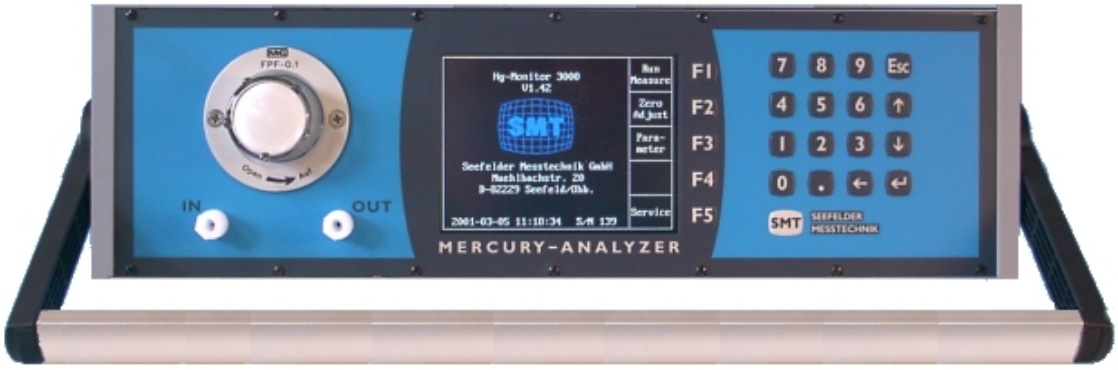
User's Guide...

Mercury Analyzer



Hg Monitor 3000

Seefelder Messtechnik

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Version Number

Edition	Month / Year	Valid for Software Version
1.0	December 2000	1.42

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Germany

Part No: V73/3/01-20d

Edition 1.0

Release 12.200

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CUSTOMER SERVICE

We at Seefelder want to provide you with the very best customer service possible. If you have any questions, problems or comments about the instrument, we would like to hear from you. In addition, it is recommended that all maintenance and repair work on the instrument should only be done by Seefelder customer service or appropriately trained personnel. You can reach us at:

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E-Mail: seefelder@t-online.de

SAFETY INSTRUCTIONS

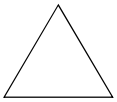
Throughout this User's Guide we will try to indicate explicitly hazardous situations that could potentially result in personal injury or damage to the instrument.

Please read this User's Guide carefully before installing and using the instrument. In particular, please pay attention to paragraphs that refer to possible hazardous situations.

Warnings and messages are presented as follows:

Indicates that non-compliance with the instructions can lead to potential personal injury.

Warning



Indicates that the instructions must be followed explicitly to avoid damage to the instrument.

Attention

Voltage

Danger of potential injury

Warning

- Always run the instrument with a ground connection (grounding).
- Do not remove or open the internal ground connection under any circumstances.
- If the instrument is switched on, the electrical connections are charged. Therefore, do not attempt to touch internal components when the instrument is switched on. Internal components should only be touched or removed when the monitor has been switched off.

The following general guidance should be followed during operation of the instrument:

- Do not touch the interior components of the instrument when it is switched on.
- Never operate the instrument if the cover or any other parts the instruments are removed.

- Only Seefelder customer service or appropriately trained personnel should perform maintenance and repair work.
- If you observe that the instrument has insufficient grounding or that the grounding connection is damaged, please take the instrument out of operation and prevent unauthorized use of the instrument.

Some situations leading to insufficient instrument grounding include:

- Instrument has visible physical damage.
- Instrument was stored for a long time under unfavorable conditions (e.g. high humidity environments).
- Instrument was handled improperly during transportation and shipping.

Explosive gases in the operating environment

The instrument should never be operated in an explosive environment.

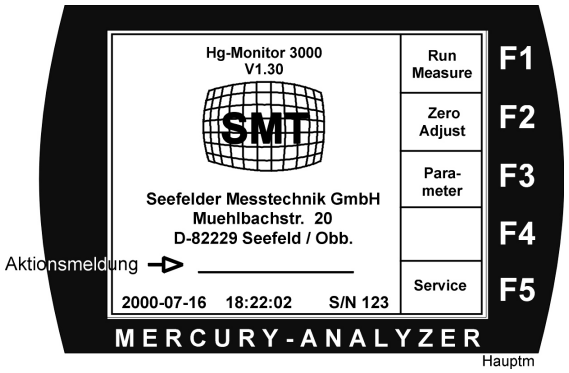
Warning

Some other environments that can lead to operating problems and should be avoided include:

- Outdoor environments where the instrument is not appropriately protected from nature's elements (sun, rain and snow).
- Excessively humid environments.

1 QUICK START

An automatic initialization program starts when the analyzer is turned on using the power switch located on the back panel. Messages will appear on the front display indicating various stages of the startup routine:

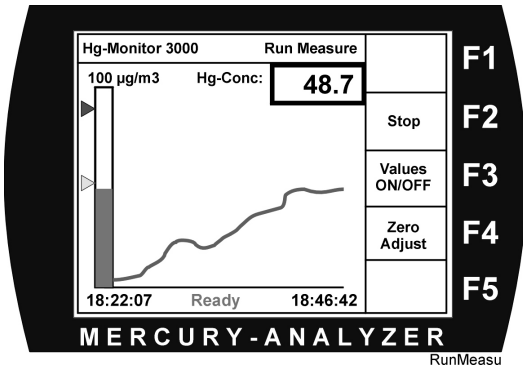


WAITING FOR LAMP

STABILIZING

ZERO ADJUST

Note: *This process can take to up to 10 minutes. After successful completion of the startup sequence, the internal flow gas pump starts automatically. At this point, the instrument is ready for making measurements.*



F1

F2 Stop

F3 Value ON / OFF

F4 Zero Adjust

F5

Press the **FI Run Measure** selection to start making measurements. The air will flow through the analyzer. On the monitor, the real-time value of the mercury concentration is displayed numerically and graphically. The analog output (4 to 20 mA or 0 to 10v) is proportional to the measured value. Press **F2 Stop** to stop taking measurements.

