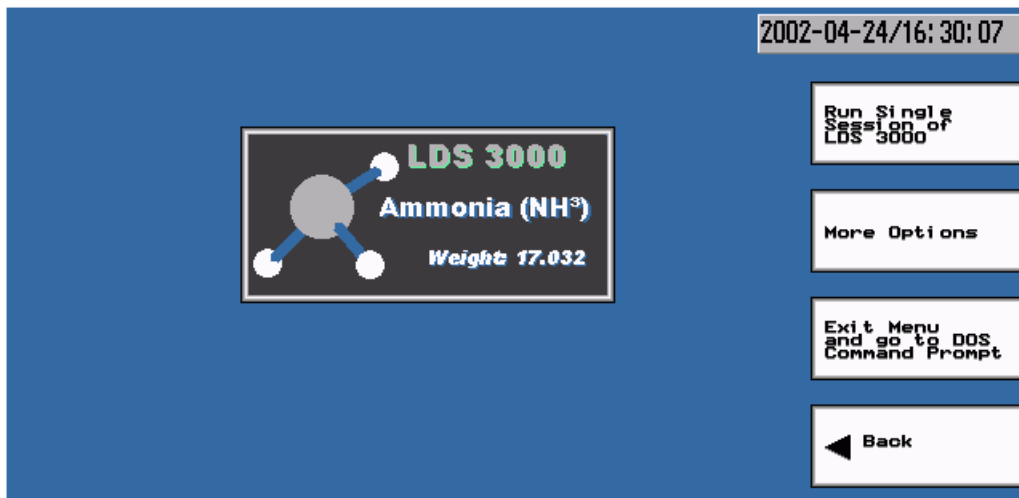
Press [F2] to cancel the start-up.

During start-up, the text "Preparing LDS 3000 for measurement..." is flashing in the window. When it disappears the system is up and running. The starting procedure can, depending on the temperature in the room where the central unit is installed, take 1 to 10 minutes since the laser has to be regulated to its operating temperature very accurately (the temperature tunes the laser wavelength to the proper absorption line). The end of the start phase and the beginning of the measurement phase is indicated by alarm L1. If the start-up procedure fails, the alarm L1 remains not activated and authorized personal have to be contacted.

**Note!**

### More options

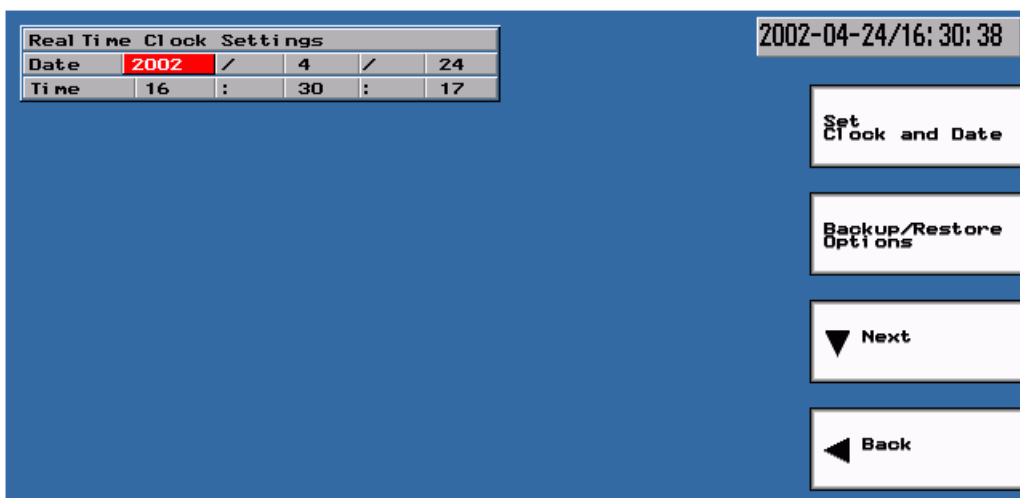
Press [F2], More Options, to enter the following window. The functions under More Options are used in association with Siemens Laser Analytics AB.



Press [F1] to run a single session of the measurement program in LDS 3000. This is used when ...

Press [F3], Exit Menu and go to DOS Command Prompt, if you need to access the file structure in LDS 3000. This requires an external keyboard. Return to the start-up window by pressing 1 followed by return at the DOS-prompt (C:\).

Press [F2] and the following window will appear.



Here you can set the system clock. You also make backup on present sys-

tem parameters settings in this window. If an old setting needs to be restored this is also done in this window.

#### 4.4 User level

If you started at the lowest user level you can set your privileges at run-time. You must navigate to Display Mode [F2], Users... Window [F3] and User Level [F3]. Enter the appropriate password and press Enter. The following parameters can also be set in this window.

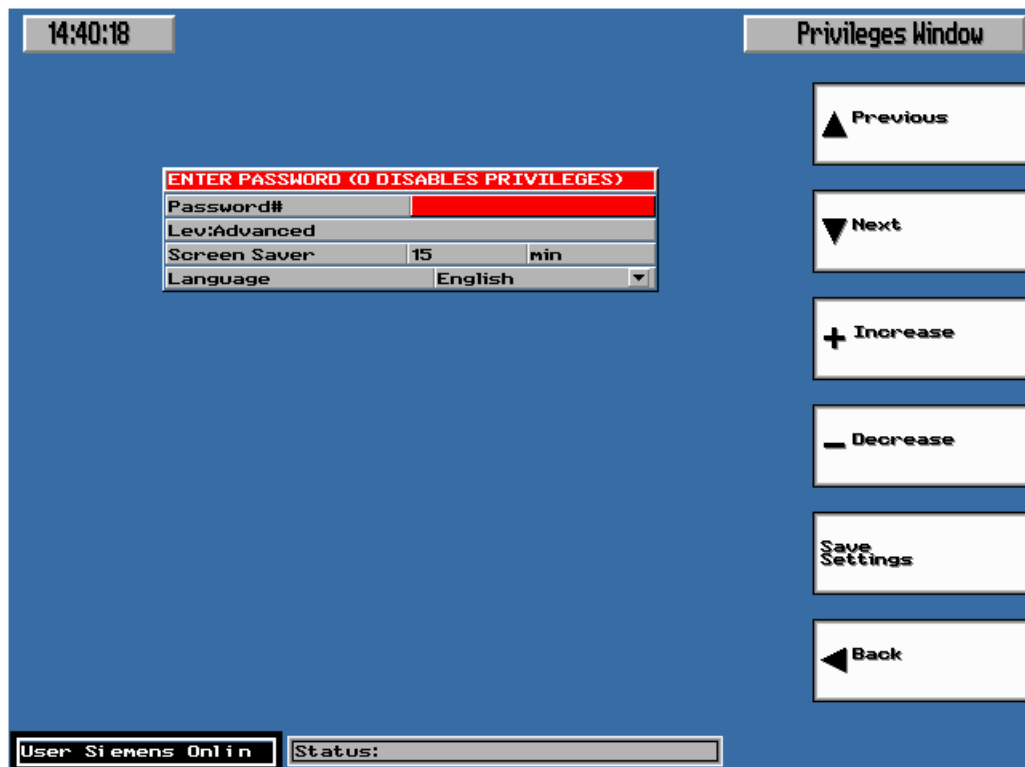
##### Screen saver.

Sets the time in minutes from the last key operation until the screen saver becomes active. When in screen saver mode: press any key to activate the display.

##### Language

Select language for the menus. The language is changed immediately and the action will blank the display for a couple of seconds.

*Main window → Display Mode → User Level*



There are five different user levels and they are described in the table below. A user with higher privileges has access to all functionality at the level below. To disable privileges (Level 1) enter 0 and press Ent.

User levels	Privileges
Quick start - (1)	User can view the main window, the settings window, the alarm table and the about window
Basic - (2)	User can view the service window, the I/O module windows and the communication window

User levels	Privileges
Normal - (3)	User can modify settings in the settings window and can perform calibrations.
Service - (4)	User can modify settings in the settings window and can communicate with connected clients. User can also modify I/O module configurations.
Advanced - (5)	User can add and remove users in the priority list. He can also access and modify settings in all possible windows. This is the priority level when Siemens Laser Analytics is logged in to the system.

