

**Model 931S, 932S, 933S, 934 Analyzers  
Serial Communication Interface (Modbus®)**

**Manual Supplement**

This document contains supplemental information for the use of Model 931S, 932S, 933S, and 934 Analyzers. Data herein has been verified and validated and is believed adequate for the intended use of this instrument. If the instrument or procedures are used for purposes over and above the capabilities specified herein, confirmation of their validity and suitability should be obtained; otherwise, AMETEK does not guarantee results and assumes no obligation or liability. This publication is not a license to operate under, or a recommendation to infringe upon, any process patents.

## Overview

This Supplement describes the customer serial communication interface on the Model 931S Single-Gas, Model 932S Multi-Gas, Model 933S Multi-Gas, and Model 934 Analyzers; use the information as it applies to your analyzer. The communication protocol implemented is Modicon Modbus® as defined in “*Modicon Modbus Protocol Reference Guide*” (PI-MBUS-300). The Modbus protocol transmission mode implemented is *Remote Terminal Unit (RTU)* with the analyzer operating as a slave device.

- Supported Modbus function codes are 03 (read multiple registers), 06 (write one register), and 16 (write multiple registers).
- The analyzer responds to Modbus queries that match its assigned node address from either the customer data acquisition port (RS-485) or the service ports (RS-232 and RS-485).
- The analyzer also responds to Modbus queries with the special node address of 255 from the service ports (RS-232 and RS-485). This acts as a back-door access to the analyzer when the assigned node address is unknown. The special node address should only be used when directly connecting to the analyzer (i.e., not in a multi-drop environment).
- The service ports settings are fixed at 9600 8-N-1.
- When the analyzer Modbus node address or any of communication parameters is changed, the change takes effect on the next query.

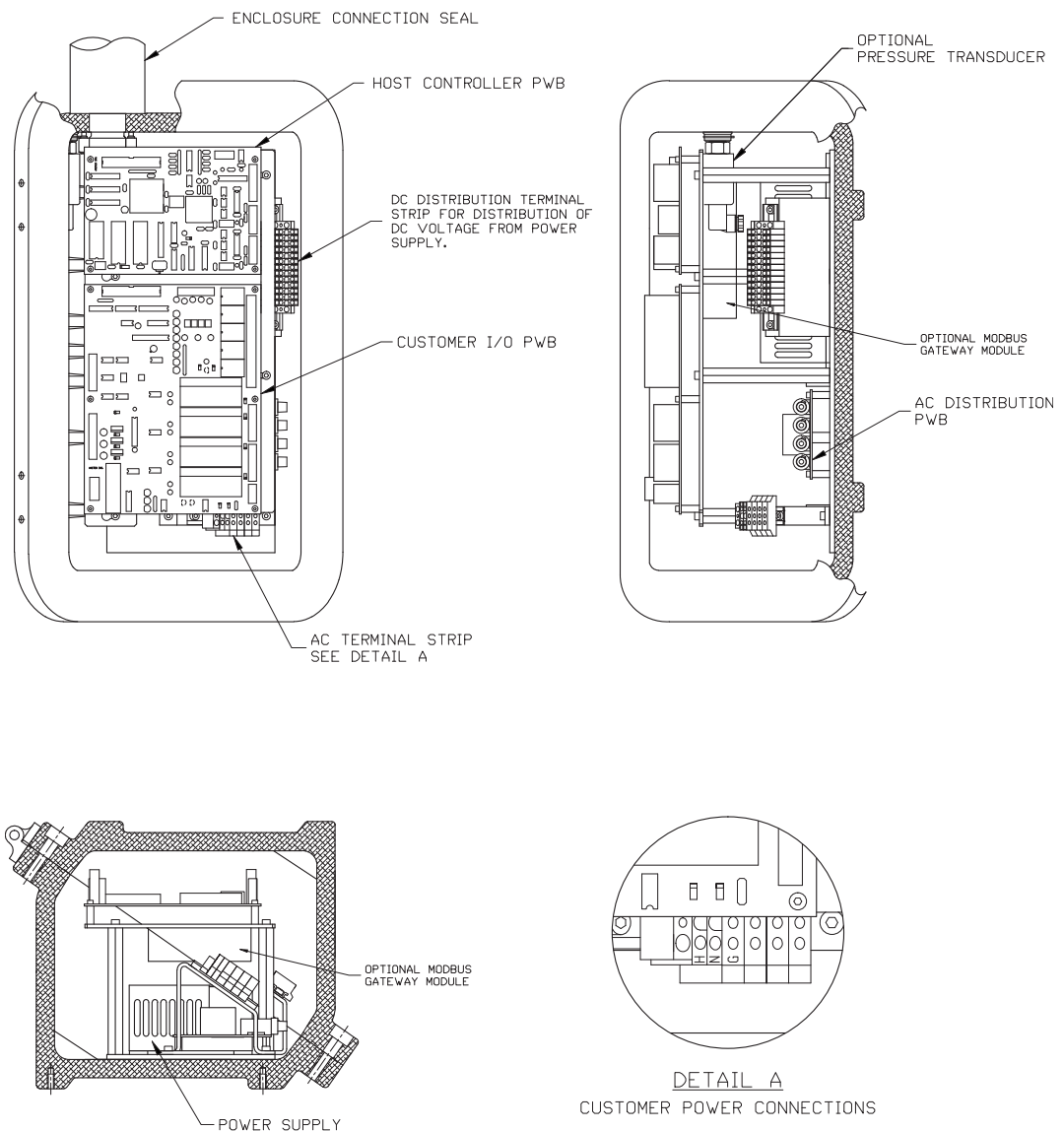
## Optional HMI and Ethernet Gateway Module Wiring

This section contains communication termination wiring options for AMETEK analyzers. Use the information as it applies to your analyzer (area hazardous Location classification).

See Figure 1 for the location of the Ethernet Gateway Module on the analyzer, and Figure 2 for the optional AMETEK analyzer wiring configurations.

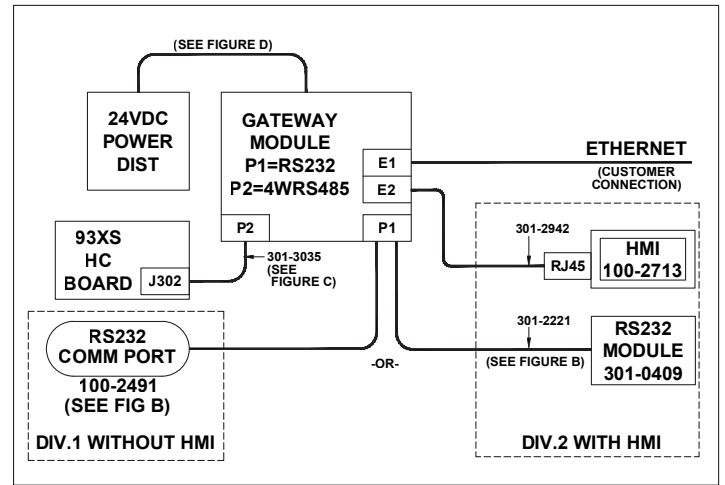
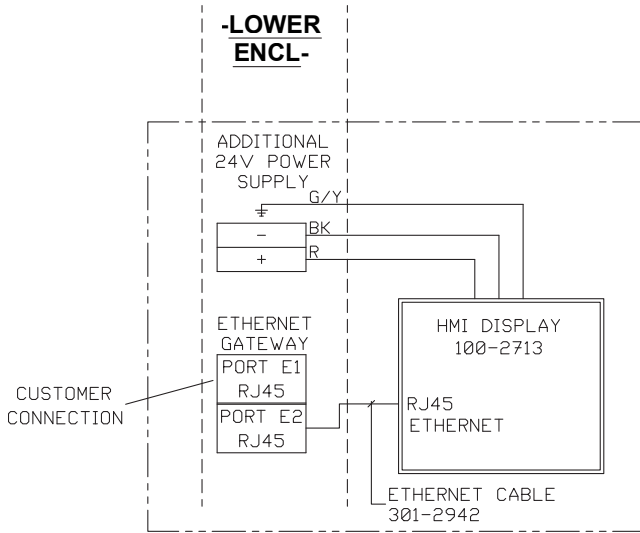


*For additional information, refer to the MOXA Ethernet Gateway CD that is shipped with the analyzer.*

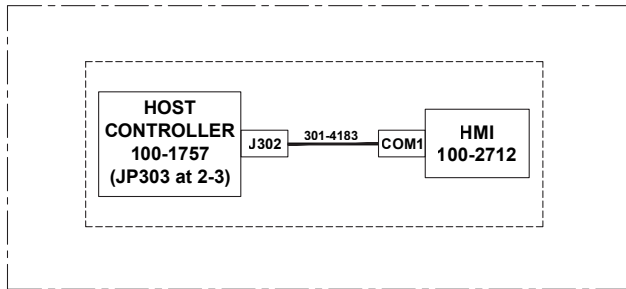


**Figure 1.**  
**Location of optional Modbus**  
**Gateway Module, Lower Enclosure,**  
**Model 93XS Analyzers.**

## HMI TO GATEWAY OVER ETHERNET

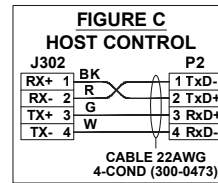


## HMI ONLY (NO GATEWAY)



**FIGURE B  
RS232  
COMM PORT**

| RS232 | R  | P1    |
|-------|----|-------|
| CD 1  | G  | 1 CD  |
| RD 2  | W  | 2 RxD |
| TD 3  | Y  | 3 TxD |
| DTR 4 | BK | 4 DTR |
| GND 5 | BL | 5 GND |
| N/C 6 | O  | 6 DSR |
| RTS 7 |    | 7 RTS |
| CTS 8 |    | 8 CTS |



**FIGURE D  
GATEWAY POWER**

| Terminal | Wire Color | Description |
|----------|------------|-------------|
| GND 1    | G/Y        | Chassis GND |
| V2+ 2    | O          | +24VDC      |
| V2- 3    | BK         | DC GND      |
| Relay 4  |            | 18AWG WIRES |
| Relay 5  |            |             |
| V1+ 6    |            |             |
| V1- 7    |            | TB2 DCPWR   |

NOTE:

HMI AVAILABLE ONLY IN DIV 2/GP VERSIONS.  
HMI NOT USED IN ZONE 1/DIV 1 VERSIONS.