Note: *Even after the **F2 Stop** selection is pressed, the pump will continue to operate and air will flow through the analyzer.*

2 INTRODUCTION

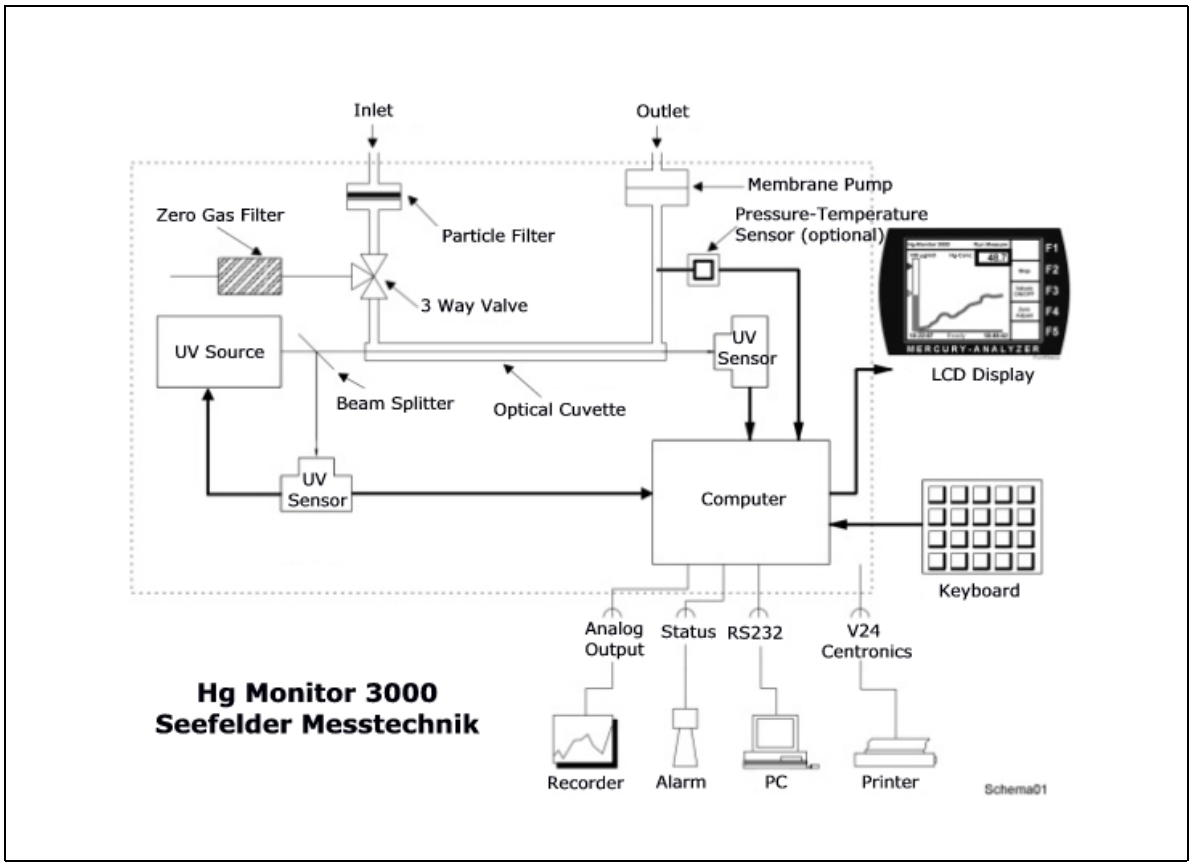
The Hg Monitor 3000 is a compact fixed wavelength UV photometer for measuring mercury concentrations in air. It can be used in the laboratory, for process control, for workplace exposure studies and for mobile field applications. The instrument has been designed so that it can operate with minimal startup preparation. Using the built-in flow pump, air passes through an optical cuvette in the instrument and real-time values are displayed continuously. The instrument is factory calibrated and does not require a user-calibration process. Within the measuring range, two threshold alarm limits can be selected. When concentrations exceed those threshold values, an external alarm can be triggered via output signals. The instrument can be attached to an external recording device (e.g. strip-chart recorder.) It is also possible to connect the analyzer to a personal computer and values can be displayed either numerically or graphically. Analog output consists of 0 to 10 volts or 4 to 20 mA. The analog output is proportional to the measured values. By pressing the **F2 Stop** selection, measurements are temporarily paused, however, the pump still continues pulling air through the analyzer.

2.1 Measuring Principle

The Hg Monitor 3000 operates on the principle of Atomic Absorption Spectroscopy (AAS). This technique is one of the most reliable and sensitive methods for measuring mercury. Besides noble gases (e.g. Argon, Krypton etc), Mercury is one of the few elements that is monoatomic at ambient temperatures. This attribute allows mercury to be measured using AAS. Sample air passes continuously through the optical cuvette where absorption (attenuation) of the light produced by a UV lamp (253.7 nm Hg line) is measured.

2.2 Analyzer Design

The Hg Monitor 3000 consists of a radiation source (UV lamp at 253.7 nm), the absorption cell/cuvette, the photodetector with an amplifier and the computer. A diaphragm pump pulls air directly through the cuvette. The UV radiation is absorbed by mercury atoms in the sample gas stream resulting in a signal modification, which corresponds to the concentration of mercury within the sample stream.


Inlet
Outlet
Membrane Pump
Zero Gas Filter
Particle Filter
Pressure-Temperature
Sensor (optional)
3 Way Valve
UV Source
UV
Sensor
LCD Display
Beam Splitter
Optical Cuvette
UV
Sensor
Computer
Keyboard
Analog
Output
Status
RS232
V24
Centronics
Hg Monitor 3000
Seefelder Messtechnik
Recorder
Alarm
PC
Printer
Schema01

3 TECHNICAL DESCRIPTION

3.1 UV Lamp

An electrodeless low-pressure mercury lamp is used to obtain long-term stability. This UV source was developed exclusively for our mercury analyzers. The extremely long life span of the lamp is achieved because the lamp does not possess any inner electrodes (which are common in hollow cathode lamps.) To maintain constant output, a high-frequency field is maintained around the lamp. The main spectrometric line produced by the analyzer is 253.7 nm and it is extremely narrow. In order to eliminate lamp drift, the lamp temperature is controlled thermostatically.

3.2 UV Detector

A unique UV sensitized photodiode is used for measuring UV radiation. The photodiode together with the preamplifier form the UV detector. Using a narrow-band interference filter eliminates stray radiation.