After finished operating the system at a higher user level, please disable privileges to avoid unauthorized personal manipulating the instrument.

## 4.5 Turn off LDS 3000

LDS 3000 is turned off by pressing the [F6] key labelled Stop in the Main window or by pressing the Stop key. You have to confirm the stop by pressing yes [F5] or press no [F6] to cancel the stop procedure. Now it is safe to turn off the power with the power switch at the rear.

**If the measuring program in LDS 3000 is terminated in any other way (like in a temporarily power failure) it will automatically restart if the power is turned back on after it has been off.**

**Note!**

## 4.6 Display modes

The Main window is the normal overview window. Here the measured values are displayed in a horizontal bar graph and with large numerals, including unit. The scaling is the same as the 4-20 mA output. Also on display here is the Rms-parameter which is a measure of the optical transmission level in the measurement path. It is always calibrated to 100% during installation and further measurements are thus referenced to this time. The measured gas will also be displayed here.

### Status line

At the bottom of the screen a status line is always visible which shows the status of the LDS 3000. For more information see **Status messages on LDS 3000** on page 47.

**Main window**

The screenshot shows the 'Main Window' interface. At the top left, the time is 16:46:39. The main area displays three channels, each with a table of data and a corresponding bar chart. Channel 1 has a frequency of 92.4, Channel 2 has 195, and Channel 3 has 318. Each channel table includes 'Rms' (100 %) and 'PPM' (500) values. The bar charts show a red segment on the left and a blue segment on the right. On the right side, there is a vertical menu with buttons for 'Alarm Table', 'Display Modes (Users, Language, About, Service)', 'Settings', 'Calibration', 'Communication', and 'Stop'. At the bottom, there is a 'Status:' field.

Channel	Frequency	Rms	PPM
Channel 1	92.4	100 %	500
Channel 2	195	100 %	500
Channel 3	318	100 %	500

If you press the key Display Mode, Users,... [F2] a new button-set will appear. From this you can select three display modes, overview windows, Numeric Display and Graphic Display.

*Main window → Display Mode*

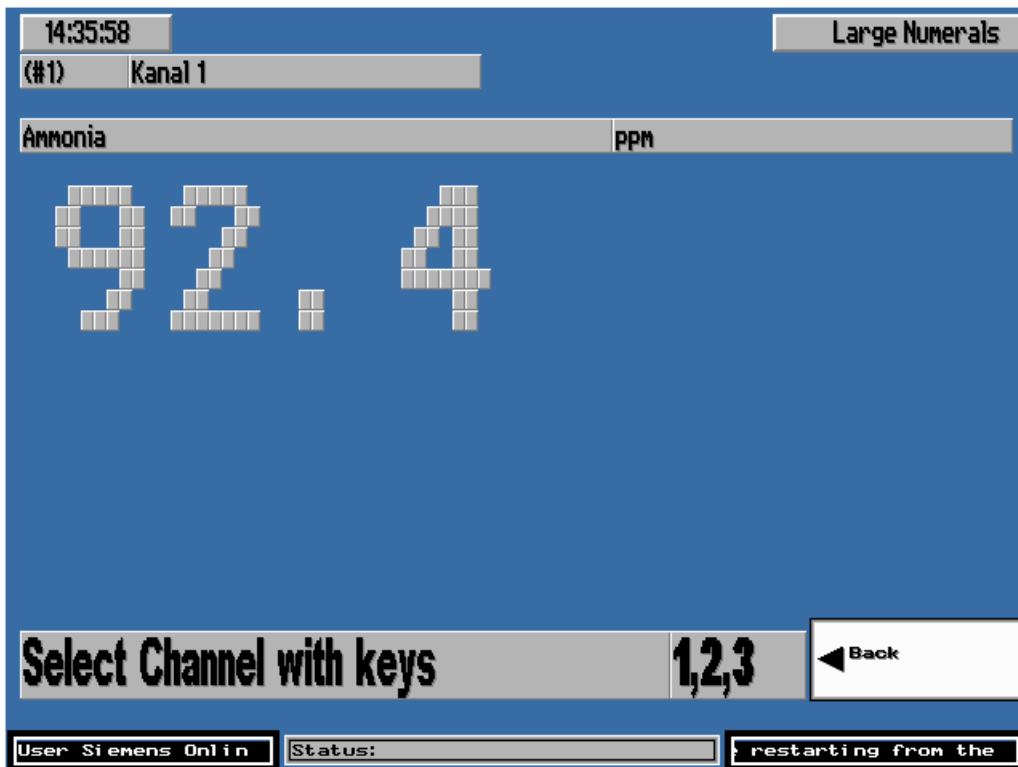
The screenshot shows the 'Display Mode' interface. The layout is similar to the 'Main Window' but the right-side menu is different. The time is still 16:46:39. The channel data and bar charts are identical. The right-side menu now includes buttons for 'Nuneric Display', 'Graphic Display', 'User Level (Screensaver, Language)', 'About LDS 3000', 'Service', and a 'Back' button with a left-pointing arrow. The 'Status:' field is at the bottom.

Channel	Frequency	Rms	PPM
Channel 1	92.4	100 %	500
Channel 2	195	100 %	500
Channel 3	318	100 %	500

*Display mode*

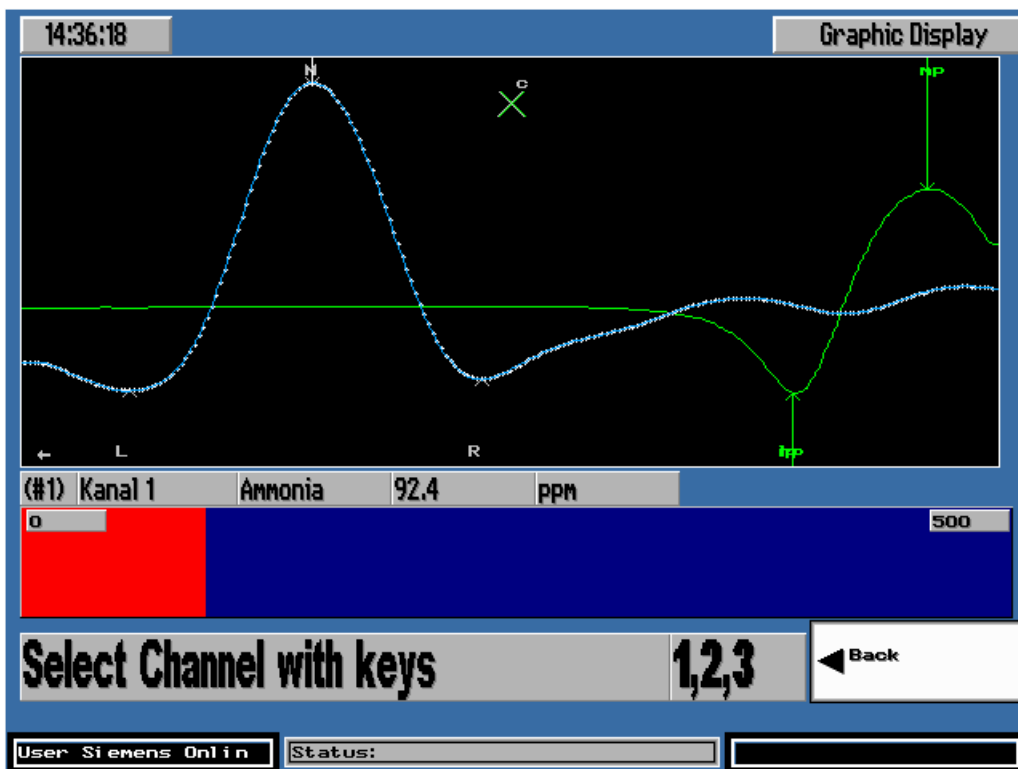
**Large numerals, [F1]**

Main window → Display Mode → Numeric Display

**Graph/Bar graph, [F2]**

This mode displays the absorption line from the selected channel (thin curve) and from the reference channel (bold curve).