**Figure 2.**  
Optional HMI and Ethernet  
Gateway Wiring diagram,  
Model 93XS Analyzers.

## Holding Registers



References to “93XS” in this document indicate that the function applies to Model 931S, Model 932S, and Model 933S Analyzers, except where noted. “934” indicates the function applies to the Model 934 Analyzer.

The references to ‘\*’, ‘\*\*’, ‘\*\*\*’, and ‘#’ in the Holding Register Definitions are:

\* Standard concentration unit of a UV species is ppmv. However, it can be changed to other unit such as % or mg/m<sup>3</sup> via the corresponding Unit Conversion Factor.

\*\* The unit of an analog output channel is the same as the result variable assigned to it.

\*\*\* The unit for Unit Conversion Factor is <desired unit/ppmv>.

# The scaling factor for INT16 register of a UV species concentration result is 1 (i.e., no decimal point). For full resolution of a UV species concentration result, use the corresponding FLOAT register (i.e., Registers 681–719).

| Reg # | Description / Definition                  | Units | Scaling | Reg Type | Access | Analyzer   |
|-------|---|-------|---------|----------|--------|------------|
| 1     | Concentration result of UV species 1      | *     | #       | INT16    | RO     | 93XS       |
| 2     | Concentration result of UV species 2      | *     | #       | INT16    | RO     | 932S, 933S |
| 3     | Concentration result of UV species 3      | *     | #       | INT16    | RO     | 932S, 933S |
| 4     | Concentration result of UV species 4      | *     | #       | INT16    | RO     | 932S, 933S |
| 5     | Concentration result of UV species 5      | *     | #       | INT16    | RO     | 932S, 933S |
| 6     | Concentration result of UV species 6      | *     | #       | INT16    | RO     | 932S, 933S |
| 7     | Concentration result of sensor1           | %     | x0.01   | INT16    | RO     | 93XS, 934  |
| 8     | Concentration result of sensor2           | %     | x0.01   | INT16    | RO     | 93XS, 934  |
| 9     | Concentration result of sensor3           | %     | x0.01   | INT16    | RO     | 93XS, 934  |
| 10    | Custom concentration result of UV species | *     | #       | INT16    | RO     | 932S, 933S |
| 11    | Reserved                                  | -     | -       | -        | -      | -          |
| 12    | Reserved                                  | -     | -       | -        | -      | -          |
| 13    | Reserved                                  | -     | -       | -        | -      | -          |
| 14    | Reserved                                  | -     | -       | -        | -      | -          |
| 15    | Reserved                                  | -     | -       | -        | -      | -          |
| 16    | Reserved                                  | -     | -       | -        | -      | -          |
| 17    | Reserved                                  | -     | -       | -        | -      | -          |
| 18    | Reserved                                  | -     | -       | -        | -      | -          |
| 19    | Reserved                                  | -     | -       | -        | -      | -          |
| 20    | Reserved                                  | -     | -       | -        | -      | -          |
| 21    | Reserved                                  | -     | -       | -        | -      | -          |
| 22    | Reserved                                  | -     | -       | -        | -      | -          |
| 23    | Reserved                                  | -     | -       | -        | -      | -          |
| 24    | Reserved                                  | -     | -       | -        | -      | -          |
| 25    | Reserved                                  | -     | -       | -        | -      | -          |
| 26    | Reserved                                  | -     | -       | -        | -      | -          |
| 27    | Reserved                                  | -     | -       | -        | -      | -          |
| 28    | Reserved                                  | -     | -       | -        | -      | -          |
| 29    | Reserved                                  | -     | -       | -        | -      | -          |
| 30    | Reserved                                  | -     | -       | -        | -      | -          |

| Reg # | Description / Definition  | Units | Scaling | Reg Type | Access | Analyzer           |
|-------|---|-------|---------|----------|--------|--------------------|
| 31    | Reserved  | -     | -       | -        | -      | -                  |
| 32    | Reserved  | -     | -       | -        | -      | -                  |
| 33    | Reserved  | -     | -       | -        | -      | -                  |
| 34    | Reserved  | -     | -       | -        | -      | -                  |
| 35    | Reserved  | -     | -       | -        | -      | -                  |
| 36    | Reserved  | -     | -       | -        | -      | -                  |
| 37    | Reserved  | -     | -       | -        | -      | -                  |
| 38    | Reserved  | -     | -       | -        | -      | -                  |
| 39    | Reserved  | -     | -       | -        | -      | -                  |
| 40    | Reserved  | -     | -       | -        | -      | -                  |
| 41    | Reserved  | -     | -       | -        | -      | -                  |
| 42    | Reserved  | -     | -       | -        | -      | -                  |
| 43    | Time to next auto-zero calibration<br>-1 = auto-zero calibration inactive         | min   | x1      | INT16    | RO     | 93XS, 934          |
| 44    | Time to next auto-calibration sequence<br>-1 = auto-calibration sequence inactive | min   | x1      | INT16    | RO     | 931S, 932S,<br>934 |
| 45    | Time to end of calibration<br>-1 = no calibration in progress                     | sec   | x1      | INT16    | RO     | 93XS, 934          |
| 46    | Time to next stream switch (931S, 932S, 934)<br>-1 = stream switching inactive    | sec   | x1      | INT16    | RO     | 93XS, 934          |
|       | Time to next column switch (933S)<br>-1 = column switching inactive               |       |         |          |        |                    |
| 47    | Host-controller run time – lower 16 bits  | sec   | x1      | UINT16   | RO     | 93XS, 934          |
| 48    | Host-controller run time – upper 16 bits  | sec   | x1      | UINT16   | RO     | 93XS, 934          |
| 49    | Micro-controller run time – lower 16 bits   | sec   | x1      | UINT16   | RO     | 93XS, 934          |
| 50    | Micro-controller run time – upper 16 bits   | sec   | x1      | UINT16   | RO     | 93XS, 934          |
| 51    | T&H concentration result of UV species 1  | *     | #       | INT16    | RO     | 93XS               |
| 52    | T&H concentration result of UV species 2  | *     | #       | INT16    | RO     | 932S, 933S         |
| 53    | T&H concentration result of UV species 3  | *     | #       | INT16    | RO     | 932S, 933S         |
| 54    | T&H concentration result of UV species 4  | *     | #       | INT16    | RO     | 932S, 933S         |
| 55    | T&H concentration result of UV species 5  | *     | #       | INT16    | RO     | 932S, 933S         |
| 56    | T&H concentration result of UV species 6  | *     | #       | INT16    | RO     | 932S, 933S         |
| 57    | T&H concentration result of sensor1   | %     | x0.01   | INT16    | RO     | 93XS, 934          |
| 58    | T&H concentration result of sensor2   | %     | x0.01   | INT16    | RO     | 93XS, 934          |
| 59    | T&H concentration result of sensor3   | %     | x0.01   | INT16    | RO     | 93XS, 934          |
| 60    | T&H custom concentration result of UV species                                     | *     | #       | INT16    | RO     | 932S, 933S         |
| 61    | Reserved  | -     | -       | -        | -      | -                  |
| 62    | Reserved  | -     | -       | -        | -      | -                  |
| 63    | Reserved  | -     | -       | -        | -      | -                  |
| 64    | Reserved  | -     | -       | -        | -      | -                  |
| 65    | Reserved  | -     | -       | -        | -      | -                  |
| 66    | Reserved  | -     | -       | -        | -      | -                  |
| 67    | Reserved  | -     | -       | -        | -      | -                  |
| 68    | Reserved  | -     | -       | -        | -      | -                  |
| 69    | Reserved  | -     | -       | -        | -      | -                  |
| 70    | Reserved  | -     | -       | -        | -      | -                  |
| 71    | Reserved  | -     | -       | -        | -      | -                  |
| 72    | Reserved  | -     | -       | -        | -      | -                  |
| 73    | Reserved  | -     | -       | -        | -      | -                  |
| 74    | Reserved  | -     | -       | -        | -      | -                  |