3.3 Optical Cuvette

The optical cuvette is constructed from SUPRASIL and has an optical path length of 230 mm. The pump is configured behind the cuvette and ensures an even flow rate within the cuvette. Within the cuvette, mercury atoms absorb the UV radiation resulting in an attenuated signal that is dependent upon the mercury concentration.

3.4 Measurement Value Display

The current measurement value can be read directly from the front display. The last measured value is written on the front screen and displayed graphically. It is possible to configure the instrument to display values for time intervals ranging from 0.5 hour to 16 hours. The current value can also be displayed simultaneously on a chart recorder. Calibration of the analyzer is not required. Zero adjustment takes place automatically at preselected time intervals. If the Zero interval is set to 0, no automatic zero point adjustment is done.

Note: *When the Hg Monitor 3000 is switched on, an initial zero point adjustment is done and subsequent adjustments are done every 10 minutes for a period of one hour. This sequence is necessary to eliminate the initial thermal drift of the instrument.*

3.5 Measurement Value Outputs

The sockets and built-in connections on the back panel have the following specifications:

ANALOG OUTPUT	4 - 20 mA or 0 - 10 V, see identification plate (optional), BNC socket, center: + pluses / outside: - minus
PRINTER	Standard Centronics
RS232: 9 – pin SUB-D	Pin No. 2 RxD1, pin No. 3 TxD1, pin No. 5 GND, remaining pins: unoccupied Data communication: 9600 Baud, 8 data bit, 1 stop bit, no log, no parity
COMMUNICATION PROTOCOL	Data communication: 9600 Baud, 8 data bit, 1 stop bit, no log, no parities
STATUS: 9 – pin SUB-D	Reed-relay, 50 V, 400 mA -actively: Contact closed Exceedance of alarm level 1: Pin No. 1.2 Exceedance of alarm level 2: Pin No. 3.4
SPECIAL: 9 - pin SUB-D	9 pin SUB D connector for internal service
I/O: 50 – pin SUB-D	Not used currently
BATTERY OPERATION	PIN 1,2: + 12 V...+ 15 V DC, PIN 3: NC, PIN 4,5: GND
POWER: FUSE 2A / SLOW	100 – 240 V AC

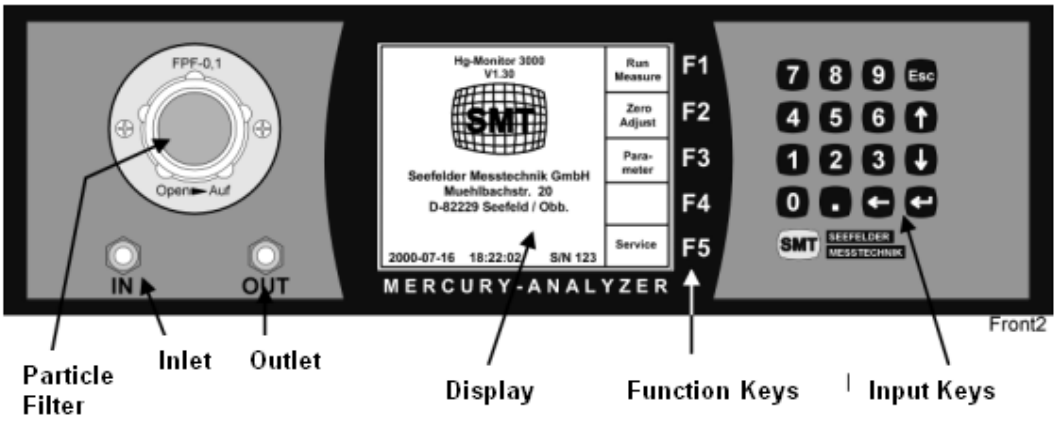
3.6 Electrical Fuse Protection

On the back panel of the instrument you will find a fuse between the power switch and the electrical connection socket. Please refer to the analyzer identification plate for details. Normally for 230v a T 2 A fuse is used.

4 OPERATING INSTRUCTIONS

4.1 Display Panels

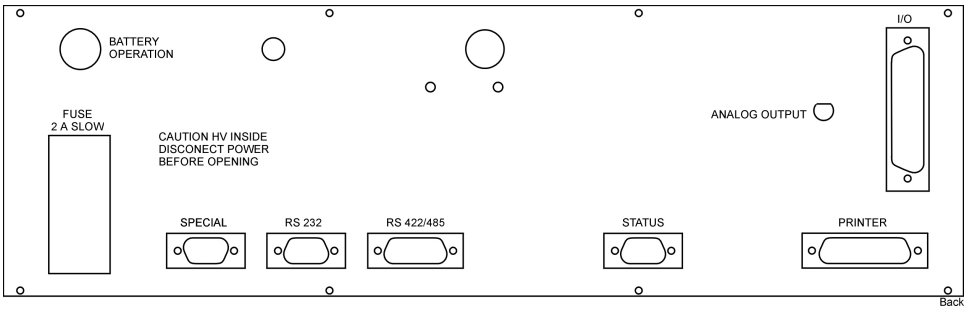
4.1.1 Front Display



All operating functions of the Hg Monitor 3000 can be accessed through the controls on the front panel. The sample inlet and outlet are also located on the front panel. A particle filter is located on the front panel and must be changed frequently depending upon instrument usage. The particle filter is accessed by turning the glass housing in an counter-clockwise direction. The selection keys F1 through F5 are used for used for various functionalities. The digital keypad can be used to enter numerical values, when necessary.

4.1.2 Back Panel

On the back panel you will find the power inlets and a connector for battery operation (12 Volt DC). The analog output connector can produce 0 to 10 volts or 4 to 20 mA. The printer port produces standard Centronics format output. The connector marked “status” is used to check alarm levels and analyzer status. The connector marked “special” is used for service-related work.



4.2 Preliminary Operation

Before you power up the instrument and start taking measurements, please make sure that the particle filter is physically located within the intake filter housing.

