

# TWO GREAT TECHNOLOGIES – TOGETHER AT LAST THE 700 SERIES NANO TRACE MOISTURE AND OXYGEN ANALYZERS

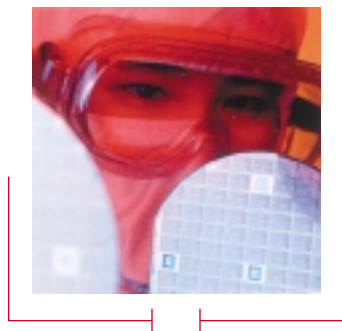


## THE DF-750 NANOTRACE MOISTURE ANALYZER:



### Redefining Moisture Analysis

The DF-750 NanoTrace Moisture Analyzer pushes the boundaries of moisture analysis technology. Using revolutionary Tunable Diode Laser Absorption Spectroscopy (TDLAS), the DF-750 delivers parts-per-trillion (ppt) capabilities for a range of applications in semiconductor fabrication and UHP gas measurements. The analyzer comfortably fits into a 19" rack and is ideal for mobile carts. The analyzer has internal isolation capability so that you can move the analyzer from port to port without incurring any dry-down time. And, like Delta F's world-renowned oxygen analyzers, it provides results that are consistent and reliable over a long instrument life cycle.

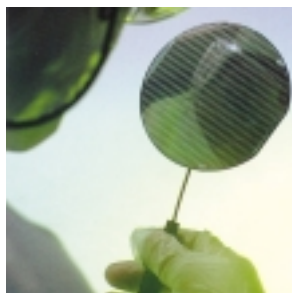


### Unsurpassed Accuracy and Performance

The 700 Series uses laser absorption spectroscopy to identify and "count" the water molecules in a gas sample as it flows through the instrument. Since its fundamental design is based upon Beer's Law, the 700 Series can perform ultra trace moisture determinations and does not require field calibration. In addition, the TDLAS technology delivers:

- 100 ppt sensitivity with very high accuracy
- 200 ppt LDL
- no field calibration necessary
- a wide dynamic range from 100 ppt to 10 ppm (linear)
- an ambient operating temperature range from 10 to 40°C
- fast response time with an initial dry down time of <24 hours to 5 ppb
- fast clean up time with upset recovery from ppm levels in minutes

Every 700 Series Analyzer is custom configured to your specifications and thoroughly tested to ensure flawless performance. You'll be able to start running at installation without field calibration.



## THE DF-760 NANOTRACE DUAL ANALYZER:



### A Dual H<sub>2</sub>O and O<sub>2</sub> Analysis Solution

Only Delta F can provide a moisture and oxygen analysis to ppt levels in a single unit – the DF-760.

The DF-760 is the only analyzer in the world that combines the industry standard O<sub>2</sub> analysis capabilities of the NanoTrace II Oxygen Analyzer with the high accuracy and performance capabilities of TDLAS moisture analysis.

The NanoTrace non-depleting gas-phase oxygen sensor delivers:

- Rapid response
- An inert cathode immune to damage from trace levels of acids or hydrocarbons
- A non-depleting anode - no drifting and no frequent calibrations

Combined these analyzers give you the one-two punch to knockout your moisture and oxygen analysis challenges



# DF-750/760



## Unparalleled Performance

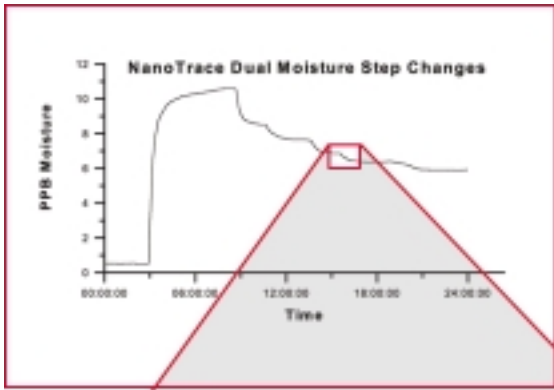
Measures ppt levels instantly!  
High accuracy that matches the performance an APIMS!