| Reg #  | Description / Definition  | Units | Scaling | Reg Type | Access | Analyzer   |
|--|---|-------|---------|----------|--------|------------|
| 75   | Reserved  | -     | -       | -        | -      | -          |
| 76   | Reserved  | -     | -       | -        | -      | -          |
| 77   | Reserved  | -     | -       | -        | -      | -          |
| 78   | Reserved  | -     | -       | -        | -      | -          |
| 79   | Reserved  | -     | -       | -        | -      | -          |
| 80   | Reserved  | -     | -       | -        | -      | -          |
| 81   | Host-controller warning status bitmask history 1 [newest] (see Note 1)  | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 82   | Host-controller fault status bitmask history 1 [newest] (see Note 1)    | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 83   | Host-controller warning status bitmask history 2 (see Note 1)           | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 84   | Host-controller fault status bitmask history 2 (see Note 1)             | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 85   | Host-controller warning status bitmask history 3 (see Note 1)           | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 86   | Host-controller fault status bitmask history 3 (see Note 1)             | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 87   | Host-controller warning status bitmask history 4 (see Note 1)           | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 88   | Host-controller fault status bitmask history 4 (see Note 1)             | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 89   | Host-controller warning status bitmask history 5 [oldest] (see Note 1)  | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 90   | Host-controller fault status bitmask history 5 [oldest] (see Note 1)    | -     | x1      | UINT16   | RO     | 93XS, 934  |
| <b>Note 1: (Registers 81–90)</b><br>Refer to registers 154 and 155 for bit definitions.  |   |       |         |          |        |            |
| 91   | Micro-controller warning status bitmask history 1 [newest] (see Note 2) | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 92   | Micro-controller fault status bitmask history 1 [newest] (see Note 2)   | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 93   | Micro-controller warning status bitmask history 2 (see Note 2)          | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 94   | Micro-controller fault status bitmask history 2 (see Note 2)            | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 95   | Micro-controller warning status bitmask history 3 (see Note 2)          | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 96   | Micro-controller fault status bitmask history 3 (see Note 2)            | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 97   | Micro-controller warning status bitmask history 4 (see Note 2)          | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 98   | Micro-controller fault status bitmask history 4 (see Note 2)            | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 99   | Micro-controller warning status bitmask history 5 [oldest] (see Note 2) | -     | x1      | UINT16   | RO     | 93XS, 934  |
| 100  | Micro-controller fault status bitmask history 5 [oldest] (see Note 2)   | -     | x1      | UINT16   | RO     | 93XS, 934  |
| <b>Note 2: (Registers 91–100)</b><br>Refer to registers 156 and 157 for bit definitions. |   |       |         |          |        |            |
| 101  | Reserved  | -     | -       | -        | -      | -          |
| 102  | Reserved  | -     | -       | -        | -      | -          |
| 103  | Bench temperature   | °C    | x0.1    | INT16    | RO     | 93XS, 934  |
| 104  | Cell or oven temperature  | °C    | x0.1    | INT16    | RO     | 93XS, 934  |
| 105  | Cell or oven pressure   | mmHg  | x1      | INT16    | RO     | 93XS, 934  |
| 106  | Reserved  | -     | -       | -        | -      | -          |
| 107  | Reserved  | -     | -       | -        | -      | -          |
| 108  | Probe temperature (931S, 932S, 934)                                     | °C    | x0.1    | INT16    | RO     | 93XS, 934  |
|  | Column temperature (933S)   |       |         |          |        |            |
| 109  | Reserved  | -     | -       | -        | -      | -          |
| 110  | Reserved  | -     | -       | -        | -      | -          |
| 111  | Filter wheel speed  | RPM   | x1      | UINT16   | RO     | 932S, 933S |
| 112  | Active lamp pulse of filter 1   | mV    | x1      | INT16    | RO     | 93XS       |
| 113  | Active lamp pulse of filter 2   | mV    | x1      | INT16    | RO     | 93XS       |
| 114  | Active lamp pulse of filter 3   | mV    | x1      | INT16    | RO     | 932S, 933S |
| 115  | Active lamp pulse of filter 4   | mV    | x1      | INT16    | RO     | 932S, 933S |
| 116  | Active lamp pulse of filter 5   | mV    | x1      | INT16    | RO     | 932S, 933S |
| 117  | Active lamp pulse of filter 6   | mV    | x1      | INT16    | RO     | 932S, 933S |



| Reg # | Description / Definition  | Units | Scaling | Reg Type | Access | Analyzer   |
|-------|---|-------|---------|----------|--------|------------|
| 118   | Reserved  | -     | -       | -        | -      | -          |
| 119   | Reserved  | -     | -       | -        | -      | -          |
| 120   | Bench Heater Duty Cycle   | %     | x1      | UINT16   | RO     | 93XS       |
| 121   | Cell or oven Heater Duty Cycle  | %     | x1      | UINT16   | RO     | 93XS, 934  |
| 122   | Reference-PMT signal of filter 1  | mV    | x1      | UINT16   | RO     | 93XS       |
| 123   | Reference-PMT signal of filter 2  | mV    | x1      | UINT16   | RO     | 93XS       |
| 124   | Reference-PMT signal of filter 3  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 125   | Reference-PMT signal of filter 4  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 126   | Reference-PMT signal of filter 5  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 127   | Reference-PMT signal of filter 6  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 128   | Measure-PMT signal of filter 1  | mV    | x1      | UINT16   | RO     | 93XS       |
| 129   | Measure-PMT signal of filter 2  | mV    | x1      | UINT16   | RO     | 93XS       |
| 130   | Measure-PMT signal of filter 3  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 131   | Measure-PMT signal of filter 4  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 132   | Measure-PMT signal of filter 5  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 133   | Measure-PMT signal of filter 6  | mV    | x1      | UINT16   | RO     | 932S, 933S |
| 134   | Reserved  | -     | -       | -        | -      | -          |
| 135   | Reserved  | -     | -       | -        | -      | -          |
| 136   | Reserved  | -     | -       | -        | -      | -          |
| 137   | Probe heater duty cycle (931S, 932S, 934)<br><br>Column heater duty cycle (933S)  | %     | x1      | UINT16   | RO     | 93XS, 934  |
| 138   | Reserved  | -     | -       | -        | -      | -          |
| 139   | Reserved  | -     | -       | -        | -      | -          |
| 140   | Reserved  | -     | -       | -        | -      | -          |
| 141   | Reserved  | -     | -       | -        | -      | -          |
| 142   | Reserved  | -     | -       | -        | -      | -          |
| 143   | Reserved  | -     | -       | -        | -      | -          |
| 144   | Reserved  | -     | -       | -        | -      | -          |
| 145   | Reserved  | -     | -       | -        | -      | -          |
| 146   | Reserved  | -     | -       | -        | -      | -          |
| 147   | Reserved  | -     | -       | -        | -      | -          |
| 148   | Reserved  | -     | -       | -        | -      | -          |
| 149   | Reserved  | -     | -       | -        | -      | -          |
| 150   | Reserved  | -     | -       | -        | -      | -          |
| 151   | Reserved  | -     | -       | -        | -      | -          |
| 152   | Reserved  | -     | -       | -        | -      | -          |
| 153   | Analyzer operating mode<br>low byte indicates analyzer system state:<br><i>0 = start-up shut-in (93XS)</i><br><i>1 = start-up time delay (931S, 932S, 934) / start-up auto-zero (933S)</i><br><i>2 = operational (93XS)</i><br><i>3 = alarm clearing (93XS)</i><br><i>4 = start-up auto-zero recheck (933S)</i><br><i>5 = high concentration excursion recovery (933S)</i><br><i>6 = ALC warning recovery (933S)</i><br>high byte indicates bench setup state:<br><i>0 = idle/completed (93XS)</i><br><i>1 = adjusting PMT-level (93XS)</i><br><i>2 = adjusting lamp pulses (93XS)</i><br><i>3 = adjusting PMT-balance (93XS)</i><br><i>4 = adjusting PMT-level (93XS)</i><br><i>5 = adjusting lamp pulses (93XS)</i><br><i>6 = setting up ALC (93XS)</i> | -     | x1      | 2x UINT8 | RO     | 93XS, 934  |