Note: *The filter can be removed or placed in the housing by turning the glass screws in a counter-clockwise direction.*

Once the analyzer is connected to an appropriate power supply (voltage as per analyzer identification plate) and the power switch is activated, the analyzer begins the startup sequence. The measurements will be delayed until the UV lamp has stabilized and its proper operating temperature has been attained. Subsequently, an automatic zero point alignment will take place.

Note: *This process can last up to 10 or 15 minutes depending upon temperature conditions.*

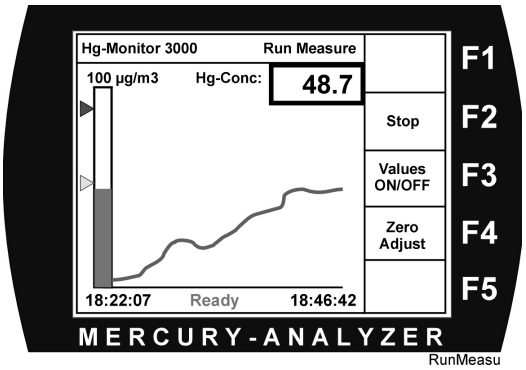
The startup sequence comprises of the following:

WAITING FOR LAMP	Waiting period as lamp ignites
STABILIZING	Waiting period as lamp stabilizes
ZERO LINE ADJUST	Zero point alignment

Note: *During the first one hour of operation the system may have significant drift in the displayed values. During this period, it is recommended that the measuring range be set to 1000 ug/m3. Once the optimal operating temperature has been attained, the appropriate measuring range can be selected.*

4.3 Measurement Operation

During measurement mode, gas is continuously pulled into the analyzer by the diaphragm pump through the dust filter and the optical cuvette. The front display shows the numerical value along with a graph of the most recent measurements.



RunMeasu

F1

F2 Stop

F3 Value ON / OFF

F4 Zero Adjust

F5

Pressing the **F2 Stop** selection will temporarily pause the measurements.

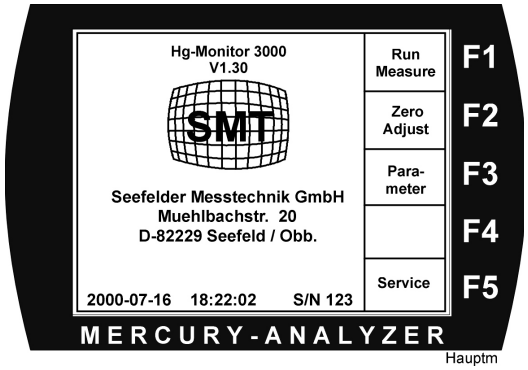
It is also possible to do a zero point correction by pressing the **F4 Zero Adjust** selection. The measurements are temporarily paused for 20 seconds while a zero point alignment is carried out.

4.4 Manual Zero Point Setting

In the normal mode of operation, the instrument automatically carries out a zero point alignment periodically. In addition, it is possible to do a manual zero point alignment. There are two possibilities:

Option 1 – Zero Adjust from the Main Menu

From the main menu simply select the **F2 Zero Adjust** key. An internal valve opens and ambient air is automatically passed over an activated charcoal filter into the cuvette. Since this stream is mercury-free, the associated absorption and mercury concentration are set to zero. Drifting values during the zero adjust procedure are eliminated by protective grounding. Subsequently, the instrument can be returned to the normal measurement mode.

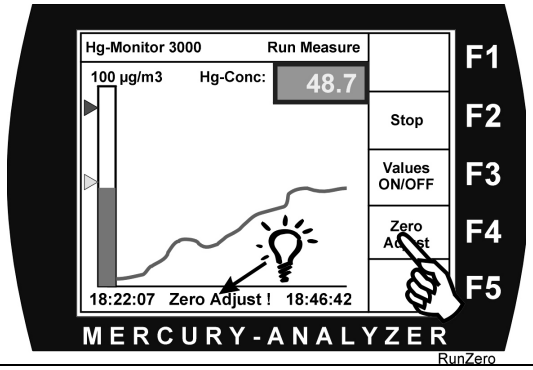


Hauptm

F1 Run Measure
F2 Zero Adjust
F3 Parameter
F4
F5 Service

Option 2 – Zero Adjust from the Run Menu

When the instrument is operating in the Run Measure mode you can press the **F4 Zero Adjust** key. Measurements are interrupted for about 20 seconds and the null point is reset. You can also do a zero point setting by pressing the **F2 Stop** interrupt key and the instrument will reset the zero. After either one of these selections, you must press **F1 Start** to resume taking measurements.



RunZero

F1
F2 Stop
F3 Value ON / OFF
F4 Zero Adjust
F5

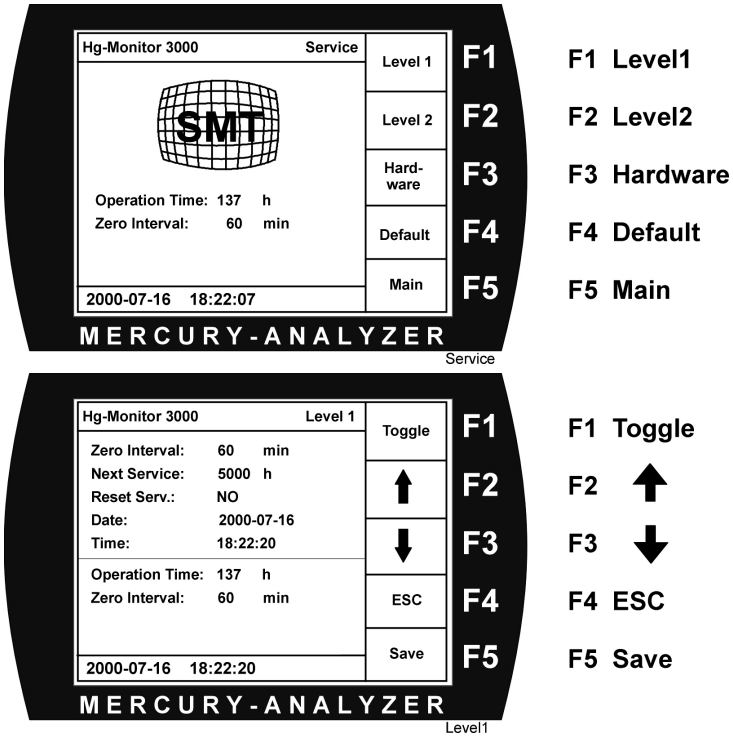
4.5 Automatic Zero Point Adjustment

Before producing the first measurements, the instrument automatically conducts a zero point procedure. This occurs automatically after switching on the instrument. On the front panel, the **ZERO ADJUST** message will be displayed during this process.