## Low Maintenance

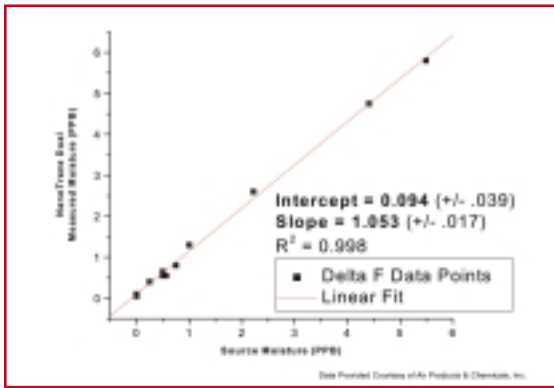
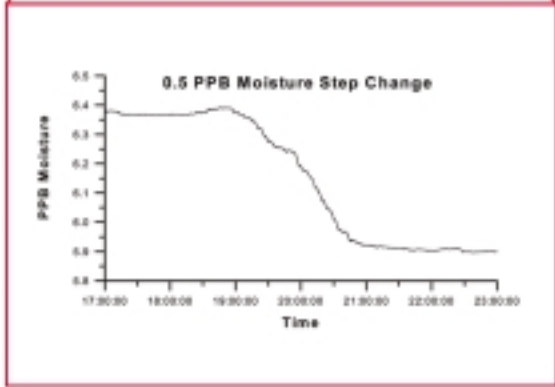
Based on Beer's Law, the measurement requires no field calibration.

## Increased Capabilities

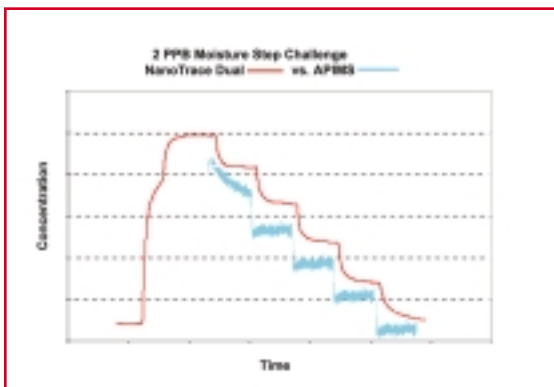
When packaged with the NanoTrace II Oxygen Analyzer, you can easily make both measurements from a single unit.



*A 0.5 ppb step change is measured instantly by the NanoTrace Dual.*



*The NanoTrace Dual correlation to an APIMS is an amazing 0.998!*



*The NanoTrace Dual duplicates the APIMS performance when measuring the same sample gas.*

*(courtesy of SAES Getters S.P.A.)*

## System Specifications

### Gas Sample Conditions

<b>Sample Pressure</b>	
Operating limits:	15 to 150 psig (2.03 to 11.3 bar)
<b>Sample Return Pressure</b>	Atmospheric Vent (optimal)
	Limits: -2 to 2 psig (0.88 bar to 1.14 bar)
For H <sub>2</sub> and He	Maximum limit: ± 1 psig
For N <sub>2</sub> , Ar, and all other background gases	Maximum limit: ± 2 psig

### Flow Rate:

Operating: DF-750	2 to 4 slpm for N <sub>2</sub> . Contact factory for other background gases
DF-760	3 to 5 slpm for N <sub>2</sub> . Contact factory for other background gases
Bypass:	0.25 to 2.5 slpm

### Sample Line Temperature

Heat Trace to 140°F (60°C)	Limits: 50° to 176°F (10° to 80°C)
	For best results, maintain sample line at 60°C
	60 to 100 psig

### Pneumatic Pressure

### Gas Flow System

**Construction Materials** 300 Series stainless steel

### Gas Connections

<b>System:</b>	1/4 inch VCR compatible inlet fitting
	1/4 inch compression bypass outlet fitting
	1/8 inch compression fitting for pneumatic gas inlet
<b>Pump:</b>	1/4 inch compression outlet fitting to vacuum pump
	1/4 inch compression inlet/outlet fittings on vacuum pump

### Electrical

**Back Lighted Display** 7.4" VGA Monochrome (640x480)

### Audible/Visual Alarm Status Indicators

4 oxygen levels, 4 moisture levels, temperature, electrolyte condition, moisture sensor diagnostic, loss of flow, zero calibration-in-process, moisture analyzer off-line, oxygen analyzer analog output freeze control during calibration

### Relays

(Failsafe action upon loss of power to alarm condition)

4 non-latching, independently assignable to oxygen alarms or oxygen calibration-in-process indicator and 4 non-latching independently assignable to moisture alarms. SPDT contacts rated for 1 amps at 30 VDC

### Power Requirements

100-120 VAC @ 5A, 50/60 Hz (standard); 200-240 VAC @ 2.5A, 50/60 Hz (optional). Configurable at factory.