| Reg # | Description / Definition   | Units | Scaling | Reg Type | Access | Analyzer  |
|-------|--|-------|---------|----------|--------|-----------|
| 154   | <p>Host-controller warning status bitmask (931S, 932S, 934)<br/>[0=clear; 1=warning]<br/>b0: EEPROM full<br/>b1: analog output out of range<br/>b2: probe temperature out of range if not controlling<br/>b3: excessive zero drift (931S, 932S)<br/>b4: calibration gas pressure out of range<br/>b5: sample gas pressure out of range<br/>b6: low-flow detected if configured to activate warning alarm<br/>b7..b15: reserved</p> <p>Host-controller warning status bitmask (933S)<br/>[0=clear; 1=warning]<br/>b0: EEPROM full<br/>b1: analog output out of range<br/>b2: column temperature too high<br/>b3: excessive zero drift<br/>b4: zero gas pressure out of range if configured to activate warning alarm<br/>b5: sample gas pressure too high<br/>b6: sample gas pressure too low if configured to activate warning alarm<br/>b7: low-flow detected if configured to activate warning alarm<br/>b8..b15: reserved</p>                       | –     | x1      | UINT16   | RO     | 93XS, 934 |
| 155   | <p>Host-controller fault status bitmask (931S, 932S, 934)<br/>[0=clear; 1=fault]<br/>b0: HC-MC internal communication problem<br/>b1: UV bench analytic data not received (931S, 932S)<br/>b2: sample gas pressure too low<br/>b3: HC on-chip ADC not responding<br/>b4: probe temperature too low if controlling<br/>b5: probe temperature too high if controlling<br/>b6: low-flow detected if configured to activate fault alarm<br/>b7..b15: reserved</p> <p>Host-controller fault status bitmask (933S)<br/>[0=clear; 1=fault]<br/>b0: HC-MC internal communication problem<br/>b1: UV bench analytic data not received<br/>b2: sample gas pressure too low if configured to activate fault alarm<br/>b3: HC on-chip ADC not responding<br/>b4: column temperature too low<br/>b5: low-flow detected if configured to activate fault alarm<br/>b6: zero gas pressure out of range if configured to activate fault alarm<br/>b7..b15: reserved</p> | –     | x1      | UINT16   | RO     | 93XS, 934 |
| 156   | <p>Micro-controller warning status bitmask<br/>[0=clear; 1=warning]<br/>b0: PMT signal out of range if configured to activate warning alarm (93XS)<br/>b1: ALC out of range if configured to activate warning alarm (93XS)<br/>b2: cell or oven temperature out of range (93XS, 934)<br/>b3: bench temperature out of range (93XS)<br/>b4: bench auto-setup problem (93XS)<br/>b5: sensor cal-adjust problem (93XS, 934)<br/>b6..b15: reserved</p>   | –     | x1      | UINT16   | RO     | 93XS, 934 |

| Reg # | Description / Definition  | Units | Scaling | Reg Type | Access | Analyzer  |
|-------|---|-------|---------|----------|--------|-----------|
| 157   | <p>Micro-controller fault status bitmask (931S, 932S, 934)<br/>[0=clear; 1=fault]</p> <p><i>b0: filter wheel speed out of range (932)</i><br/><i>b1: MC on-board ADC not responding</i><br/><i>b2: MC on-chip ADC not responding</i><br/><i>b3: MC-HC internal communication problem</i><br/><i>b4: cell or oven temperature out of range if controlling</i><br/><i>b5..b15: reserved</i></p> <p>Micro-controller fault status bitmask (933S)<br/>[0=clear; 1=fault]</p> <p><i>b0: filter wheel speed out of range</i><br/><i>b1: MC on-board ADC not responding</i><br/><i>b2: MC on-chip ADC not responding</i><br/><i>b3: MC-HC internal communication problem</i><br/><i>b4: cell or oven temperature out of range if controlling</i><br/><i>b5: lamp failure</i><br/><i>b6: PMT signal out of range if configured to activate fault alarm</i><br/><i>b7: ALC out of range if configured to activate fault alarm</i><br/><i>b8..b15: reserved</i></p>           | –     | x1      | UINT16   | RO     | 93XS, 934 |
| 158   | <p>Digital contact input bitmask<br/>[0=open; 1=closed]</p> <p><i>b0: auto-calibration sequence (931S, 932S, 934)   auto-zero (933S)</i><br/><i>b1: concentration alarm hard-enable</i><br/><i>b2..7: reserved</i><br/><i>b8: stream selection (931S, 932S, 934)</i><br/><i>b9: flow-switch</i><br/><i>b10..b15: reserved</i></p>   | –     | x1      | UINT16   | RO     | 93XS, 934 |
| 159   | <p>Calibration action bitmask<br/>[0=abort/inactive; 1=start/active]</p> <p><i>b0: auto-calibration sequence (931S, 932S, 934)</i><br/><i>b1: auto-zero calibration</i><br/><i>b2: auto-span1 calibration (931S, 932S, 934)</i><br/><i>b3: auto-span2 calibration (931S, 932S, 934)</i><br/><i>b4: reserved</i><br/><i>b5: manual span-calibration of sensor 1</i><br/><i>b6: manual span-calibration of sensor 2</i><br/><i>b7: manual span-calibration of sensor 3</i><br/><i>b8: manual zero-calibration</i><br/><i>b9: manual span-calibration of UV species 1 (93xS)</i><br/><i>b10: manual span-calibration of UV species 2 (932S, 933S)</i><br/><i>b11: manual span-calibration of UV species 3 (932S, 933S)</i><br/><i>b12: manual span-calibration of UV species 4 (932S, 933S)</i><br/><i>b13: manual span-calibration of UV species 5 (932S, 933S)</i><br/><i>b14: manual span-calibration of UV species 6 (932S, 933S)</i><br/><i>b15: reserved</i></p> | –     | x1      | UINT16   | RW     | 93XS, 934 |
| 160   | <p>Digital output bitmask<br/>b0..b6: reserved</p> <p><i>b7: concentration alarm soft-enable [0=disable; 1=enable]</i><br/><i>b8: fault relay [0=fault; 1=normal]</i><br/><i>b9: warning relay [0=warning; 1=normal]</i><br/><i>b10: concentration alarm invalid relay [0=invalid; 1=valid]</i><br/><i>b11: concentration alarm 1 [0=deactivated; 1=activated]</i><br/><i>b12: concentration alarm 2 [0=deactivated; 1=activated]</i><br/><i>b13: solenoid A [0=de-energized; 1=energized]</i><br/><i>b14: solenoid B [0=de-energized; 1=energized]</i><br/><i>b15: solenoid Z [0=de-energized; 1=energized]</i></p>  | –     | x1      | UINT16   | RW     | 93XS, 934 |
| 161   | Output hold time for UV species 1 after column switch   | sec   | x1      | UINT16   | RW     | 933S      |
| 162   | Output hold time for UV species 2 after column switch   | sec   | x1      | UINT16   | RW     | 933S      |
| 163   | Output hold time for UV species 3 after column switch   | sec   | x1      | UINT16   | RW     | 933S      |
| 164   | Output hold time for UV species 4 after column switch   | sec   | x1      | UINT16   | RW     | 933S      |
| 165   | Output hold time for UV species 5 after column switch   | sec   | x1      | UINT16   | RW     | 933S      |
| 166   | Output hold time for UV species 6 after column switch   | sec   | x1      | UINT16   | RW     | 933S      |

| Reg # | Description / Definition   | Units | Scaling | Reg Type | Access | Analyzer        |
|-------|--|-------|---------|----------|--------|-----------------|
| 167   | Span gas concentration for sensor1   | %     | x0.01   | UINT16   | RW     | 93XS, 934       |
| 168   | Span gas concentration for sensor2   | %     | x0.01   | UINT16   | RW     | 93XS, 934       |
| 169   | Span gas concentration for sensor3   | %     | x0.01   | UINT16   | RW     | 93XS, 934       |
| 170   | Startup zero re-check interval   | min   | x1      | UINT16   | RW     | 933S            |
| 171   | Auto-zero gas flow duration  | min   | x1      | UINT16   | RW     | 93XS, 934       |
| 172   | Auto-span1 gas flow duration   | min   | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 173   | Auto-span2 gas flow duration   | min   | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 174   | Stream switching interval (931S, 932S, 934)<br>Column switching interval (933S)          | sec   | x1      | UINT16   | RW     | 93XS, 934       |
| 175   | Sample return time delay   | sec   | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 176   | Auto-zero interval   | hr    | x1      | UINT16   | RW     | 93XS, 934       |
| 177   | Auto-calibration sequence interval   | hr    | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 178   | Calibration integration duration   | sec   | x1      | UINT16   | RW     | 93XS, 934       |
| 179   | Alarm type to activate when low-flow detected by flow-switch<br>0 = warning<br>1 = fault | -     | x1      | UINT16   | RW     | 93XS, 934       |
| 180   | Time delay to activate alarm when low-flow detected by flow-switch                       | sec   | x1      | UINT16   | RW     | 93XS, 934       |
| 181   | Solenoid combination code for zero gas flow (see Note 3)                                 | -     | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 182   | Solenoid combination code for span1 gas flow (see Note 3)                                | -     | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 183   | Solenoid combination code for span2 gas flow (see Note 3)                                | -     | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 184   | Solenoid combination code for stream A flow (see Note 3)                                 | -     | x1      | UINT16   | RW     | 931S, 932S, 934 |
| 185   | Solenoid combination code for stream B flow (see Note 3)                                 | -     | x1      | UINT16   | RW     | 931S, 932S, 934 |

**Note 3: (Registers 181–185)**

Each solenoid assumes a value:

solenoid A = 1  
solenoid B = 10  
solenoid Z = 100

The solenoid combination for a particular flow is the sum of the solenoid values.