Subsequently, the zero adjust interval can be set to a specific value --- any value between 0 to 999 minutes can be chosen.

Note: *When the Mercury analyzer is switched on, automatic zero is carried out every 10 minutes for a period of one hour because the lamp is stabilizing and the instrument is trying to eliminate drift.*

The value of the time interval for Zero Point adjustment is dependent upon the ambient temperature and should normally be chosen to be between 30 to 300 minutes. On the Main Menu, select **F4 Service** and then **F1 Level1**. On the first line of the display you will then be able to enter the zero point interval.



Note: *If you enter 0, no zero point adjustment will be carried out.*

4.6 Selecting Measuring Range and Concentration Units

With the Hg Monitor 3000, you can select up to five measuring ranges. These ranges can be summarized as:

Units	Measuring Range				
µg/m3	0 ... 20	0 ... 100	0 ... 1000	0 ... 2000	0 ... 3000
ppb	0 ... 2	0 ... 10	0 ... 100	0 ... 200	0 ... 300

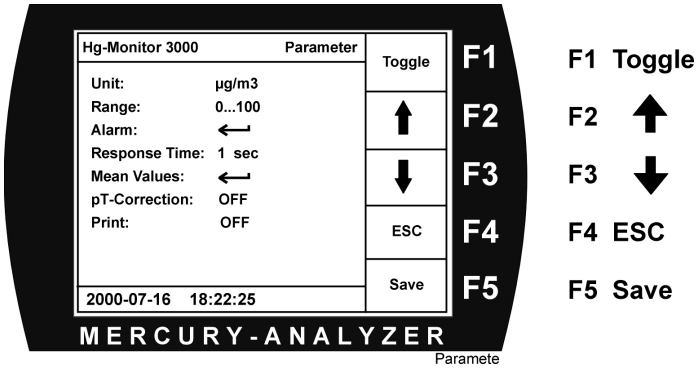
Note: *When you make a modification of the measuring range or concentration units, the alarm thresholds are proportionately adjusted automatically.*

From the main Menu select **F3 Parameter** to enter the Parameter mode. Press the **F2 Up** and **F3 Down** keys to navigate between the different entries on the display screen. Use the **F1 Toggle** key to cycle through various measurement ranges and selection of the units. Pressing the **F5 Save** key will save new values.

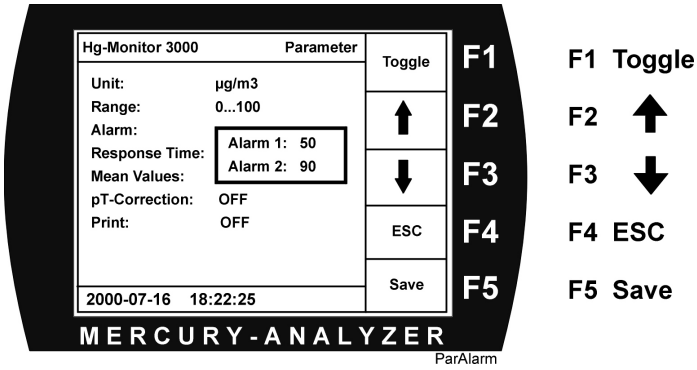
4.7 Setting Alarm Thresholds

From the main Menu select **F3 Parameter** to enter the Parameter mode. Press the **F2 Up** and **F3 Down** keys to navigate to the Alarm entry. Press the ENTER (or RETURN) key to display a pop-up menu for the two alarm levels. Using the numeric keypad enter the desired alarm values. Finally, press the **F5 Save** key to save the new alarm values.

Note: *If you insert 0 as an alarm level, the alarm threshold is inactive and the menu displaying measured values will be faded out.*



Paramete



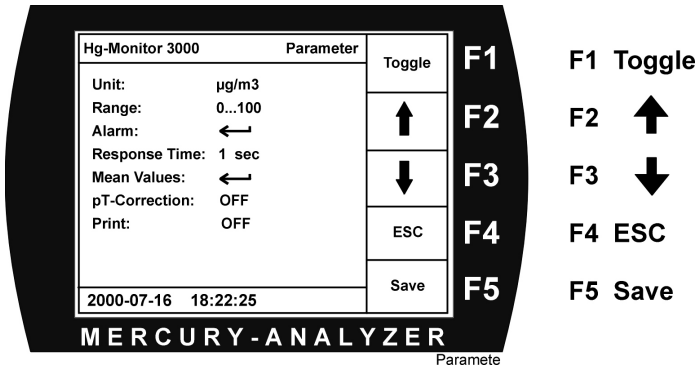
ParAlarm

4.8 Response Time Interval Adjustment

With the Hg monitor 3000 you can select up to four different values for the Response Time.

Response Time			
0 sec	1 sec	5 sec	30 sec

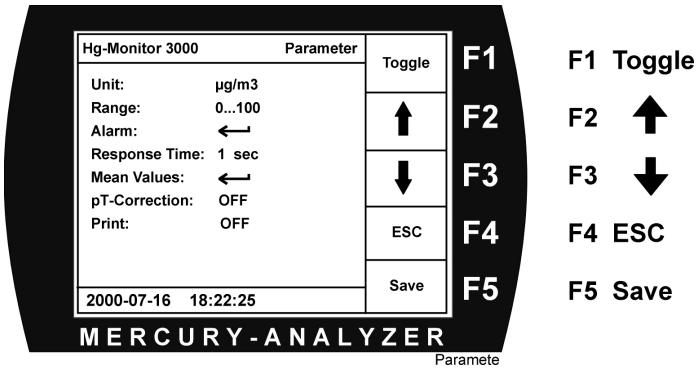
From the main Menu select **F3 Parameter** to enter the Parameter mode. Press the **F2 Up** and **F3 Down** keys to navigate yourself to the Response Time entry. Use the **F1 Toggle** key to select an appropriate response time. Finally press the **F5 Save** key to save the new alarm values.