### Output Signals

#### Analog Outputs:

Menu scaleable single output range:	
Moisture:	0-10 ppb up to 0-20 ppm
Oxygen:	0-2 ppb up to 20 ppm
Isolated 4-20 mA DC, 0-100 mVDC, 0-1, 0-2, 0-5, or 0-10 VDC for both moisture and oxygen	

#### Expanded Range Scales

Two user selectable secondary analog output ranges for re-scaling the output once the primary range is exceeded

**Digital Output:** RS232 or RS485

### Configuration and Installation

Delta F provides comprehensive assistance for a broad variety of application problems including measurements of semiconductor specialty gases. Depending on the model, Delta F analyzers can be configured to provide a wide choice of outputs for data collection and process control systems. Contact your Delta F representative for an Applications Data Sheet and pricing information.

## Moisture System Performance

<b>Lowest Detection Level</b>	200 ppt
<b>Resolution</b>	
Analytical ( <i>Sensitivity-smallest detectable change</i> )	100 ppt
Display	10 ppt
<b>Accuracy (greater of)</b>	±3% of reading or ±0.2 ppb (Constant Conditions)

### Speed of Response (typically)

Time to reach 90% of final reading in <10 minutes

### Range (Output Scale)

0-10 ppm

### Ambient Operating Temperature

50° to 105° F (10° to 40° C)

### Background Gas Compatibility

All inert and passive gases including N<sub>2</sub>, He, H<sub>2</sub>, Ar, and O<sub>2</sub>, (DF-760 is not O<sub>2</sub> compatible). Includes Scale Factor as standard which permits accurate read-out of moisture in background gases other than nitrogen

## Oxygen System Performance

<b>Lowest Detection Level</b>	75 ppt
<b>Resolution</b>	
Analytical ( <i>Sensitivity-smallest detectable change</i> )	50 ppt
Display	10 ppt
<b>Accuracy (greater of)</b>	±3% of reading or ±0.1 ppb (Constant Conditions)

### Speed of Response (typically)

Time to reach 90% of final reading in either direction

### Upset Recovery Time

< 15 minutes

Time from high ppm upset to within 10 ppb of the previously stable reading

### Range

0-20 ppm

### Ambient Operating Temperature

50° to 105° F (10° to 40° C)

### Background Gas Compatibility

All inert and passive gases including N<sub>2</sub>, He, H<sub>2</sub>, Ar, light hydrocarbons, halocarbons, etc. Includes Scale Factor as standard which permits accurate read-out of oxygen in background gases with different diffusivities to nitrogen.

### Extended Tracking Range (standard)

When the analyzer reads over range, 10 ppm, it will continue to read, for tracking purposes, up to 100 ppm for a limited time



THE DIFFERENCE  
**DELTA F**

# NanoTrace Dual

DF-760

Rev. Date: April 25, 2002

## System Performance & Specifications

### **Gas Sample Conditions**

#### **Sample Pressure**

*Operating limits:* 15 to 150 psig (2.03 to 11.3 bar)

#### **Sample Return Pressure**

Atmospheric Vent (optimal)  
Limits: -2 to 2 psig (0.88 bar to 1.14 bar)

*For H<sub>2</sub> and He*

Maximum limit: ± 1 psig

*For all other background gases*

Maximum limit: ± 2 psig

#### **Flow Rate:**

*Operating:* 2 to 5 slpm N<sub>2</sub>  
(Contact factory for other background gases)

*Bypass:* 0.25 to 2.5 slpm

#### **Sample Line Temperature**

Heat Trace to 140°F (60°C) Limits: 50° to 176°F (10° to 80°C)  
For best results, maintain sample line at 60°C