Main window → Display Mode → Graphic Display

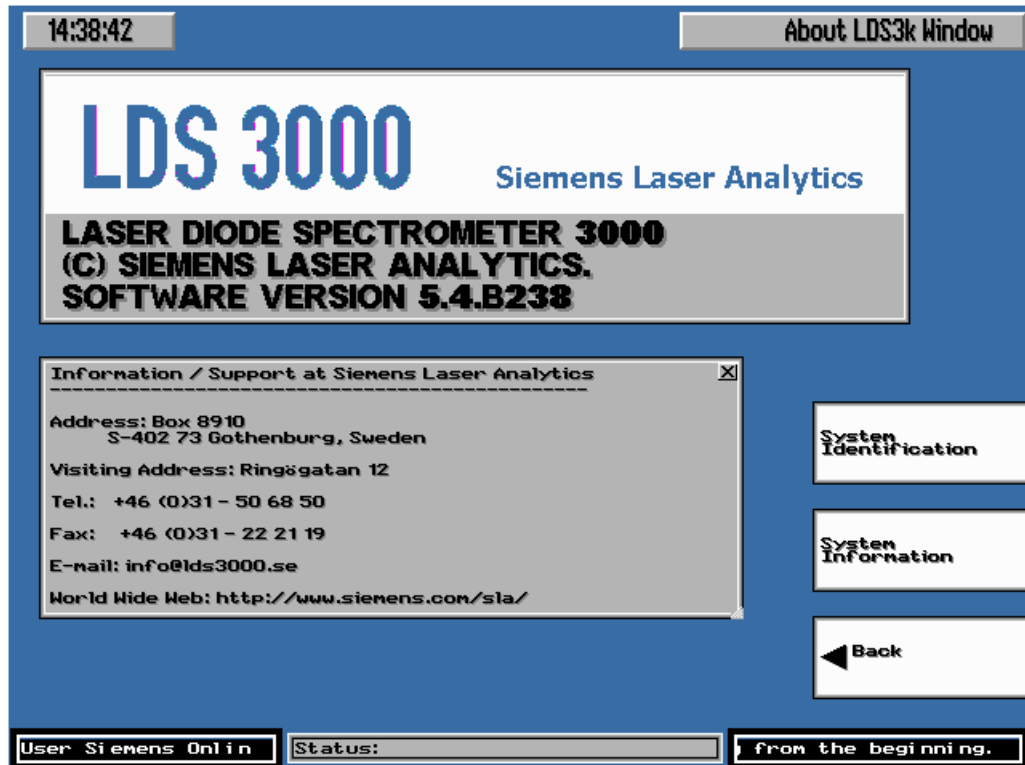


Graphic display

**About LDS 3000, [F4]**

Pressing this button will display an information window. Here you will find information about the program version, the name and addresses of Siemens Laser Analytics AB - the supplier of LDS 3000.

*Main window → Display Modes → About LDS 3000*



*About LDS 3000*

Here the information about the system ID and the system configuration may also be found.

Main window → Display Modes → About LDS 3000 → System Identification

System identification

Main window → Display Modes → About LDS 3000 → System Information

System information

**Service, [F5]**

The Service window is for service purposes only and is described in the **Reference Manual**.



**Back, [F6]**

Return to the Main window.

**4.7 Main window**

The Main window is the normal overview window and shows the measured values numerically and as a horizontal bar graph. The bar graph has the same range scaling as the 4-20 mA current output.



Main window

**Function keys****Alarm table**

When you press [F1] the alarm table is accessed. In the alarm table you find information on alarms that have occurred. You can also reset the table.

**Display modes, Users, Language, About, Service**

When you press [F2] you can select one of two possible alternative display modes, Numeric Display and Graphic Display. Furthermore, you can select your user level.

**Settings**

When you press [F3] you enter the window for changing the measurement parameters. See the section Settings.

**Calibrate**

With the function key [F4] labelled Calibration you display the Settings window with a button-set for calibration. See the chapter Calibration. Not available in the user levels Quick Start and Basic.

## Communication

Pressing [F5] shows the Communication window. See **Communication** on page 43. This item is not available in the user level Quick Start.

## Stop

When you press [F6] you stop the measurements and leave the system. This action needs confirmation. The Start-up window is shown.

## 4.8 Settings window

In the Settings window the measuring parameters e.g. scaling of the 4-20 mA analog output, response time and the length of the measurement path is set. The settings can't be changed if the operator has logged in with a lower user level than normal.

Main window → Settings window

Channel 1			Channel 2			Channel 3			Settings Window	
Path Len.	5.00	m	Path Len.	5.00	m	Path Len.	5.00	m	▲ Previous  ▼ Next  + Increase  - Decrease  Save Settings  ◀ Back	
Cable Len.	50	m	Cable Len.	50	m	Cable Len.	50	m		
Gas Temp.	23	°C	Gas Temp.	23	°C	Gas Temp.	23	°C		
Pressure	1013	mbar	Pressure	1013	mbar	Pressure	1013	mbar		
Transm.	2084		Transm.	1787		Transm.	1555			
Ammonia	92.4		Ammonia	195		Ammonia	318			
Resp.Time	15.0	s	Resp.Time	15.0	s	Resp.Time	15.0	s		
Unit	ppm	▼	Unit	ppm	▼	Unit	ppm	▼		
SCALING			SCALING			SCALING				
Lower	0		Lower	0		Lower	0			
Upper	500		Upper	500		Upper	500			
CALIBRATIONS			CALIBRATIONS			CALIBRATIONS				
Ammonia	92.4		Ammonia	195.0		Ammonia	318.0			
Purge C.	0.0		Purge C.	0.0		Purge C.	0.0			
ALARMS			ALARMS			ALARMS				
Transm.	25	%	Transm.	25	%	Transm.	25	%		
Status: <input type="text"/>										

Settings window

## Parameter settings

### Channel 1

The name tag of the channel (max 12 characters). If no keyboard is at hand the characters are entered by first entering a number and then pressing the Increase/Decrease and Next/Previous keys. The "Del" key removes characters.

### Path Len

The length of the measuring path, (0-100 m).

### Gas temp.

The temperature of the measured gas in °C. This can be set manually if no temperature signal is provided by the process. If an external temper-

ature signal is connected, the actual temperature value will be displayed.

**Pressure**

The actual absolute pressure in the measuring path in mbar.

**Transm.**

Non normalized transmission in actual channel.

**"Measured gas"**

Presents the actual measured gas concentration.

**Resp. time**

The system response time can be set from 0.1 sec up to 24 hours. The fastest practical response time is determined by the actual operating conditions. Using a short response time in a measuring situation with large and rapid transmission variations, e.g. caused by a heavy dust load, will result in a noisy concentration signal. Each installation needs testing to work out the proper response time.

**Unit**

Selects the unit for the measured gas, ppm, percent, mg/Nm<sup>3</sup>(EU) or mg/Nm<sup>3</sup>(US).

**Lower**

The lower limit for the bar graph presentation and 4-20 mA output.

**Upper**

The upper limit for the bar graph presentation and 4-20 mA output.

**"Calibration gas"**

Sets the concentration of the calibration gas.

**Purge C**

Sets the content of measured gas in the purging gas (normally zero). This parameter is important when oxygen is measured with regular instrument air purging.

**Alarm settings****Transm.**

Sets the limit (a percentage of the RMS parameter) below which the transmission alarm is activated.

**Gas concentration limit**

Sets the limit above which the concentration level alarm is activated.

**Function keys****Prev. Field**

With the function key [F2] labelled Previous you move the cursor to the previous entry field.

**Next Field**

With the function key [F1] labelled Next you move the cursor to the next entry field.

**Increase**

With the function key [F3] labelled Increase you increment the value in the current entry field with 1 in the least significant figure.

**Decrease**

With the function key [F4] labelled Decrease you decrement the value in the current entry field with 1 in the least significant figure.

**Save settings**

With the function key [F5] labelled Save settings the parameters changes made are saved to disk.

**Back**

With the function key [F6] labelled Return you return to the Main window.

## 4.9 Alarm table

Alarm table shows information on the four last types of system alarms that have occurred.

Main window → Alarm Table

REPORT OF THE FOUR LATEST OCCURED SYSTEM ALARMS.