Examples:

- a) energize solenoids Z & A for zero gas flow --> 101
- b) energize solenoids B & A for span1 gas flow --> 11
- c) energize solenoids Z & B for span2 gas flow --> 110
- d) energize solenoid A for stream A flow --> 1
- e) energize solenoid B for stream B flow --> 10

| Reg # | Description / Definition  | Units | Scaling | Reg Type | Access | Analyzer           |
|-------|---|-------|---------|----------|--------|--------------------|
| 186   | Bitmask of species to be calibrated with auto-span1<br>[0=disable; 1=enable]<br><i>b0: UV species 1 (931S, 932S)</i><br><i>b1: UV species 2 (932S)</i><br><i>b2: UV species 3 (932S)</i><br><i>b3: UV species 4 (932S)</i><br><i>b4: UV species 5 (932S)</i><br><i>b5: UV species 6 (932S)</i><br><i>b6: sensor1 (931S, 932S, 934)</i><br><i>b7: sensor2 (931S, 932S, 934)</i><br><i>b8: sensor3 (931S, 932S, 934)</i><br><i>b9..b15: reserved</i>  | –     | x1      | UINT16   | RW     | 931S, 932S,<br>934 |
| 187   | Bitmask of species to be calibrated with auto-span2<br>[0=disable; 1=enable]<br><i>b0: UV species 1 (931S, 932S)</i><br><i>b1: UV species 2 (932S)</i><br><i>b2: UV species 3 (932S)</i><br><i>b3: UV species 4 (932S)</i><br><i>b4: UV species 5 (932S)</i><br><i>b5: UV species 6 (932S)</i><br><i>b6: sensor1 (931S, 932S, 934)</i><br><i>b7: sensor2 (931S, 932S, 934)</i><br><i>b8: sensor3 (931S, 932S, 934)</i><br><i>b9..b15: reserved</i>  | –     | x1      | UINT16   | RW     | 931S, 932S,<br>934 |
| 188   | Bitmask of pressure correction source<br>[0=use pressure measurement; 1=use default pressure]<br><i>b0: sensor1</i><br><i>b1: sensor2</i><br><i>b2: sensor3</i><br><i>b3: UV species</i><br><i>b4..b15: reserved</i>  | –     | x1      | UINT16   | RW     | 93XS, 934          |
| 189   | Relay3 operation type<br><i>0 = alarm invalid [default]</i><br><i>1 = CAL in progress</i>   | –     | x1      | UINT16   | RW     | 93XS, 934          |
| 190   | Gas flow control (931S, 932S, 934)<br><i>0 = automatic by analyzer</i><br><i>1 = continuous shut-in/shut-off</i><br><i>2 = continuous zero flow</i><br><i>3 = continuous span1 flow</i><br><i>4 = continuous span2 flow</i><br><i>5 = continuous stream–A flow</i><br><i>6 = continuous stream–B flow</i><br><i>7 = continuous sample flow with stream switching</i><br><br>Gas flow control (933S)<br><i>0 = automatic by analyzer</i><br><i>1 = continuous column–A flow</i><br><i>2 = continuous column–B flow</i><br><i>3 = continuous zero flow</i><br><i>4 = continuous shut-in/shut-off</i><br><i>5 = continuous sample flow with column switching</i> | –     | x1      | UINT16   | RW     | 93XS, 934          |
| 191   | Active stream (If controlled via Modbus, write to register to select stream.)<br><i>-1 = none</i><br><i>0 = streamA</i><br><i>1 = streamB</i>   | –     | x1      | INT16    | RW     | 931S, 932S,<br>934 |
| 192   | Stream switching control source<br><i>0 = automatic by analyzer</i><br><i>1 = digital input</i><br><i>2 = Modbus</i>  | –     | x1      | UINT16   | RW     | 931S, 932S,<br>934 |

| Reg # | Description / Definition   | Units | Scaling | Reg Type | Access | Analyzer   |
|-------|--|-------|---------|----------|--------|------------|
| 193   | Alarm type to activate when status bit is set<br>[0 = warning; 1 = fault]<br>b0: sample pressure too low<br>b1: zero pressure out of range<br>b2: PMT signal out of range<br>b3: ALC out of range<br>b4..b15: reserved | –     | x1      | UINT16   | RW     | 933S       |
| 194   | Exclude CAL condition in activation of warning alarm<br>0 = include<br>1 = exclude   | –     | x1      | UINT16   | RW     | 933S       |
| 195   | Limit analog current output range<br>0 = under- and over-range permitted<br>1 = limit to between 4mA and 20mA  | –     | x1      | UINT16   | RW     | 93XS, 934  |
| 196   | Default cell temperature   | °C    | x0.1    | INT16    | RW     | 93XS       |
| 197   | Default cell or sample pressure  | mmHg  | x1      | INT16    | RW     | 93XS, 934  |
| 198   | Zero transmittance of filter 1   | –     | x0.0001 | UINT16   | RW     | 93XS       |
| 199   | Zero transmittance of filter 2   | –     | x0.0001 | UINT16   | RW     | 93XS       |
| 200   | Zero transmittance of filter 3   | –     | x0.0001 | UINT16   | RW     | 932S, 933S |
| 201   | Zero transmittance of filter 4   | –     | x0.0001 | UINT16   | RW     | 932S, 933S |
| 202   | Zero transmittance of filter 5   | –     | x0.0001 | UINT16   | RW     | 932S, 933S |
| 203   | Zero transmittance of filter 6   | –     | x0.0001 | UINT16   | RW     | 932S, 933S |
| 204   | Span factor of UV species 1  | –     | x0.001  | UINT16   | RW     | 93XS       |
| 205   | Span factor of UV species 2  | –     | x0.001  | UINT16   | RW     | 932S, 933S |
| 206   | Span factor of UV species 3  | –     | x0.001  | UINT16   | RW     | 932S, 933S |
| 207   | Span factor of UV species 4  | –     | x0.001  | UINT16   | RW     | 932S, 933S |
| 208   | Span factor of UV species 5  | –     | x0.001  | UINT16   | RW     | 932S, 933S |
| 209   | Span factor of UV species 6  | –     | x0.001  | UINT16   | RW     | 932S, 933S |
| 210   | Span factor of sensor1   | –     | x0.001  | UINT16   | RW     | 93XS, 934  |
| 211   | Span factor of sensor2   | –     | x0.001  | UINT16   | RW     | 93XS, 934  |
| 212   | Span factor of sensor3   | –     | x0.001  | UINT16   | RW     | 93XS, 934  |
| 213   | Reserved   | –     | –       | –        | –      | –          |
| 214   | Zero (4mA) calibration reading of current output channel 1   | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 215   | Zero (4mA) calibration reading of current output channel 2   | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 216   | Zero (4mA) calibration reading of current output channel 3   | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 217   | Zero (4mA) calibration reading of current output channel 4   | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 218   | Span (20mA) calibration reading of current output channel 1  | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 219   | Span (20mA) calibration reading of current output channel 2  | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 220   | Span (20mA) calibration reading of current output channel 3  | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 221   | Span (20mA) calibration reading of current output channel 4  | mA    | x0.001  | UINT16   | RW     | 93XS, 934  |
| 222   | Zero (1000mV) calibration reading of voltage output channel 1  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 223   | Zero (1000mV) calibration reading of voltage output channel 2  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 224   | Zero (1000mV) calibration reading of voltage output channel 3  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 225   | Zero (1000mV) calibration reading of voltage output channel 4  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 226   | Span (5000mV) calibration reading of voltage output channel 1  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 227   | Span (5000mV) calibration reading of voltage output channel 2  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 228   | Span (5000mV) calibration reading of voltage output channel 3  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 229   | Span (5000mV) calibration reading of voltage output channel 4  | mV    | x1      | UINT16   | RW     | 93XS, 934  |