**Pneumatic Pressure** 60 to 100 psig

### **Gas Flow System**

**Construction Materials** 300 Series stainless steel

#### **Gas Connections**

*System:* ¼ inch VCR compatible inlet fitting  
¼ inch compression bypass outlet fitting  
¼ inch compression outlet fitting to vacuum pump  
⅛ inch compression fitting for pneumatic gas inlet

*Pump:* ¼ inch compression inlet/outlet fittings on vacuum pump

#### **Gas Delivery System Components**

Pneumatically actuated springless diaphragm valves, orbital butt welded assembly with zero dead volume for sensor isolation and zero verification

High capacity purifier provides moisture and oxygen-free zero gas (Not compatible on oxygen samples)

Heated and temperature controlled sample delivery system

Integral pressure regulator with minimal wetted area

Bypass loop with flow control

### **Maintenance & Logging**

#### **Data Logging & Graphing**

*Analyzer can store years of continuous data, downloadable in monthly blocks*

#### **Automatic Maintenance Log**

*Self checking, maintains records satisfying many ISO 9000 requirements*

### **Construction**

**Enclosure:** NEMA 1 in 19" Rack Mount

**Dimensions:** 19"(48.3cm) W x 10.5"(26.7cm) H x 22.5" (57.2cm) D

**Weight:** 72 lbs. (32.6 kg.)

### **Hydrogen Safety**

Optional safety system for use with hydrogen includes Sample Delivery Interlock and Case Purge Valves for instrument housing and NEMA 4 enclosure and Z-purge protection system for external vacuum pump.

Optional Hydrogen Safety System can be ordered with or without the NEMA 4 enclosure and Z-Purge Protection System for the vacuum pump.

NEMA 4 pump enclosure is 16.6" (42.4cm) W x 14.5" (36.8 cm) H x 11.6" (29.5cm) D

NOTE: Hydrogen Safety system requires the dedicated use of one of the oxygen relays

### **Electrical**

**Back Lighted Display** 7.4" VGA Monochrome (640x480)

#### **Visual Alarm Status Indicators**

4 oxygen levels, 4 moisture levels, temperature, electrolyte condition, moisture sensor diagnostic, loss of flow, zero verification or calibration-in-process, moisture analyzer off-line, oxygen analyzer analog output freeze control during calibration

#### **Relays**

*(Failsafe action upon loss of power to alarm condition)*

4 non-latching, independently assignable to oxygen alarms or oxygen calibration-in-process indicator and 4 non-latching independently assignable to moisture alarms. SPDT contacts rated for 1 amps at 30 VDC

#### **Power Requirements**

100-120 VAC @ 5A, 50/60 Hz (standard); 200-240 VAC @ 2.5A, 50/60 Hz (optional). Configurable at factory.

#### **Output Signals**

*Analog Outputs:*

Menu scaleable single output range:

Moisture: 0-2 ppb up to 0-10 ppm

Oxygen: 0-2 ppb up to 20 ppm

Isolated 4-20 mADC for both moisture and oxygen

Choice of either 0-1, 0-2, 0-5, or 0-10 VDC for moisture and oxygen

Expanded Range Scales

*Two user selectable secondary analog output ranges for re-scaling the output once the primary range is exceeded*

*Digital Output:*

2-Way RS232 or RS485

# NanoTrace Dual

DF-760

## Specifications & Configuration Guide

### Oxygen System

<b>Lowest Detection Level</b>	75 ppt
<b>Resolution</b>	
Analytical ( <i>Sensitivity-smallest detectable change</i> )	50 ppt
Display	10 ppt
<b>Accuracy (greater of)</b>	±3% of reading or ±0.1 ppb (Constant Conditions)
<b>Speed of Response</b> (typically)	< 20 seconds
<i>Time to reach 90% of final reading in either direction</i>	
<b>Upset Recovery Time</b>	<15 minutes
<i>Time from high ppm upset to within 10 ppb of the previously stable reading</i>	
<b>Range</b>	0-20 ppm
<b>Ambient Operating Temperature</b>	50° to 105° F (10° to 40° C)
<b>Background Gas Compatibility</b>	
<i>All inert and passive gases including N<sub>2</sub>, He, H<sub>2</sub>, Ar, light hydrocarbons, halocarbons, etc.</i>	
<i>Includes Scale Factor as standard which permits accurate read-out of oxygen in background gases with different diffusivities to nitrogen.</i>	
<b>Extended Tracking Range</b> (standard)	
<i>When the analyzer reads over range, 20 ppm, it will continue to read, for tracking purposes, up to 100 ppm for a limited time</i>	