**Alarm Table**

NP: No spectral line found.  
The expected reference line was not located.  
Action: Wait for system to retry search for  
reference spectral line.  
Occured#: 1 / Latest: 2002-04-24/16:34:11

<not logged>

<not logged>

<not logged>

Reset Alarm

I/O Module List

Relay Status for Channel 1

Relay Status for Channel 2

Relay Status for Channel 3

◀ Back

User: Siemens Onlin    Status: NP    log file restarting f

Alarm table

This window contains detailed information about alarms that have occurred since the last alarm reset. A new alarm is put at the top of the list. The alarm text explains the cause of the error and recommended action. Alarms of the same type are only displayed once. However, you can see how many times each alarm has occurred and the time of its last occurrence. The present alarm codes are displayed in the status line at the bottom of the window. The alarm codes are described in **Alarm** on page 29. Please observe that alarms related to a specific measurement channel

(such as low transmission etc.) is not reported here since these type of alarms are no summary alarm.

## Function keys

### Reset alarm

Pressing [F1] resets the alarm.

### Relay status

Pressing [F2] brings up a window that shows what LDS 3000 is currently sending out to the I/O-modules. Not available in the user level Quick Start.

### I/O-modules

Pressing [F3] shows information on connected I/O-modules. See the **Reference Manual**. Not available in the user level Quick Start.

### I/O Addresses

Pressing [F4] shows information on all I/O-modules possible to connect to LDS 3000. See the **Reference Manual**. Not available in the user level Quick Start.

### Back

Pressing [F6] you return to the Main window.



## 5. Calibration

LDS 3000 is calibrated before delivery. Due to the measurement principle and the continuous on-line calibration control, no further calibration is normally necessary. However, if for some reason the instrument needs to be recalibrated, it can easily be done on site, i.e. with a calibration cell located in the receiver of the sensor head.

Compensation parameters for pressure and temperature are stored in LDS 3000 before installation and after discussions with the customer. If temperature vary significantly it can be measured and fed into LDS 3000 using an optional analog input. This option is not available for pressure.

**Note!**

**The calibration procedure is critical and should only be performed by personnel from Siemens Laser Analytics AB or by certified personnel at site.**

### 5.1 Calibration procedure

The calibration procedure is self-explanatory. All relevant parameters like the concentration of calibration gas, etc. are entered. This function is only available for operators with the user level Normal or higher.

Main window → Calibration

Channel 1			Channel 2			Channel 3			Settings Window	
Path Len.	5.00	m	Path Len.	5.00	m	Path Len.	5.00	m	▲ Previous	
Cable Len.	50	m	Cable Len.	50	m	Cable Len.	50	m		
Gas Temp.	23	°C	Gas Temp.	23	°C	Gas Temp.	23	°C		
Pressure	1013	mbar	Pressure	1013	mbar	Pressure	1013	mbar		
Transm.	2084		Transm.	1787		Transm.	1555		▼ Next	
Ammonia	92.4		Ammonia	195		Ammonia	318			
Resp.Time	15.0	s	Resp.Time	15.0	s	Resp.Time	15.0	s		
Unit	PPM	▼	Unit	PPM	▼	Unit	PPM	▼		
SCALING			SCALING			SCALING			+ Increase	
Lower	0		Lower	0		Lower	0			
Upper	500		Upper	500		Upper	500			
CALIBRATIONS			CALIBRATIONS			CALIBRATIONS			- Decrease	
Ammonia	92.4		Ammonia	195.0		Ammonia	318.0			
Purge C.	0.0		Purge C.	0.0		Purge C.	0.0			
ALARMS			ALARMS			ALARMS			Calibration	
Transm.	25	%	Transm.	25	%	Transm.	25	%		
◀ Back										
Status:										

Calibration window

If an external calibration cell is used the settings for path length, temperature and pressure must be changed to appropriate values for the external calibration cell. When the calibration is completed these settings must be restored.

1. The calibration is carried out by flushing the calibration gas in the measurement path or by placing the calibration cell in the measurement path. The calibration cell is marked with a number referencing

its calibration protocol, which includes concentration and calibration date.

**If a calibration cell is used, please note that the fibre has to be connected to the calibration unit located in the receiver of the sensor unit, and that the detector must be moved to the calibration unit and attached properly. Also, please note that this calibration cell is calibrated assuming a 1 meter path length. If the instrument is set up using a different path length the calibration concentration entered above must be changed accordingly (calibration value \* path length = concentration in the calibration cell) or the path length is set to 1 meter during calibration. It is important that appropriate values for temperature and pressure are used.**

**Note!**

2. The measured value is observed and when it is stable press the function key labelled Calibrate.
3. Press the function key labelled Calibrate gas conc., followed by the function key Calibrate gas conc.channel-... where the appropriate channel number should be used.
4. The new calibration state will be permanent when the function key labelled Save Settings is pressed. The new parameters will then be saved on disk
5. Return to the Main window by pressing [F6].

The calibration is now completed. The time and the result of the calibration are stored in the log file in the system.



## 6. Alarm

This chapter describes all available alarms and diagnostics methods of the LDS 3000 system. This includes all settings and configuration possibilities.

### 6.1 Alarm indications in LDS 3000

#### Summary alarm 'L1'.

The summary alarm is controlled by a number of conditions. When all conditions are fulfilled the relay will be closed and the I/O ports activated. No measurement values is valid when L1 is active. Users with the lowest user level can only use the function Reset Alarm.

Main window → Alarm Table

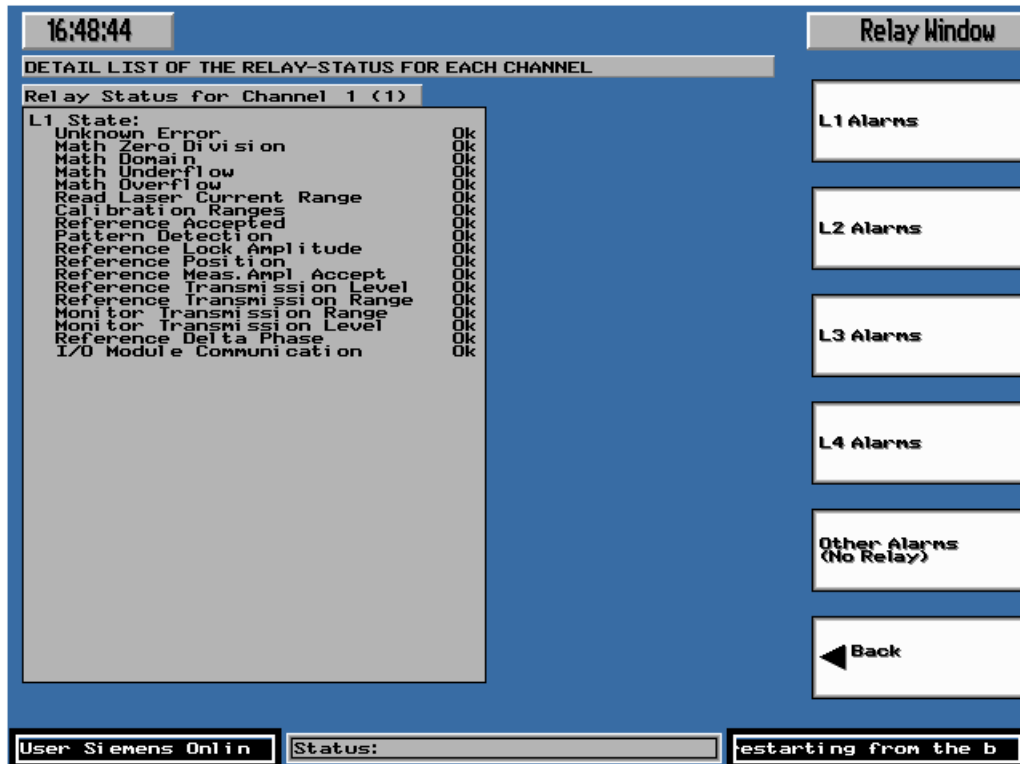
Alarm table

#### Note!

**The 'L1' relay output will always have the same state for all channels since it reflects the operating condition of the central unit and not the sensors.**

The conditions for L1 are displayed in the Relay window. This window displays the status of the relay modules, and a diagram showing the gas absorption lines for all active channels.

Main window → Alarm Table → Relay Status



Relay status

## Function key

### Back, [F6]

Return to the Alarm Table.