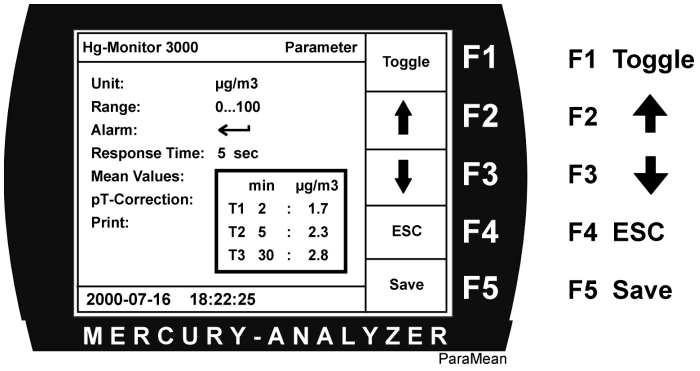
4.9 Averaging Time Interval Adjustment

The Hg Monitor 3000 can provide values using up to three averaging time intervals.

From the main Menu select **F3 Parameter** to enter the Parameter mode. Press the **F2 Up** and **F3 Down** keys to navigate to the Alarm entry. Press the ENTER (or RETURN) key to display a pop-up menu for the three averaging time intervals. Use the numeric keypad to enter the desired time intervals and calculated average values. Finally press the **F5 Save** key to save the new averaging time values.



Paramete



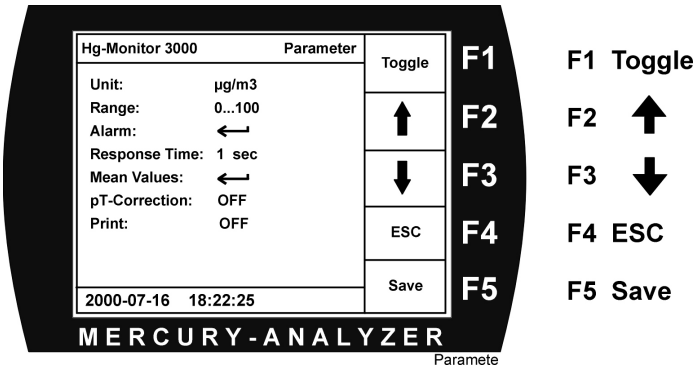
ParaMean

Note: *If you input 0 as the time interval, no averaging will be carried out.*

4.10 Printing Options

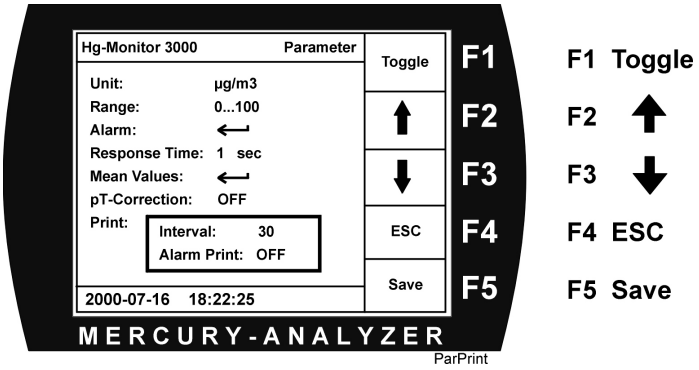
Over the parallel interface a printer can be attached to the Hg monitor 3000. If a printer is connected and switched on with the Hg monitor 3000, the current measured values with user-defined time intervals can be printed out. Likewise average values with the appropriate time intervals are printed out.

It is also possible, to configure the Hg Monitor 3000 such that values are printed out when measured values exceed alarm levels. If this option is selected, the printout of the current measured value takes place in the case of exceeding alarm levels once per minute.



Paramete

Here is how you can make the appropriate settings – first select the **Parameter** menu option from the Main menu … using the **F2 and F3** arrow keys move the cursor down to the Print option. Use the **F1 key to toggle** and a floating menu selection will appear. On this menu selection you can choose the Time Interval and also whether the ALARM Printing should be activated or not.



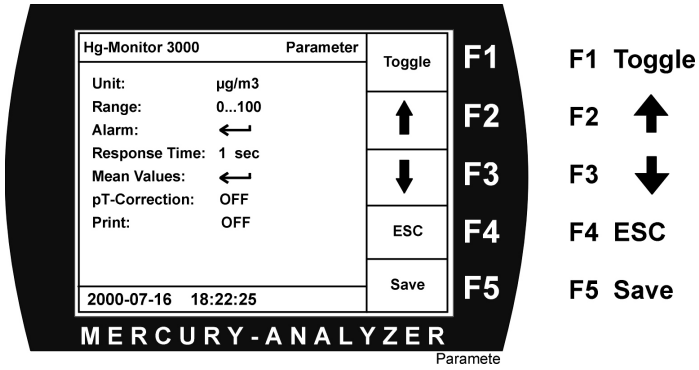
ParPrint

Note: If the time interval is inputted as “0” no printing takes place

4.11 Pressure and Temperature Compensation (Optional Feature)

Notice: *The P-T correction factor can only be activated if your instrument has pressure and temperature sensors integrated in the monitor. Standard version of the Hg Monitor 3000 does not include this feature.*

The mercury concentration measured by the Hg monitor 3000 corresponds to the mass concentration actually present in the optical cuvette (mercury atoms per measuring volume). Optionally a pressure and a temperature sensor that is built in the Hg Monitor 3000 can adjust the measured values continuously to standard conditions (1013 mbar, 273.16 K) is corrected. When the pressure-temperature compensation is switched on, micro gram per cubic meter appears with an “N” standing for standard cubic meter (ug/m3N). The values for pressure and temperature appear in the parameter menu.