| Reg #                              | Description / Definition   | Units | Scaling | Reg Type | Access | Analyzer   |
|------------------------------------|--|-------|---------|----------|--------|------------|
| 230                                | Sensor enable and signal type bitmask<br><i>b0: sensor1 [0=disable; 1=enable]</i><br><i>b1: sensor2 [0=disable; 1=enable]</i><br><i>b2: sensor3 [0=disable; 1=enable]</i><br><i>b3 reserved</i><br><i>b4: sensor1 signal type [0=differential; 1=voltage]</i><br><i>b5: sensor2 signal type [0=positive; 1=inverted]</i><br><i>b6: sensor3 signal type [0=differential; 1=voltage]</i><br><i>b7..b15: reserved</i> | –     | x1      | UINT16   | RW     | 93XS, 934  |
| 231                                | Sensor2 voltage input offset in terms of PWM duty cycle  | %     | x1      | UINT16   | RW     | 93XS, 934  |
| 232                                | Sensor3 voltage input offset in terms of PWM duty cycle  | %     | x1      | UINT16   | RW     | 93XS, 934  |
| 233                                | Micro-controller analog input channel 1  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 234                                | Micro-controller analog input channel 2  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 235                                | Micro-controller analog input channel 3  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 236                                | Micro-controller analog input channel 4  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 237                                | Micro-controller analog input channel 5  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 238                                | Micro-controller analog input channel 6  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 239                                | Micro-controller analog input channel 7  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 240                                | Micro-controller analog input channel 8  | mV    | x1      | UINT16   | RO     | 93XS, 934  |
| 241                                | Transmittance of filter 1  | –     | x0.0001 | UINT16   | RO     | 93XS       |
| 242                                | Transmittance of filter 2  | –     | x0.0001 | UINT16   | RO     | 93XS       |
| 243                                | Transmittance of filter 3  | –     | x0.0001 | UINT16   | RO     | 932S, 933S |
| 244                                | Transmittance of filter 4  | –     | x0.0001 | UINT16   | RO     | 932S, 933S |
| 245                                | Transmittance of filter 5  | –     | x0.0001 | UINT16   | RO     | 932S, 933S |
| 246                                | Transmittance of filter 6  | –     | x0.0001 | UINT16   | RO     | 932S, 933S |
| 247                                | Absorbance of filters 1  | –     | x0.0001 | INT16    | RO     | 93XS       |
| 248                                | Absorbance of filters 2  | –     | x0.0001 | INT16    | RO     | 93XS       |
| 249                                | Absorbance of filters 3  | –     | x0.0001 | INT16    | RO     | 932S, 933S |
| 250                                | Absorbance of filters 4  | –     | x0.0001 | INT16    | RO     | 932S, 933S |
| 251                                | Absorbance of filters 5  | –     | x0.0001 | INT16    | RO     | 932S, 933S |
| 252                                | Absorbance of filters 6  | –     | x0.0001 | INT16    | RO     | 932S, 933S |
| 253                                | Result assignment of concentration alarm 1 (see Note 4)  | –     | x1      | UINT16   | RW     | 93XS, 934  |
| 254                                | Result assignment of concentration alarm 2 (see Note 4)  | –     | x1      | UINT16   | RW     | 93XS, 934  |
| <b>Note 4: (Registers 253–254)</b> |  |       |         |          |        |            |
| 93XS, 934:                         |  |       |         |          |        |            |
| 0 = alarm disabled                 |  |       |         |          |        |            |
| 1 = UV species 1 result            |  |       |         |          |        |            |
| 2 = UV species 2 result            |  |       |         |          |        |            |
| 3 = UV species 3 result            |  |       |         |          |        |            |
| 4 = UV species 4 result            |  |       |         |          |        |            |
| 5 = UV species 5 result            |  |       |         |          |        |            |
| 6 = UV species 6 result            |  |       |         |          |        |            |
| 7 = sensor 1 result                |  |       |         |          |        |            |
| 8 = sensor 2 result                |  |       |         |          |        |            |
| 9 = sensor 3 result                |  |       |         |          |        |            |
| 10 = custom UV result              |  |       |         |          |        |            |
| +10 for T&H result                 |  |       |         |          |        |            |
| 931S, 932S, 934:                   |  |       |         |          |        |            |
| +100 for stream–B                  |  |       |         |          |        |            |
| 255                                | Sensor1 raw concentration low scale (voltage signal type)  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 257                                | Sensor1 raw concentration high scale (voltage signal type)   | –     | –       | FLOAT    | RW     | 93XS, 934  |

| Reg # | Description / Definition  | Units | Scaling            | Reg Type | Access | Analyzer  |
|-------|---|-------|--------------------|----------|--------|-----------|
| 259   | Time delay to activate concentration alarm 1  | sec   | x1                 | UINT16   | RW     | 93XS, 934 |
| 260   | Time delay to activate concentration alarm 2  | sec   | x1                 | UINT16   | RW     | 93XS, 934 |
| 261   | Enable latching of concentration alarm 1<br>0 = <i>disable</i><br>1 = <i>enable</i> | –     | x1                 | UINT16   | RW     | 93XS, 934 |
| 262   | Enable latching of concentration alarm 2<br>0 = <i>disable</i><br>1 = <i>enable</i> | –     | x1                 | UINT16   | RW     | 93XS, 934 |
| 263   | Enable latching of fail/fault alarm<br>0 = <i>disable</i><br>1 = <i>enable</i>      | –     | x1                 | UINT16   | RW     | 93XS, 934 |
| 264   | Name of sensor1 result [characters 1 & 2] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 265   | Name of sensor1 result [characters 3 & 4] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 266   | Name of sensor1 result [characters 5 & 6] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 267   | Name of sensor2 result [characters 1 & 2] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 268   | Name of sensor2 result [characters 3 & 4] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 269   | Name of sensor2 result [characters 5 & 6] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 270   | Name of sensor3 result [characters 1 & 2] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 271   | Name of sensor3 result [characters 3 & 4] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 272   | Name of sensor3 result [characters 5 & 6] (see Note 5)                              | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934 |
| 273   | Host-controller software version [characters 1 & 2] (see Note 5)                    | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 274   | Host-controller software version [characters 3 & 4] (see Note 5)                    | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 275   | Host-controller software version [characters 5 & 6] (see Note 5)                    | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 276   | Host-controller software version [characters 7 & 8] (see Note 5)                    | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 277   | Host-controller software version [characters 9 & 10] (see Note 5)                   | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 278   | Host-controller software version [characters 11 & 12] (see Note 5)                  | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 279   | Host-controller software version [characters 13 & 14] (see Note 5)                  | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 280   | Host-controller software version [characters 15 & 16] (see Note 5)                  | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 281   | Micro-controller software version [characters 1 & 2] (see Note 5)                   | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 282   | Micro-controller software version [characters 3 & 4] (see Note 5)                   | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 283   | Micro-controller software version [characters 5 & 6] (see Note 5)                   | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |
| 284   | Micro-controller software version [characters 7 & 8] (see Note 5)                   | –     | ASCII<br>character | 2x UINT8 | RO     | 93XS, 934 |



| Reg #  | Description / Definition  | Units | Scaling         | Reg Type | Access | Analyzer   |
|--|---|-------|-----------------|----------|--------|------------|
| 285  | Micro-controller software version [characters 9 & 10] (see Note 5)  | –     | ASCII character | 2x UINT8 | RO     | 93XS, 934  |
| 286  | Micro-controller software version [characters 11 & 12] (see Note 5)   | –     | ASCII character | 2x UINT8 | RO     | 93XS, 934  |
| 287  | Micro-controller software version [characters 13 & 14] (see Note 5)   | –     | ASCII character | 2x UINT8 | RO     | 93XS, 934  |
| 288  | Micro-controller software version [characters 15 & 16] (see Note 5)   | –     | ASCII character | 2x UINT8 | RO     | 93XS, 934  |
| <b>Note 5: (Register 264–288; 383–448)</b>                                   |   |       |                 |          |        |            |
| <i>ASCII character registers</i>   |   |       |                 |          |        |            |
| <i>high byte = 1st character</i>   |   |       |                 |          |        |            |
| <i>low byte = 2nd character</i>  |   |       |                 |          |        |            |
| 289  | Reserved  | –     | –               | –        | –      | –          |
| 290  | Reserved  | –     | –               | –        | –      | –          |
| 291  | Modbus node address (see Note 6)  | –     | x1              | UINT16   | RW     | 93XS, 934  |
| <b>Note 6: (Register 291)</b>  |   |       |                 |          |        |            |
| <i>The new node address is effective once it is written to the analyzer.</i> |   |       |                 |          |        |            |
| 292  | Modbus serial communication baud rate<br>0 = 9600<br>1 = 4800<br>2 = 2400<br>3 = 1200   | –     | x1              | UINT16   | RW     | 93XS, 934  |
| 293  | Modbus serial communication stop bits<br>0 = 1 stop bit<br>1 = 2 stop bits  | –     | x1              | UINT16   | RW     | 93XS, 934  |
| 294  | Modbus serial communication parity<br>0 = none<br>1 = odd<br>2 = even   | –     | x1              | UINT16   | RW     | 93XS, 934  |
| 295  | Compensation factor of gas1 to sensor1 result   | –     | –               | FLOAT    | RW     | 93XS, 934  |
| 297  | Compensation factor of gas2 to sensor1 result   | –     | –               | FLOAT    | RW     | 93XS, 934  |
| 299  | Reserved  | –     | –               | –        | –      | –          |
| 300  | EEPROM write counter  | –     | x1              | UINT16   | RO     | 93XS, 934  |
| 301  | Analyzer action request bitmask (see Note 7)<br>[0=n/a; 1=initiate action]<br>b0 (1): save configuration to EEPROM<br>b1 (2): bench auto-setup<br>b2 (4): zero-calibration of analog outputs<br>b3 (8): span-calibration of analog outputs<br>b4 (16): mid-scale check of analog outputs<br>b5..14: reserved<br>b15 (32768): reset analyzer | –     | x1              | UINT16   | RW     | 93XS, 934  |
| <b>Note 7: (Register 301)</b>  |   |       |                 |          |        |            |
| <i>The new node address is effective once it is written to the analyzer.</i> |   |       |                 |          |        |            |
| 302  | Key filter  | –     | x1              | UINT16   | RW     | 93XS       |
| 303  | Lamp pulse control of filter 1  | mV    | x1              | INT16    | RW     | 93XS       |
| 304  | Lamp pulse control of filter 2  | mV    | x1              | INT16    | RW     | 93XS       |
| 305  | Lamp pulse control of filter 3  | mV    | x1              | INT16    | RW     | 932S, 933S |
| 306  | Lamp pulse control of filter 4  | mV    | x1              | INT16    | RW     | 932S, 933S |
| 307  | Lamp pulse control of filter 5  | mV    | x1              | INT16    | RW     | 932S, 933S |
| 308  | Lamp pulse control of filter 6  | mV    | x1              | INT16    | RW     | 932S, 933S |
| 309  | Base pulse control for lamp 1   | mV    | x1              | INT16    | RW     | 93XS       |
| 310  | Base pulse control for lamp 2   | mV    | x1              | INT16    | RW     | 93XS       |