## Parameters

The dialogue at the top of the window contains the conditions for L1:

### Reference Shape Accepted

The amplitude of the reference channel must be visible in the graph and settled within its boundaries for acceptance during a sufficient period of time (depends on the temporal temperature characteristics of the laser heat sink - typically 1 to 10 min.). Normal state is 'Yes'.

### Reference Conc Within Normal

The amplitude of the reference absorption line must not go outside  $\pm 30\%$  of the nominal levels. Normal state is 'Yes'.

### Reference RMS. Within Range

The transmission RMS level of the reference channel must not go outside  $\pm 30\%$  of the nominal levels or exceed maximum limits. Normal state is 'Yes'.

### Mon. RMS Within Range

The transmission RMS levels from the laser itself must not exceed the preset hardware limitation level (varies from system to system) or go outside  $\pm 30\%$  of the nominal levels. Normal state is 'Yes'.

**DeltaPH. Within Range**

The Delta-Phase is an internal parameter important for the signal conditioning. Normal state is 'Yes'. It's state is not reflected on any relay.

**I/O Modules OK**

Is activated if any I/O module fails to respond. Normal state is 'Yes'.

**Channel x (1-3) ADR \$xx**

The hexadecimal number attached with each module (when being addressed by the software).

**Low Transm. Alarm L2**

This field shows 'Yes' when the transmission level goes below the alarm limit. The normal state is 'No'. This limit is set in the Settings window.

**High Conc. Alarm L3**

This field shows 'Yes' when the measured primary gas concentration level exceeds the alarm limit. Normal state is 'No'. This limit is set in the Settings window.

**DeltaP High. Detected**

Normal state is 'No'.

**Note!**

**The DeltaP. High indication is not assigned to any relays, and will only be shown on the status line, alarm table and within these fields.**

**High Water c. L4 (only in a two gas instrument)**

This field shows 'Yes' when a second, (usually water) gas type concentration level exceeds the alarm limit. Normal state is 'No'. Other options for this alarm function may exist in special applications

**Note!**

**The high water L4 field is only shown when the system is set up to measure a second gas type (commonly water). The limit is set in the settings window.**

## 6.2 Set the alarm limits for the relay modules

The alarm limits for the relay modules are set in the Settings window. Here we only describe the alarm parameters. For information about the other parameters and function keys, see the section **Basic functions** on page 9.

Main window → Settings window

Channel 1			Channel 2			Channel 3			Settings Window	
Path Len.	5.00	m	Path Len.	5.00	m	Path Len.	5.00	m	▲ Previous	
Cable Len.	50	m	Cable Len.	50	m	Cable Len.	50	m		
Gas Temp.	23	°C	Gas Temp.	23	°C	Gas Temp.	23	°C		
Pressure	1013	mbar	Pressure	1013	mbar	Pressure	1013	mbar		
Transm.	2084		Transm.	1787		Transm.	1555		▼ Next	
Ammonia	92.4		Ammonia	195		Ammonia	318			
Resp.Time	15.0	s	Resp.Time	15.0	s	Resp.Time	15.0	s	+ Increase	
Unit	ppm	▼	Unit	ppm	▼	Unit	ppm	▼		
SCALING			SCALING			SCALING			- Decrease	
Lower	0		Lower	0		Lower	0			
Upper	500		Upper	500		Upper	500		Save Settings	
CALIBRATIONS			CALIBRATIONS			CALIBRATIONS				
Ammonia	92.4		Ammonia	195.0		Ammonia	318.0		← Back	
Purge C.	0.0		Purge C.	0.0		Purge C.	0.0			
ALARMS			ALARMS			ALARMS			Status: <input type="text"/>	
Transm.	25	%	Transm.	25	%	Transm.	25	%		

Settings window

## Alarms

### Transm.

A value in percent, showing the transmission level where the transm. alarm is activated. The value can be set between 0.0 and 100.0% and is relative to the calibrated transmission level.

### Primary gas concentration

This value field has the same name as the primary gas type, e.g. ammonia. The value is expressed in the same unit as the primary gas concentration presented in the Main window (either: ppm, mg/Nm<sup>3</sup>(EU), mg/Nm<sup>3</sup>(US) or percent). The value can be set within the following ranges:

For units ppm and mg/Nm<sup>3</sup>: 0.0 to 1000000.0

For unit percent: 0.0 to 100.0

### Second gas concentration alarm limit

This field is only visible if a second gas type is measured, or when some other application-specific alarm is active, such as temperature. The value can be set as above.

## 6.3 Calibrate transmission level

The user must calibrate the transmission when the system operates under standard conditions (clean and well aligned sensors and normal dust load). The system will use this calibration to determine the value of transmission degradation. You are allowed to calibrate the transmission for one channel at a time.

Main window → Calibration window → Calibrate Transmission

Channel 1			Channel 2			Channel 3			Settings Window
Path Len.	5.00	m	Path Len.	5.00	m	Path Len.	5.00	m	Calibrate Transm. for Channel 1
Cable Len.	50	m	Cable Len.	50	m	Cable Len.	50	m	
Gas Temp.	23	°C	Gas Temp.	23	°C	Gas Temp.	23	°C	
Pressure	1013	mbar	Pressure	1013	mbar	Pressure	1013	mbar	
Transm.	2084		Transm.	1787		Transm.	1555		Calibrate Transm. for Channel 2
Ammonia	92.4		Ammonia	195		Ammonia	318		
Resp. Time	15.0	s	Resp. Time	15.0	s	Resp. Time	15.0	s	
Unit	ppm	▼	Unit	ppm	▼	Unit	ppm	▼	
SCALING			SCALING			SCALING			Calibrate Transm. for Channel 3
Lower	0		Lower	0		Lower	0		
Upper	500		Upper	500		Upper	500		
CALIBRATIONS			CALIBRATIONS			CALIBRATIONS			Decrease
Ammonia	92.4		Ammonia	195.0		Ammonia	318.0		
Purge C.	0.0		Purge C.	0.0		Purge C.	0.0		
ALARMS			ALARMS			ALARMS			Save Settings
Transm.	25	%	Transm.	25	%	Transm.	25	%	
Status:									Back

Store Normal value for Transm. RMS window

Press the function key for the channel you wish to calibrate nominal transmission levels for. Press Save Settings to store these levels.

## 6.4 View connected I/O-modules

When the LDS 3000 starts up, it connects all available modules in the I/O network automatically. The list of connected system modules can be viewed in the I/O-modules window. It takes a few seconds after start-up before the system has located all connectable I/O-modules.

Main window → Alarm Table → I/O-modules

The screenshot shows the 'I/O Window' interface. At the top left, the time is 10:00:27. The main title is 'SYSTEM SETUP OF COMPLETE I/O-MODULE LIST'. Below this is a table with columns: Address, Type, Chan, and Usage. The table lists three modules: \$11 (Ana-Out), \$21 (Dig-Out), and \$31 (Ana-In), all on channel 1. Usage for \$11 is Gas Conc., for \$21 is Alarm Level, and for \$31 is Temperature. Below the table, it says '3 module(s) found in system.' To the right of the table are navigation buttons: Previous, Next, Increase, Decrease, Save Settings, and Back. Below the table is the 'I/O MODULE SETTINGS' section, which is divided into two columns of settings. The left column includes I/O Type (Adam / NuDam), COM-Port (1), IRQ Vector (4), In.Tmin (32.0 °C), In.Tmax (1500.0 °C), In.Prs.min (0 mbar), In.Prs.max (4000 mbar), In.Amin (4 mA), In.Amax (20 mA), InRng (+/- 20 mA), OutRange (4 - 20 mA), and ViewMode (All Detected). The right column includes Chan (1), Water comp range (C.Lo 0.00 %, C.Hi 49.00 %), Limits (TL.Lo 23 °C, TL.Hi 1000 °C, T.Def 23 °C, PL.Lo 0 mbar, PL.Hi 2000 mbar, P.Def 1013 mbar, CL.Lo 0.0 %, CL.Hi 49.0 %, C.Def 0.0 %). At the bottom, there is a 'Status:' field.

Show List Of Connected I/O-modules window

The list contains information about every module. The normal user can only view these parameters. For a user with system user level it is possible to change the parameters in the I/O-modules, such as communication port, module types and scaling.

## I/O module settings

Changes here should only be performed by certified personnel.