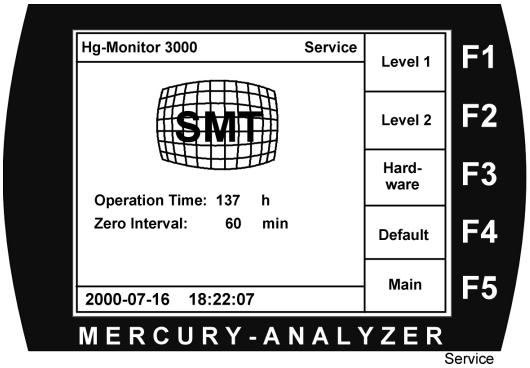


Call the **Parameter** menu from the **Main menu**…use the **F1 and F2** arrow keys to move up and down. Position the cursor on the **P-T Correction** selection. Press the **F1 Toggle key** to switch between the ON and OFF modes.

4.12 Adjusting the Time and Date

These values can be stopped with the following commands: From the **Main Menu**, select the **Service** option. Once you are on this screen, select the **Level1 F1** Menu change option. Subsequently position yourself on the **Date and Time** fields and enter appropriate values as necessary.

Finally press the **F5 key to save selections**.



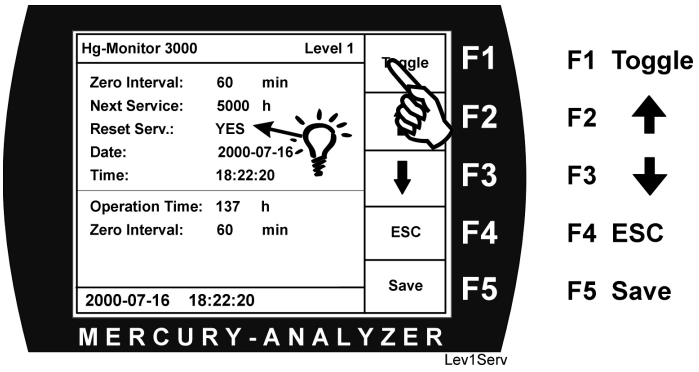
Service

4.13 Service and Maintenance Interval

The Hg monitor 3000 has an integrated clock/time device to keep track of the hours between maintenance intervals. Using this powerful capability you can track the amount of time between maintenance and service. Some of the common activities requiring maintenance and service include cleaning of pipes/tubing, replacing the activated charcoal filter cartridge and checking the flow pump. Cleaning of the optical cuvette is also recommended.

From the **Main menu**, select the **Service menu** selection. Choose **Level1** selection on this menu. Navigate yourself to the **Next Service** selection and enter a time interval.

After performing maintenance/service on your instrument you can go to the Service screen and reset the time interval using the **F1 Toggle** switch. Finally press the **F5 Save** key to save all modifications.



Lev1Serv

5. Signal Outputs

5.1 Current or Voltage Output

The HG Monitor 3000 can output an analog signal, which is either 4 to 20 mA or 0 to 10 volts. Each analyzer has an identification plate attached that clearly states the type of analog output (voltage or current). Appropriate connectors and cables can be used to measure this analog output.

5.2 Status Signal

The Hg monitor has 3 setting switches, which are laid out as a change over switches. The instrument parameters and output are monitored depending upon the switch settings:

- Alarm threshold value 2
- Zero drift (red light alarm)
- Service (Maintenance Interval / yellow light on)

The switch settings are as follows:

Status		**Change Over Switch 1**				**Change Over Switch 2**				**Change Over Switch 3**		
Ready	Pin	2	1	5	Pin	4	3	6	Pin	8	7	9
		xxxxxxxxxx				**xxxxxxxxxx**				**xxxxxxxxxx**		

Maintenance	Pin	2	1	5	Pin	4	3	6	Pin	8	7	9
			xxxxxxxxxx			**xxxxxxxxxx**					**xxxxxxxxxx**	

Alarm 2	Pin	2	1	5	Pin	4	3	6	Pin	8	7	9
			xxxxxxxxxx			**xxxxxxxxxx**				**xxxxxxxxxx**		

5.3 Printer Output

If a printer is attached to the instrument and activated through the menus, data records are sent to the printer. On each line you will see the date (Day-Month-Year) followed by the time and the current concentration value. Subsequently you will see averaged concentrations along with the averaging time interval within the box brackets.

Monitor 3000 Seefelder Meßtechnik – Print ON					
02.03.2001,	**17:38:18,**	**0.5, [ug/m3],**	**3.4,[1],**	**2.3,[5],**	**1.8,[10]**
02.03.2001,	**17:48:18,**	**3.4, [ug/m3],**	**4.0,[1],**	**3.2,[5],**	**1.5,[10]**
02.03.2001,	**17:58:18,**	**2.3, [ug/m3],**	**4.6,[1],**	**1.9,[5],**	**2.2,[10]**

For example, look at the third record in the above printout. The day is 2 March 2001 and the time is 17:58:18 (24 hour clock). The current value is 2.3 ug/m3. The current 1-minute averaged value is 4.6 ug/m3, the 5-minute averaged value is 1.9 ug/m3 and 10-minute averaged value is 2.2 ug/m3.

5.4 R-S 232 interface

The RS232 serial interface also outputs digital values on a regular basis. The data record comprises of six values separated by semi-colons. The fields are the following:

1. Date
2. Time
3. Absorption (absolute units)
4. Concentration value
5. Units for the concentration (see table below)
6. Status code (see table below)

Unit code	
1	For µg/m3
2	For µg/Nm3 (optional)
3	For ppb

Status Code:	
1	Ready
2	Maintenance / Service
3	Alarm threshold 2

An example data record is

15-02-00;10:43:07;0.0202;0044.9;1;1{Return}

This indicates that

- Date is 15 February 2000
- Time is 10:43:07 (24-hour clock)
- Absorbance is 0.0202
- Concentration is 44.9
- Concentration units are ug/m3
- Status is NORMAL/READY

6. Use of the Hg Monitor 3000 for Process Monitoring

The Hg Monitor 3000 is an excellent analyzer for measuring elemental mercury – Hg (o) in a process stream. **Caution should be exercised when using the instrument in process streams that have high levels of particles, soot or Sulfur Dioxide**. Since all processes tend to be unique, it is recommended that you consult with us before exploring the use of the Hg Monitor for your particular process application.