| Reg # | Description / Definition  | Units | Scaling | Reg Type | Access | Analyzer   |
|-------|---|-------|---------|----------|--------|------------|
| 311   | Maximum lamp pulse  | mV    | x1      | INT16    | RW     | 93XS       |
| 312   | PMT-level gain control  | mV    | x1      | UINT16   | RW     | 93XS       |
| 313   | PMT-balance gain Control  | mV    | x1      | UINT16   | RW     | 93XS       |
| 314   | Maximum PMT signal  | mV    | x1      | UINT16   | RW     | 93XS       |
| 315   | Reserved<br>{Service host configuration parameter}  | -     | x1      | UINT16   | RW     | 93XS, 934  |
| 316   | Reserved  | -     | -       | -        | -      | -          |
| 317   | UV bench type bitmask<br>b0: bench orientation<br><i>0=normal</i><br><i>1=reverse</i><br>b1..3: filter pulsing sequence<br><i>000 (0)=1-3-5,4-6-2</i><br><i>001 (2)=3-5,4-6-1-2</i><br><i>010 (4)=1-3-4-5,6-2</i><br><i>011 (6)=motorless (1-3-2)</i><br><i>100 (8)=1-3-5,4-6-1</i><br>b3..15: reserved   | -     | x1      | UINT16   | RW     | 93XS       |
| 318   | PMT signal acquisition – samples  | -     | x1      | UINT16   | RW     | 93XS       |
| 319   | PMT signal acquisition – delay  | -     | x1      | UINT16   | RW     | 93XS       |
| 320   | Reserved  | -     | -       | -        | -      | -          |
| 321   | T90 time constant   | sec   | x1      | UINT16   | RW     | 93XS, 934  |
| 322   | Enable ALC<br><i>0 = disable</i><br><i>1 = enable</i>   | -     | x1      | UINT16   | RW     | 93XS       |
| 323   | ALC gain for filter 1   | -     | x1      | UINT16   | RW     | 93XS       |
| 324   | ALC gain for filter 2   | -     | x1      | UINT16   | RW     | 93XS       |
| 325   | ALC gain for filter 3   | -     | x1      | UINT16   | RW     | 932S, 933S |
| 326   | ALC gain for filter 4   | -     | x1      | UINT16   | RW     | 932S, 933S |
| 327   | ALC gain for filter 5   | -     | x1      | UINT16   | RW     | 932S, 933S |
| 328   | ALC gain for filter 6   | -     | x1      | UINT16   | RW     | 932S, 933S |
| 329   | ALC set-point for filter 1  | mV    | x1      | UINT16   | RW     | 93XS       |
| 330   | ALC set-point for filter 2  | mV    | x1      | UINT16   | RW     | 93XS       |
| 331   | ALC set-point for filter 3  | mV    | x1      | UINT16   | RW     | 932S, 933S |
| 332   | ALC set-point for filter 4  | mV    | x1      | UINT16   | RW     | 932S, 933S |
| 333   | ALC set-point for filter 5  | mV    | x1      | UINT16   | RW     | 932S, 933S |
| 334   | ALC set-point for filter 6  | mV    | x1      | UINT16   | RW     | 932S, 933S |
| 335   | UV analysis algorithm selection bitmask<br>[0=deselect; 1=select]<br><i>b0: NDr compensation</i><br><i>b1: linearization correction 1</i><br><i>b2: linearization correction 2</i><br><i>b3..b7: reserved</i><br><i>b8: no temperature/pressure correction and unit scaling</i><br><i>b9: regenerate transmittance</i><br><i>b10..b15: reserved</i> | -     | x1      | UINT16   | RW     | 931S, 932S |
| 336   | Cell or sample pressure when zero-calibrating sensor2   | mmHg  | x1      | UINT16   | RW     | 93XS, 934  |
| 337   | Reserved  | -     | -       | -        | -      | -          |
| 338   | Signal reading when zero-calibrating sensor2  | mV    | x1      | UINT16   | RW     | 93XS, 934  |
| 339   | Gas1 concentration in the zero gas for sensor2 result compensation  | %     | x0.01   | UINT16   | RW     | 93XS, 934  |
| 340   | Gas2 concentration in the zero gas for sensor2 result compensation  | %     | x0.01   | UINT16   | RW     | 93XS, 934  |
| 341   | Gas1 concentration in the process gas for sensor2 result compensation   | %     | x0.01   | UINT16   | RW     | 93XS, 934  |
| 342   | Gas2 concentration in the process gas for sensor2 result compensation   | %     | x0.01   | UINT16   | RW     | 93XS, 934  |

| Reg #                              | Description / Definition   | Units      | Scaling  | Reg Type | Access | Analyzer  |
|------------------------------------|--|------------|----------|----------|--------|-----------|
| 343                                | Reference signal reading when zero-calibrating sensor3 (differential signal type)<br>Voltage reading when zero-calibrating sensor3 (voltage signal type)           | mV         | x1       | UINT16   | RW     | 93XS, 934 |
| 344                                | Differential signal reading when zero-calibrating sensor3 (differential signal type)<br>Cell pressure when zero-calibrating sensor3 (voltage signal type)          | mV<br>mmHg | x1<br>x1 | UINT16   | RW     | 93XS, 934 |
| 345                                | Gas1 concentration in the process stream for sensor3 result compensation   | %          | x0.01    | UINT16   | RW     | 93XS, 934 |
| 346                                | Gas2 concentration in the process stream for sensor3 result compensation   | %          | x0.01    | UINT16   | RW     | 93XS, 934 |
| 347                                | Sensor1 voltage input offset in terms of PWM duty cycle  | %          | x1       | UINT16   | RW     | 93XS, 934 |
| 348                                | Reference signal reading when zero-calibrating sensor1 (differential signal type)<br>Voltage signal range of sensor1 (voltage signal type)                         | mV         | x1       | UINT16   | RW     | 93XS, 934 |
| 349                                | Differential signal reading when zero-calibrating sensor1 (differential signal type)<br>Voltage signal reading when zero-calibrating sensor1 (voltage signal type) | mV         | x1       | UINT16   | RW     | 93XS, 934 |
| 350                                | Gas1 concentration in the process stream for sensor1 result compensation   | %          | x0.01    | UINT16   | RW     | 93XS, 934 |
| 351                                | Gas2 concentration in the process stream for sensor1 result compensation   | %          | x0.01    | UINT16   | RW     | 93XS, 934 |
| 352                                | Sensor1 calibration signal target  | mV         | x1       | UINT16   | RW     | 93XS, 934 |
| 353                                | Sensor1 calibration signal delta   | mV         | x1       | UINT16   | RW     | 93XS, 934 |
| 354                                | Cell or sample pressure measurement range – low scale  | mmHg       | x1       | INT16    | RW     | 93XS, 934 |
| 355                                | Cell or sample pressure measurement range – high scale   | mmHg       | x1       | INT16    | RW     | 93XS, 934 |
| 356                                | Bench temperature too hot limit  | °C         | x0.1     | INT16    | RW     | 93XS      |
| 357                                | Bench temperature too cold limit   | °C         | x0.1     | INT16    | RW     | 93XS      |
| 358                                | Cell or oven temperature too hot limit   | °C         | x0.1     | INT16    | RW     | 93XS, 934 |
| 359                                | Cell or oven temperature too cold limit  | °C         | x0.1     | INT16    | RW     | 93XS, 934 |
| 360                                | Probe temperature too hot limit (931S, 932S)<br><br>Column temperature too hot limit (933S)  | °C         | x0.1     | INT16    | RW     | 93XS, 934 |
| 361                                | Probe temperature too cold limit (931S, 932S)<br><br>Column temperature too cold limit (933S)  | °C         | x0.1     | INT16    | RW     | 93XS, 934 |
| 362                                | UV species for compensating sensor1 result (see Note 8)  | –          | x1       | UINT16   | RW     | 93XS      |
| 363                                | UV species for compensating sensor2 result (see Note 8)  | –          | x1       | UINT16   | RW     | 93XS      |
| 364                                | UV species for compensating sensor3 result (see Note 8)  | –          | x1       | UINT16   | RW     | 93XS      |
| <b>Note 8: (Registers 362–364)</b> |  |            |          |          |        |           |
| 0 = compensation disabled          |  |            |          |          |        |           |
| 1 = UV species 1 result            |  |            |          |          |        |           |
| 2 = UV species 2 result            |  |            |          |          |        |           |
| 3 = UV species 3 result            |  |            |          |          |        |           |
| 4 = UV species 4 result            |  |            |          |          |        |           |
| 5 = UV species 5 result            |  |            |          |          |        |           |
| 6 = UV species 6 result            |  |            |          |          |        |           |
| 10 = custom UV result              |  |            |          |          |        |           |
| +10 for T&H result                 |  |            |          |          |        |           |
| 365                                | Bench temperature measurement range<br>1 = 31 to 47 °C<br>2 = 45 to 66 °C  | –          | x1       | UINT16   | RW     | 93XS      |