**Note!**

### COM-Port

This is the port used for the RS-485 transferring between LDS 3000 and the I/O modules. The system supports two ports and the default setting does normally not need to be changed.

### IRQ Vector

The request for interrupt setting only needs to be changed when the com-port is altered. The following IRQ's should be used:

COM1 – IRQ4

COM2 – IRQ3

### In T<sub>min</sub> and In T<sub>max</sub>

The input temperature range of the analog modules for temperature measurements connected to LDS 3000 can be set, corresponding to the transducers in the process.

The lower setting (0 - 1999 degrees) must not be higher than the upper setting (1 - 2000 degrees).

**In A<sub>min</sub> and In A<sub>max</sub>**

The input current range of the analog modules for temperature measurements connected to LDS 3000 is set here.

The usual setting is 0 – 20 mA or 4 – 20 mA but it can have any range.

**InRange**

The type of the input modules connected to LDS 3000 must be configured at start-up. This pop-up menu contains the types supported by LDS 3000 and the proper choice must be made here.

**OutRange**

The type of the output modules connected to LDS 3000 must be configured at start-up. This pop-up menu contains the types supported by LDS 3000 and the proper choice must be made here.

**ModSelect**

This parameter is not yet implemented.

**Exchanging data with other sensors**

In many cases the calculation of a concentration value depends on other parameters such as temperature, pressure, concentration of other gases like water, etc. These parameters can be transferred to LDS 3000 via 4 – 20 mA modules. The other sensor can be another LDS 3000 measuring for instance water or it can be a thermocouple delivering a temperature value. The ranges and limits for these parameters are set here.

**Chan**

The settings under **Ranges** and **Limits** are channel specific and the appropriate channel is selected here – 1 through 3.

**Ranges****C.Lo and C.Hi**

This is the lower and upper range limits for the incoming or outgoing concentration values. When two LDS 3000 are interconnected these settings must coincide. LDS 3000 can not act as a receiver and transmitter at the same time.

Valid interval is 0 to 100 000 ppm.

**Limits**

These settings are used as a quality check of the incoming parameters. If for instance a thermocouple fails the signal will fall outside these limits and the measured value will be replaced with a default value representing an educated guess of the actual value.

**TL.Lo and TL.Hi**

This is the lower and upper range limits for the incoming temperature values.

**CL.Lo and CL.Hi**

This is the lower and upper range limits for the incoming concentration

values.

## 6.5 View I/O configurations

This feature is available for users who configure the system's I/O-modules. The following list shows the different I/O modules that can be attached to the system, and how the modules should be configured.

Main window → Alarm table → I/O Addresses

The screenshot shows the 'I/O Window' interface. At the top left, the time is 10:00:27. The main window title is 'SYSTEM SETUP OF COMPLETE I/O-MODULE LIST'. It contains a table with the following data:

Address	Type	Chan	Usage
\$11	Ana-Out	1	Gas Conc.
\$21	Dig-Out	1	Alarm Level
\$31	Ana-In	1	Temperature

Below the table, it says '3 module(s) found in system.' To the right of the table are several control buttons: 'Previous', 'Next', '+ Increase', '- Decrease', 'Save Settings', and 'Back'. Below the main window, there is a section for 'I/O MODULE SETTINGS' with two sub-tables:

I/O Type		Chan	
I/O Type	Adan / NuDam	Chan	1
COM-Port	1	Water conc range	
IRQ Vector	4	C.Lo	0.00 %
In.Tmin	32.0 °C	C.Hi	49.00 %
In.Tmax	1500.0 °C	Limits	
In.Prs.min	0 mbar	TL.Lo	23 °C
In.Prs.max	4000 mbar	TL.Hi	1000 °C
In.Amin	4 mA	T.Def	23 °C
In.Amax	20 mA	PL.Lo	0 mbar
InRng	+/- 20 mA	PL.Hi	2000 mbar
OutRange	4 - 20 mA	P.Def	1013 mbar
ViewMode	All Detected	CL.Lo	0.0 %
		CL.Hi	49.0 %
		C.Def	0.0 %

At the bottom of the window, there is a 'Status:' field.

Show Setup Of Complete I/O list window

The following is shown in this window:

1. The module's addresses (hexadecimal), ranging between 01 and 73.
2. The module type. The following types are currently available:
  - Analog Output → Used for concentration/temperature/transmission levels
  - Digital Output → Used for alarms (relays)
  - Analog Input → Commonly used for temperature input
3. The module usage field explains for what the individual modules are intended. The following module functions are currently available:
  - Gas Conc., Alarm Level, Temperature, Transmission, Water Conc., extended O<sub>2</sub>/Temperature.

## 6.6 Status line and alarm table

On the status line, alarm codes concerning the current system status are displayed. It is also possible to obtain a more detailed description about the alarm in the alarm table where you will find information about the date and time of the occurrence. Different types of messages have different duration period depending on the message's nature and the degree of importance. Each displayed message also has a delay while it is in the



background, until it can occur again. The following table describes the status text.

<b>Alarm code</b>	<b>Minimum duration (sec)</b>	<b>Meaning/comment</b>
AD	3	The momentary analog data conversion was invalid and could not be used for measurement. System may require restart.
AP(1-3)	5	There is currently a gas concentration alarm on the given channel (primary gas type), and the L3 relay for this channel is now closed. This alarm is not displayed in the alarm table.
AS(1-3)	5	There is currently a concentration/analysis alarm on the given channel (second gas/analysis type), and the L4 relay is now closed. This alarm is not displayed in the alarm table.
AT(1-3)	5	The transmission level for the given channel is below the accepted level. L3 relay is closed in the digital output module associated with the channel. This alarm is not displayed in the alarm table.
TRM	20	The reference channel's transmission level has gone below the set limit, and the L1 relays on all digital output modules are now closed.
LC	4	The laser current has given an incorrect reading during a non-accepted period of time. When not in privileged mode, this will normally cause the software to restart.
MXX	7	A previously connected I/O-module has stopped responding and has been disconnected from the network. XX is the module hexadecimal address
MO,MU,ZD	1	An internal mathematical error has occurred in the software. Measurement is currently invalid. The connections should be verified.
RP	10	Reference channel's position is not accepted. L1 is closed, (may be temporary).
RA	10	Reference channel's amplitude is not accepted. L1 is closed, (may be temporary).
QR	7	This alarm is specific for the oxygen/temperature measurement.
MD	5	Math. domain error
FS	5	Fine Scan Mode started
FC	5	False Beer-Lambert calibration constant
TR(1-3)	5	Max transmission level reached
MON	5	Monitor level deviates from normal

Alarm code	Minimum duration (sec)	Meaning/comment
DPR	5	Reference Delta Phase level exceeds maximum level
DP(1-3)	5	Delta Phase level for measurement channel exceeds maximum level
NP.	5	No pattern detected (fatal)
ATR	5	Transmission in reference channel deviates more than 30% from normal

## Alarm Table

The alarm table contains a table presenting a history of the last four alarms that have occurred (of different types). The user resets the alarms in this window. Any status message presented keeps information about occurrence date/time and the amount of times the alarm has occurred. Many messages will also contain information about probable causes and the eventual action needed. Notice that the order of the message does not say anything about their importance, neither does the time of its latest occurrence.

Main window → Alarm Table

The screenshot displays the 'Alarm Table' interface. The main window is titled 'REPORT OF THE FOUR LATEST OCCURED SYSTEM ALARMS.' and contains four stacked text boxes, each displaying '<not logged>'. To the right of the main window is a vertical sidebar with the following buttons: 'Reset Alarm', 'I/O Module List', 'Relay Status for Channel 1', 'Relay Status for Channel 2', 'Relay Status for Channel 3', and 'Back'. At the bottom of the main window, there is a 'Status:' label followed by a text input field.

Alarm Table

Use the [F1] key to reset alarm. Most of the displayed messages are also appended to a log file, which will be viewable when using the communication software LDS Communication Client (LDSComm). The log file only

contains brief and shortened text entries of the occurred system events.

## 6.7 Viewing temperature from input modules

Some systems are supplied with a temperature (analog) input module accepting an input of 4-20 mA. If LDS 3000 is configured to measure only one gas it is possible to activate a second bar graphs for each active channel in the *Main window* showing the process temperature in °C. This temperature reading is also available as an analog output if an appropriate output module is connected and configured. The temperature value is also available in the *Settings window* as usual.