Guidelines for an installation of the Hg-MONITOR 3000 into a system

a) Location

The Hg Monitor 3000 should be located in an environment where there are small ambient temperature fluctuations. Slow changing temperatures do not significantly impact measurements, however large short-term fluctuations significantly impact measurement values. It is recommended that you maintain the ambient temperature in the range specified in the TECHNICAL SPECIFICATIONS section. The location should be free of dust and excessive moisture must be avoided. Depending upon the environment it may be necessary to place the instrument in a housing. For such applications it is possible to purchase the Hg Monitor 3000 in a rack-mounted configuration (without external handles).

b) Sample Stream

The sample stream should be free of particles/dust as much as possible. If necessary a suitable dust collector should be connected to the instrument (separate accessory available). The sample stream temperature must be maintained higher than the dew point to prevent condensation with the tubing and optical cuvette. For excessively high moisture content streams, a gas cooler may be required (appropriate gas-liquid condensers/conditioners are available as special accessories). The sample gas flow to the Hg monitor 3000 is approximately 2 liter/min at atmospheric pressure. If there is excessive flow resistance (e.g. pinched/bent tubing or false settings of valves) then the vacuum pump built in the Hg monitor 3000 produces a negative pressure which results in an appropriate modification of the measured value. When the automatic pressure-temperature compensation feature is activated this pressure change is compensated.

c) Sample Lines

The sample gas should only come in contact with materials that have minimum interaction with Mercury. In particular, amalgamation materials like copper, zinc, aluminum, brass, bronze etc. are to be avoided. Suitable materials include PFA and FEP Teflon, Tygon. Sample line tubing made from Tygon R 3603 is available as an accessory. It is recommended that you use as short a sampling line length as possible. For long sample lines, the response time increases and MEMORY effects may result in artifacts. For sample lines, which are shorter than 1 m length, use tubing with 6 mm inside diameter. For longer sample line lengths (1 to 10 m) you can use a 4 mm inside diameter (the idea is to reduce the volume of gas held within the long inlet tube.) Appropriate fittings are available to connect the Hg Monitor to the sample lines as special accessories.

d) Exhaust Gas Disposal

If the Hg Monitor 3000 is used to measure mercury in ambient air or workplace environments with very low mercury concentration levels then no special exhaust gas disposal processing is required. However if you are sampling an extremely high mercury concentration stream (e.g. industrial manufacturing) it is recommended that you dispose the exhaust gas safely so as not to endanger operating personnel. The output/exhaust port of the instrument can be attached to a Tygon tube (4mm inside and 6 mm outside diameter). This exhaust stream can be fed into an appropriate mercury removal equipment (e.g. activated charcoal filter) or can be fed back into the process stream.

7. Maintenance

The maintenance work Hg monitor 3000 is limited to exchanging the intake filter, replacing the activated charcoal filter for zero adjustment and exchange of the Tygon tubing. It is also recommended that the optical cuvette be cleaned when necessary.

7.1 Intake Filter Exchange

Note: The Hg Monitor 3000 should be never operated without the intake particle filter!

The intake filter cartridge is accessible after loosening of the glass filter housing cover and can be easily exchanged when contamination is observed.

7.2 Exchange of the Activated Charcoal Cartridge

In order to produce a mercury-free air stream, which can be used for zeroing the instrument, the Hg Monitor 3000 includes an integrated activated charcoal filter cartridge that possesses a very large capacity. We recommend exchange of this filter cartridge on an annual basis.

To exchange this filter cartridge, the frame/housing cover must be opened:

1. Disconnect the instrument from the power supply
2. Remove the frame/housing cover of the instrument
3. The activated charcoal cartridge is now visible.
4. Disconnect the filter cartridge from the tubing and remove the old cartridge.
5. Place an appropriate new filter cartridge.
6. Place the instrument within the outside housing.

7.3 Cleaning the Optical Cuvette

Depending upon the level of contamination, the optical cell may require cleaning

Methodology for removing the cuvette

1. Adjust the cuvette retaining springs at both edges and slightly move the cuvette upwards.
2. The retaining springs will loosen and you will be able to remove the cuvette.
3. Hold the cuvette and remove the end flange fittings carefully.
4. Depending upon the level of contamination clean the cuvette with an appropriate acid like HCl or HNO3.

   Note: DO NOT USE HF – Hydrofluoric Acid for cleaning the cuvette!

   Subsequently rinse the cuvette with distilled water and let dry completely.
5. If necessary, clean the outside of the cuvette with alcohol. While remounting the cuvette avoid making fingerprints – use a paper tissue and mount using the end flange fittings.
6. Remount the cuvette in the reverse order. Press firmly to ensure a firm fitting.

8.0 Technical Specifications for the Hg Monitor 3000

Measuring Method	UV photometer with precise regulated lamp
Measuring Ranges	0...100 / 0...1000 / 0...2000 µg/m^3 / (µg/Nm^3, optional) 0...10 / 0...100 / 0...200 ppb
Detection Threshold	0,5 µg/m^3
Light Source	High frequency-lively low pressure glow lamp, regulated performance, thermostated
Response Time	Selectable, 0 / 1 / 5 / 30 seconds
Measurement Wavelength	254 nm
Optical Cuvette	Quartz glass, length 230 mm
Pressure-Temperature Correction	Optional feature
Alarm Level:	2 levels, user-defined
Alarm output Alarm 1 Alarm 2 active: permanently closed	REED Relays 50V/400 mA / Wechsler REED relay 50V/400 mA / change-over switches Alarm1: indicator in the display (yellow) Alarm2: Indicator in the display (red) and REED relay 50V/400 mA / change-over switches
Display:	TFT-Color displays, diagrams and indicator lights
Error display:	Error status on TFT display
Outputs	Measured value: 4... 20 mA or 0 - 10 V (according to user needs), Centronics parallel for printer, R-S 232 for PC or data logger. Status output for alarm and error message
Pump	Diaphragm pump at approximately 120 l/h
Filter:	Glass fiber particle filter 0.1 micron
Electrical Fuse	T 2 A
Operating temperature:	5 – 40° C
Power Requirements:	90 – 240 V AC, 50 – 60 Hz, 40 VA
Battery operation:	12 VDC, Option
Dimensions:	19“ Housing (Rack mounted version is an option)
Width:	449 mm (489mm with handle)
Height:	133 mm (3 Height Units)
Depth:	290 mm
Weight	Approximately 9.5 kg