### Moisture System

<b>Lowest Detection Level</b>	200 ppt
<b>Resolution</b>	
Analytical ( <i>Sensitivity-smallest detectable change</i> )	100 ppt
Display	10 ppt
<b>Accuracy (greater of)</b>	±3% of reading or ±0.2 ppb (Constant Conditions)
<b>Speed of Response</b> (typically)	10 minutes
<i>Time to reach 90% of an upward step challenge</i>	
<b>Upset Recovery Time</b>	< 5 minutes
<i>Time from high ppb upset to within 10 ppb of the previously stable reading</i>	
<b>Range (Output Scale)</b>	0-10 ppm
<b>Ambient Operating Temperature</b>	50° to 105° F (10° to 40° C)
<b>Background Gas Compatibility</b>	
<i>All inert and passive gases including N<sub>2</sub>, He, H<sub>2</sub>, Ar, and O<sub>2</sub></i>	
<i>Includes Scale Factor as standard which permits accurate read-out of moisture in background gases other than nitrogen.</i>	

## Ordering Codes

#### **Base Models**

**760-0020** NanoTrace Dual Analyzer

**-V** (added to model number)  
230 VAC/50/60 Hz Input Power

#### **Outputs**

*(pick one Serial Communication)*

**760-RS232** Two-way Serial Communications

**760-RS485** Two-way Serial Communications

*(pick one VDC output)*

**760-OS-1** 0-1 VDC for both moisture and oxygen

**760-OS-2** 0-2 VDC for both moisture and oxygen

**760-OS-5** 0-5 VDC for both moisture and oxygen

**760-OS-10** 0-10 VDC for both moisture and oxygen

#### **Plumbing**

**760-HSS1** *Hydrogen Safety System with Pump Purge*  
Includes Sample Delivery Interlock and Case Purge valves for instrument housing, and enclosure with purge protection system for vacuum pump.

**760-HSS2** *Hydrogen Safety System without Pump Purge*  
Same as above, except vacuum pump is mounted on bracket only and does not include purge protection system.

#### **Cabinet**

**760-KYLK** Key Lock

#### **Miscellaneous**

**DF-E07** Electrolyte Solution (One charge)

# NanoTrace Dual Configuration Guide

Rev. Date: December 1, 2000

DF-760

## Standard Features & Specifications

### Performance

<b>Lowest Detection Level</b>	200 ppt
<b>Resolution</b>	
Analytical ( <i>Sensitivity-smallest detectable change</i> )	100 ppt
Display	10 ppt
<b>Accuracy (greater of)</b>	±3% of reading or ±0.2 ppb (Constant Conditions)
<b>Speed of Response (typically)</b>	10 minutes <i>Time to reach 90% of an upward step challenge</i>
<b>Upset Recovery Time</b>	< 5 minutes <i>Time from high ppb upset to within 10 ppb of the previously stable reading</i>
<b>Range</b>	0-20 ppm
<b>Ambient Operating Temperature</b>	50° to 105° F (10° to 40° C)
<b>Background Gas Compatibility</b>	All inert and passive gases including N <sub>2</sub> , He, H <sub>2</sub> , Ar, and O <sub>2</sub> Includes Scale Factor as standard which permits accurate read-out of moisture in background gases other than nitrogen.