### Note!

**This option only applies to one gas systems since only two bar graphs can be displayed simultaneously. Configuring the system can only be done by trained personnel with the highest privileges.**

### Note!

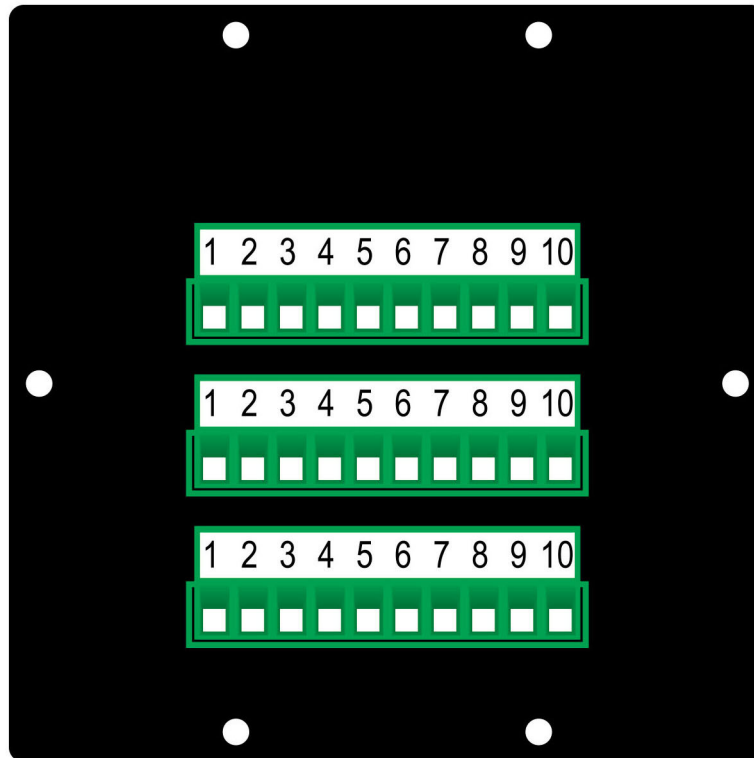
**The input modules are mounted on the door in CU 3000. However, the connection must always be done via the inputs on the back of the instrument. These inputs are all equipped with EMC filters to assure stable operation of LDS 3000 in electrically difficult environments. Connecting thermocouples directly on the input module inside CU 3000 can induce severe drift problems.**



## 7. External connections

There are provisions for a large number of external connections.

LDS 3000 is by default equipped with a 4-20 mA output for each gas value measured. Also an alarm output for the optical transmission level in the measurement channel is provided in the standard configuration. As an instrument alarm the 4-20 mA outputs for gas concentration are all at 0 mA when the system is not working properly or when it is shut down. All outputs/inputs are EMC-protected. The I/O ports are located on the rear of LDS 3000 on 10 screw joints per channel - maximum 3.



*External connections*

The following connections are active for each channel by default:

1. +Gas conc.(same range as the horizontal bar graph in LDS 3000).
2. -Gas conc.
3. Transmission OK (relay open).
4. Common.
5. +Gas conc. for second gas or temperature (when applicable).
6. -Gas conc.
7. +Transmission level in measurement channel.
8. -Transmission level.
9. +4-20 mA input (for instance temperature in measurement path)
- 10.-4-20 mA input

If LDS 3000 is configured to measure two gases, the second gas will have a 4-20 mA output on pins 5 and 6 in the same way as the primary gas. It is possible to activate optional output/inputs. The following table describes optional connections.

Parameter	Input/output	Range
Trans RMS. The optical transmission in the optical path can be monitored. The transmission level must first be calibrated and then a 4-20 mA output is available.	Analog output	0 - 200% (100% is set at calibration of transmission).
Measurement path temperature. When the temperature in the measurement volume is varying within large limits it is possible to compensate for this.	Analog input	Standard is 4-20 mA $T_{\min}$ to $T_{\max}$ .
Measurement path temperature. In some applications LDS 3000 can derive the temperature in the process gas from the spectroscopic data. This temp. signal will then be delivered as a 4-20 mA signal.	Analog output	$T_{\min}$ to $T_{\max}$ .
Transmission alarm.	Digital output	relay
Gas concentration alarm.	Digital output	relay
Gas concentration alarm, secondary gas.	Digital output	relay

**There is a limited number of I/O connections and LDS 3000 can only be equipped with as many I/O's as there are connections available. However, with 30 connections available there is normally no shortage of I/O connections, especially not in a system with less than three channels.**

**Note!**

## 8. Communication

This chapter describes the remote communication with LDS 3000. The remote system calling LDS 3000 can be a standard PC running the application "LDS Communication Client" (LDSComm) under Windows 95/98 or Windows NT with a modem installed and configured. One important feature of LDSComm is its possibility of logging measurement data onto the client hard drive. LDSComm is optional software and is described in detail in a separate Manual. LDS 3000 creates a record of all communication activities on the PC-card. The related settings are described below. This menu is not available for user level Quick Start.

The actions in the communication window normally requires a standard PC keyboard connected to LDS 3000 (by opening the back door and connecting it in the appropriate connector).

The following describes the functions available when using LDSComm.

### 8.1 The communication window in LDS 3000

The basic setting (i.e. "Com. type") and communication with the client is done in the Communication window. If a text message is received from the remote system it is shown with the preamble "Text message" in the Status line. It is also possible for the sender to force the message to show on LDS 3000 automatically. Then the Communication window will automatically appear and to continue where you were you must press the key Resume Activity.

*Main window → Communication window*

14:35:40

Com. Window

COMMUNICATION STATUS AND MESSAGES FROM/TO SYSTEM.

Incoming Text Messages

Outgoing Text Messages

COMM. INFORMATION	
User	<No Connection>
Level	<undefined>
Transfer Status :	Idle (Waiting)
Baud Rate	9600
Comm.Type	Off

Init String ATZ|AT&F|AT&C1|ATS9=6 S25=2 S38=0 S0=1

Status:

Resume Activity

Parameter Settings

Write Message

Disconnect User

Back

*Communication window*

## Function key

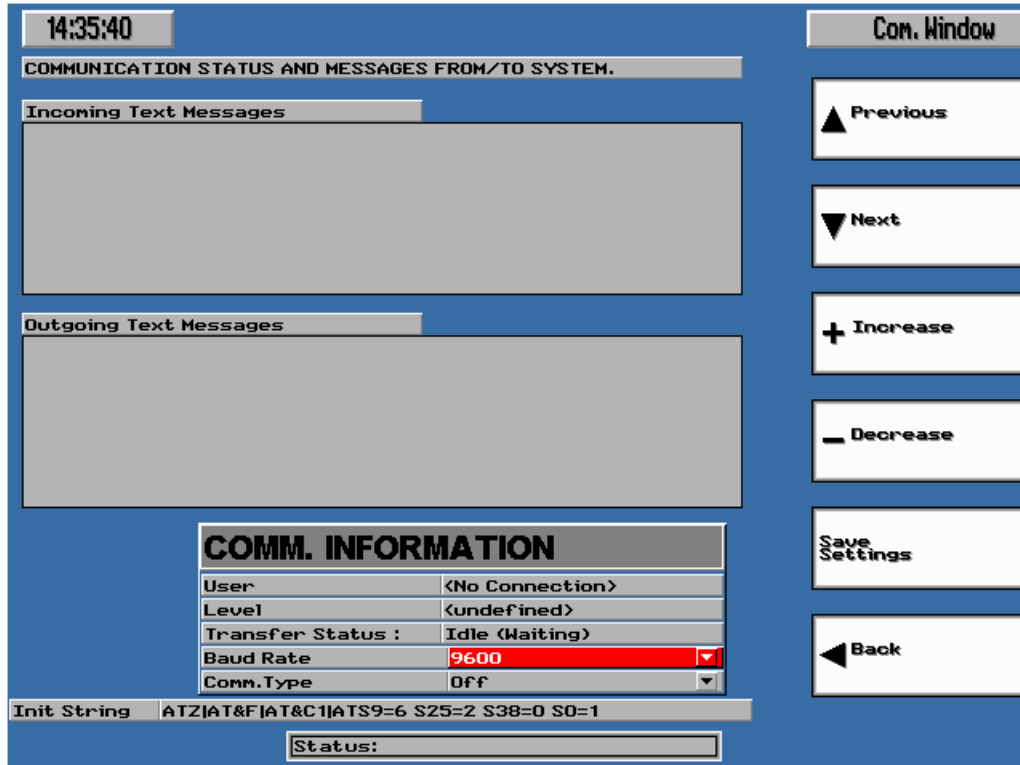
### Resume Activity, [F1]

Return to the window displayed when the message was received.

### Parameter settings, [F2]

Brings up keys that allows you to modify the parameters on this window.

*Main window → Communication window → Parameter settings*



*Parameter settings*

## Parameter settings (COMM. INFORMATION)

### User

Identifies the connected user. This user must be stored on the systems PC-card.

### Level

This shows the privilege level of the connected user – se **User level** on page 15.

### Transfer status

Shows the present activity on the serial port.

Message	Meaning
Idle (waiting)	LDS 3000 is ready and waits for an external user to connect.
Init...	LDS 3000 is initializing the modem and/or the serial port
Text Mode	LDS 3000 is in text transfer mode
Binary Mode	LDS 3000 is in binary transfer mode



Message	Meaning
Sending SMS	LDS 3000 is sending a SMS-message to a mobile phone or to an email account.
Hanging up (Comm Err.)	Connection error, LDS 3000 is trying to disconnect
LabView Bin.	LDS 3000 is connected to LDSComm in LabView mode and transfer is progressing.
Executing...	LDS 3000 is executing a DOS command on request from the external user.
Preparing...	LDS 3000 is preparing to send or receive a file.
Done XX%	File transfer is ready to XX%
Hanging up...	The external user has requested LogOff which now is in action

### **Baud rate**

Sets the baud rate for the external connection. In local mode this can be set to 57600. The connected user and the system must be set to the same baud rate. The accepted baud rate depends on the quality of the telephone line used. The default setting is 9600 and is acceptable in most situations

### **Com. type**

*Off*

In this position you cannot logg on. Incoming calls are ignored. This is the preferred setting when no modem line or phone line is connected.

*Local*

In this mode it is possible to access LDS 3000 via a “null modem cable” if the client system is located close to LDS 3000. The only signals that need to be connected in the cable are RX ↔ TX. CTS/RTS shall not be connected in this cable.

*External modem*

The system is connected to an external modem on one of the dedicated communication ports. The modem/modem settings must comply with the following:

- Baud rates up to 38 400 bps.
- Compatibility with Hayes AT industry standard.
- Handle hardware controlled flow control and error correction.

*External GSM-modem*

The system is connected to an external modem on one of the dedicated communication ports. The modem/modem settings must comply with the following:

- Baud rates up to 38 400 bps.
- Compatibility with Hayes AT industry standard.
- Handle hardware controlled flow control and error correction.

## Init String

At start-up any modem connected to LDS 3000 is initiated with one or more “init strings” that are passed to the modem. The commands in the default init strings complies to the Hayes standard. The modem is also re-initiated after shut-down and also every 10 seconds if the modem is in the idle state (see table above). The default init string is optimized for the modem type selected under “Com. type” above. Some modems, for instance if it does not comply to the Hayes standard, may require a modified init string. The modification is done by moving the cursor to the field with the init string and modifying it. This operation requires a standard PC keyboard connected to the instrument. If the change is permanent the setting must be saved.

### Write Message, [F3]

Brings up keys that allows you to exchange text messages with a connected user.

*Main window → Communication window → Write message*

The screenshot shows the 'Communication window' interface. At the top left, a digital clock displays '14:35:40'. Below it, a header reads 'COMMUNICATION STATUS AND MESSAGES FROM/TO SYSTEM.'. The main area is divided into two sections: 'Incoming Text Messages' and 'Outgoing Text Messages', both represented by large empty text boxes. To the right of these sections are two buttons: 'Send Message' and 'Clear Message'. Below the message sections is a 'COMM. INFORMATION' table with the following data:

COMM. INFORMATION	
User	<No Connection>
Level	<undefined>
Transfer Status :	Idle (Waiting)
Baud Rate	9600
Comm.Type	Off

Below the table, the 'Init String' is displayed as 'ATZ|AT&F|AT&C1|ATS9=6 S25=2 S38=0 S0=1'. At the bottom right, there is a 'Back' button with a left-pointing arrow. At the very bottom, a 'Status:' field is visible.

*Messages*

If a standard keyboard is connected to LDS 3000, it is possible to compose text messages in the text frame labelled “Outgoing text messages” and to send them to the connected user. When the message is written, the function key labelled “**Send message [F1]**” must be pressed and the message will be sent if it is allowed (You will be denied if there is traffic on the connection at the moment - just try later). Confirmation is shown on the system status line in the lower right corner of the display. Each time a new message is written, the preceding message can be erased by pressing the function key labelled “**Clear message [F2]**”.

**Disconnect User, [F4]**

Disconnect the modem connection.

**Connected users****Note!**

You can continuously see on bottom left on the screen if someone is logged on, and if so, who is logged on. This information is also stored on the log file resident on the PC-card in LDS 3000.

**8.2 Status messages on LDS 3000**

During communication with a user, certain messages can be shown for approximately three seconds in the status line in the lower right corner of the display. All of these messages are stored in the system log file. The abbreviations shown in the status line are listed below.

**User logged on**

This indicates that a user has logged-on with the correct password. The name of the logged on user is displayed.

**User logged off**

The user has logged off in a correct way.

**Lost contact**

Contact with the connected user was prematurely terminated. A reason for this could be a bad telephone connection. If this occurs frequently the modem connection, phone plug, etc. should be checked.

**Hanging up (Com. error)**

When this happens, LDS 3000 has broken the connection because no handshaking has occurred for more than one minute.

**Unknown packet**

A corrupt data package has been detected. A low priority message with a very low occurrence rate.

**Checksum error**

Not very serious if it happens on rare occasions. It means that some of the information during transfer from the host to LDS 3000 was lost. A reason might be a noisy line causing bit errors.

**Text message**

A text message was sent from the client. If the client did not automatically change the window to the Communication window, you must do so manually to read the message.

**Message sent**

Confirmation that a message was successfully sent from LDS 3000 to the external client.

**Message not sent**

Your message was not sent at this time because of ongoing communication. Try later.

**Executing...**

The host is running an executable batch file on LDS 3000. This message

flashes until the task is completed.

**Receiving file...**

The host is sending a file to LDS 3000. This message flashes until the task is completed.

**Sending file...**

LDS 3000 is sending a file to the host. This message flashes until the task is completed.

**Transfer stopped**

Transfer of the file was stopped. The reason can either be that the host cancelled the operation or that a file storage error occurred.

## 8.3 System reboot by a connected user

**Reboot message**

It is possible for users in the remote system with sufficient privileges to perform a reboot of the system, for instance when an upgrade of the software has been done. The operator of LDS 3000 will be informed about the reboot.

**A user connected to LDS 3000 has selected to reboot the system in order to be able to update the software. Please select "Override" if you wish to cancel this operation.**

**Note!**

This enables you to delay the reboot to a more convenient time.

## 9. Service

During normal use of LDS 3000 the central unit needs no service. The sensors and their optical surfaces will need regular maintenance. Depending on application and purging method the interval may be between 1 and 12 months.

### Cross duct sensor

If the transmission in a channel drops below the level set by the user, the sensor in this channel needs to be serviced (cleaning of the optical surfaces or realigning of the optical path). The procedure for this is described in the **sensor manual**.

### Semi extractive in situ sensor

If the flow rate of the gas drops below the level set by the user, the sintered steel filter needs to be cleaned or replaced.

All other types of service must be carried out by authorized personnel only. For more detailed information about the different sensors, refer to the manual for the respective sensors.

### Calibration check

Using the optional calibration cell CC 3000, the calibration can be checked at any time. Normally the LDS 3000 does not have to be calibrated but due to local regulations the calibration has to be checked with regular intervals.

#### Note!

**The calibration procedure is critical and should only be performed by personnel from Siemens Laser Analytics AB or by certified personnel at site.**