### Gas Sample Conditions

<b>Sample Pressure</b>	
<i>Operating limits:</i>	15 to 150 psig (2.03 to 11.3 bar)
<b>Sample Return Pressure</b>	Atmospheric Vent (optimal) Limits:-2 to 2 psig (0.88 bar to 1.14 bar)
<b>Flow Rate:</b>	
<i>Operating:</i>	1 to 4 slpm N <sub>2</sub> (Contact factory for other background gases)
<i>Bypass:</i>	0.25 to 2.5 slpm
<b>Sample Line Temperature</b>	
Heat Trace to 140°F (60°C)	Limits: 50° to 176°F (10° to 80°C) For best results, maintain sample line at 60° C
<b>Pneumatic Pressure</b>	60 to 100 psig

### Gas Flow System

<b>Construction Materials</b>	300 Series stainless steel
<b>Gas Connections</b>	¼ inch VCR compatible inlet fitting ¼ inch compression outlet fitting to vacuum pump ¼ inch compression inlet/outlet fittings on vacuum pump ¼ inch compression bypass outlet fitting ⅛ inch compression fitting for pneumatic gas inlet
<b>Gas Delivery System Components</b>	Pneumatically actuated springless diaphragm valves, orbital butt welded assembly with zero dead volume for sensor isolation and zero verification High capacity moisture dryer provides moisture-free zero gas Heated and temperature controlled sample delivery system Integral pressure regulator with minimal wetted area Bypass loop with flow control

### Construction

<b>Enclosure:</b>	NEMA 1 in 19" Rack Mount
<b>Dimensions:</b>	19" (48.3cm) W x 10.5" (26.7 cm) H x 22.5" (57.2 cm) D
<b>Weight:</b>	68 lbs. (31 kg.)

### Maintenance & Logging

#### Data Logging & Graphing

Analyzer can store years of continuous data, downloadable in monthly blocks

#### Automatic Maintenance Log

Self checking, maintains records satisfying many ISO 9000 requirements

### Electrical

**Back Lighted Display** 7.4" VGA Monochrome (640x480)

#### Visual Alarm Status Indicators

4 moisture levels, temperature, moisture sensor diagnostic, loss of flow, zero verification-in-process, analyzer off-line, expanded range

#### Relays

(Failsafe action upon loss of power to alarm condition)

4 non-latching, independently assignable to alarms or indicators. SPDT contacts rated for 1A at 30 VDC.

#### Power Requirements

100-120 VAC @ 5A, 50/60 Hz (standard); 200-240 VAC @ 2.5A, 50/60 Hz (optional). Configurable at factory.

#### Output Signals

*Analog Outputs:*

Menu scaleable single output range of 0-2 ppb up to 0-10 ppm

Isolated 4-20 mA DC, and choice of 0-1, 0-2, 0-5, or 0-10 VDC

Expanded Range Scales

*Two user selectable secondary analog output ranges for re-scaling the output once the primary range is exceeded*

*Digital Output:*

2-Way RS232 or RS485, configurable at factory

### Hydrogen Safety

Optional safety system for use with hydrogen includes Sample Delivery Interlock and Case Purge Valves for instrument housing and NEMA 4 enclosure and Z-purge protection system for external vacuum pump.

Optional Hydrogen Safety System can be ordered with or without the NEMA 4 enclosure and Z-Purge Protection System for the vacuum pump.

NEMA 4 pump enclosure is 16.6" (42.4cm) W x 14.5" (36.8 cm) H x 11.6" (29.5cm) D

NOTE: Hydrogen Safety system requires the dedicated use of one of the oxygen relays

# CE



# NanoTrace Moisture Analyzer

Rev. Date: April 25, 2002

DF-750

## Ordering Codes

### Base Model

**750-0020** NanoTrace Moisture Analyzer

**-V** (added to model number)  
230 VAC/50/60 Hz Input Power

### Outputs

(pick one Serial Communication)

**750-RS232** Two-Way Serial Communications

**750-RS485** Two-Way Serial Communications

(pick one VDC Output)

**750-OS-1** 0-1 VDC

**750-OS-2** 0-2 VDC

**750-OS-5** 0-5 VDC

**750-OS-10** 0-10 VDC

### Cabinet

**760-KYLK** Key Lock

### Plumbing

**760-HSS1** *Hydrogen Safety System with Pump Purge*  
Includes Sample Delivery Interlock and Case Purge valves for instrument housing, and enclosure with purge protection system for vacuum pump.

**760-HSS2** *Hydrogen Safety System without Pump Purge*  
Same as above, except vacuum pump is mounted on bracket only and does not include purge protection system.

### Miscellaneous

**DF-E07** *Electrolyte Solution* (One charge)