| Reg #                              | Description / Definition   | Units   | Scaling         | Reg Type | Access | Analyzer   |
|------------------------------------|--|---------|-----------------|----------|--------|------------|
| 366                                | Cell or oven temperature measurement range<br>1 = 5 to 65 °C<br>2 = 60 to 130 °C<br>3 = 125 to 195 °C<br>4 = 190 to 260 °C                               | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 367                                | Sensor2 calibration signal target  | mV      | x1              | UINT16   | RW     | 93XS, 934  |
| 368                                | Sensor2 calibration signal delta   | mV      | x1              | UINT16   | RW     | 93XS, 934  |
| 369                                | Bench temperature control – set-point  | °C      | x0.1            | INT16    | RW     | 93XS       |
| 370                                | Cell or oven temperature control – set-point   | °C      | x0.1            | INT16    | RW     | 93XS, 934  |
| 371                                | Sensor3 calibration signal target (differential signal type)<br>Gas1 concentration in the zero gas for sensor3 result compensation (voltage signal type) | mV<br>% | x1<br>x0.01     | UINT16   | RW     | 93XS, 934  |
| 372                                | Sensor3 calibration signal delta (voltage signal type)<br>Gas2 concentration in the zero gas for sensor3 result compensation (voltage signal type)       | mV<br>% | x1<br>x0.01     | UINT16   | RW     | 93XS, 934  |
| 373                                | Bench temperature control – start-up duty cycle  | %       | x1              | UINT16   | RW     | 93XS       |
| 374                                | Cell or oven temperature control – start-up duty cycle   | %       | x1              | UINT16   | RW     | 93XS, 934  |
| 375                                | Result assignment of voltage output channel 1 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 376                                | Result assignment of voltage output channel 2 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 377                                | Result assignment of voltage output channel 3 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 378                                | Result assignment of voltage output channel 4 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 379                                | Result assignment of current output channel 1 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 380                                | Result assignment of current output channel 2 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 381                                | Result assignment of current output channel 3 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| 382                                | Result assignment of current output channel 4 (see Note 9)   | –       | x1              | UINT16   | RW     | 93XS, 934  |
| <b>Note 9: (Registers 375–382)</b> |  |         |                 |          |        |            |
| 93XS, 934:                         |  |         |                 |          |        |            |
| 0 = output disabled                |  |         |                 |          |        |            |
| 1 = UV species 1 result            |  |         |                 |          |        |            |
| 2 = UV species 2 result            |  |         |                 |          |        |            |
| 3 = UV species 3 result            |  |         |                 |          |        |            |
| 4 = UV species 4 result            |  |         |                 |          |        |            |
| 5 = UV species 5 result            |  |         |                 |          |        |            |
| 6 = UV species 6 result            |  |         |                 |          |        |            |
| 7 = sensor 1 result                |  |         |                 |          |        |            |
| 8 = sensor 2 result                |  |         |                 |          |        |            |
| 9 = sensor 3 result                |  |         |                 |          |        |            |
| 10 = custom UV result              |  |         |                 |          |        |            |
| +10 for T&H result                 |  |         |                 |          |        |            |
| 931S, 932S, 934:                   |  |         |                 |          |        |            |
| +100 for stream-B                  |  |         |                 |          |        |            |
| 383                                | Name of UV species 1 [characters 1 & 2] (see Note 5)   | –       | ASCII character | 2x UINT8 | RW     | 93XS       |
| 384                                | Name of UV species 1 [characters 3 & 4] (see Note 5)   | –       | ASCII character | 2x UINT8 | RW     | 93XS       |
| 385                                | Name of UV species 1 [characters 5 & 6] (see Note 5)   | –       | ASCII character | 2x UINT8 | RW     | 93XS       |
| 386                                | Name of UV species 1 [characters 7 & 8] (see Note 5)   | –       | ASCII character | 2x UINT8 | RW     | 93XS       |
| 387                                | Name of UV species 2 [characters 1 & 2] (see Note 5)   | –       | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 388                                | Name of UV species 2 [characters 3 & 4] (see Note 5)   | –       | ASCII character | 2x UINT8 | RW     | 932S, 933S |

| Reg # | Description / Definition  | Units | Scaling         | Reg Type | Access | Analyzer   |
|-------|---|-------|-----------------|----------|--------|------------|
| 389   | Name of UV species 2 [characters 5 & 6] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 390   | Name of UV species 2 [characters 7 & 8] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 391   | Name of UV species 3 [characters 1 & 2] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 392   | Name of UV species 3 [characters 3 & 4] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 393   | Name of UV species 3 [characters 5 & 6] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 394   | Name of UV species 3 [characters 7 & 8] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 395   | Name of UV species 4 [characters 1 & 2] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 396   | Name of UV species 4 [characters 3 & 4] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 397   | Name of UV species 4 [characters 5 & 6] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 398   | Name of UV species 4 [characters 7 & 8] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 399   | Name of UV species 5 [characters 1 & 2] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 400   | Name of UV species 5 [characters 3 & 4] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 401   | Name of UV species 5 [characters 5 & 6] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 402   | Name of UV species 5 [characters 7 & 8] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 403   | Name of UV species 6 [characters 1 & 2] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 404   | Name of UV species 6 [characters 3 & 4] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 405   | Name of UV species 6 [characters 5 & 6] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 406   | Name of UV species 6 [characters 7 & 8] (see Note 5)                  | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 407   | Analyzer serial number [characters 1 & 2] (see Note 5)                | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 408   | Analyzer serial number [characters 3 & 4] (see Note 5)                | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 409   | Analyzer serial number [characters 5 & 6] (see Note 5)                | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 410   | Analyzer serial number [characters 7 & 8] (see Note 5)                | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 411   | Analyzer serial number [characters 9 & 10] (see Note 5)               | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 412   | Analyzer serial number [characters 11 & 12] (see Note 5)              | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 413   | Analyzer serial number [characters 13 & 14] (see Note 5)              | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 414   | Analyzer serial number [characters 15 & 16] (see Note 5)              | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |
| 415   | Reserved (see Note 5)<br>{Service host password 1 [characters 1 & 2]} | –     | ASCII character | 2x UINT8 | RW     | 93XS, 934  |

| Reg # | Description / Definition   | Units | Scaling            | Reg Type | Access | Analyzer   |
|-------|--|-------|--------------------|----------|--------|------------|
| 416   | Reserved (see Note 5)<br>{Service host password 1 [characters 3 & 4]}  | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 417   | Reserved (see Note 5)<br>{Service host password 1 [characters 5 & 6]}  | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 418   | Reserved (see Note 5)<br>{Service host password 1 [characters 7 & 8]}  | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 419   | Reserved (see Note 5)<br>{Service host password 1 [characters 9 & 10]} | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 420   | Reserved (see Note 5)<br>{Service host password 2 [characters 1 & 2]}  | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 421   | Reserved (see Note 5)<br>{Service host password 2 [characters 3 & 4]}  | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 422   | Reserved<br>{Service host password 2 [characters 5 & 6]}               | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 423   | Reserved<br>{Service host password 2 [characters 7 & 8]}               | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 424   | Reserved (see Note 5)<br>{Service host password 2 [characters 9 & 10]} | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS, 934  |
| 425   | Units conversion name 1 [characters 1 & 2] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS       |
| 426   | Units conversion name 1 [characters 3 & 4] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS       |
| 427   | Units conversion name 1 [characters 5 & 6] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS       |
| 428   | Units conversion name 1 [characters 7 & 8] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 93XS       |
| 429   | Units conversion name 2 [characters 1 & 2] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 430   | Units conversion name 2 [characters 3 & 4] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 431   | Units conversion name 2 [characters 5 & 6] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 432   | Units conversion name 2 [characters 7 & 8] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 433   | Units conversion name 3 [characters 1 & 2] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 434   | Units conversion name 3 [characters 3 & 4] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 435   | Units conversion name 3 [characters 5 & 6] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 436   | Units conversion name 3 [characters 7 & 8] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 437   | Units conversion name 4 [characters 1 & 2] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 438   | Units conversion name 4 [characters 3 & 4] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 439   | Units conversion name 4 [characters 5 & 6] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 440   | Units conversion name 4 [characters 7 & 8] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 441   | Units conversion name 5 [characters 1 & 2] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |
| 442   | Units conversion name 5 [characters 3 & 4] (see Note 5)                | –     | ASCII<br>character | 2x UINT8 | RW     | 932S, 933S |

| Reg # | Description / Definition                                | Units | Scaling         | Reg Type | Access | Analyzer   |
|-------|---|-------|-----------------|----------|--------|------------|
| 443   | Units conversion name 5 [characters 5 & 6] (see Note 5) | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 444   | Units conversion name 5 [characters 7 & 8] (see Note 5) | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 445   | Units conversion name 6 [characters 1 & 2] (see Note 5) | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 446   | Units conversion name 6 [characters 3 & 4] (see Note 5) | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 447   | Units conversion name 6 [characters 5 & 6] (see Note 5) | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 448   | Units conversion name 6 [characters 7 & 8] (see Note 5) | –     | ASCII character | 2x UINT8 | RW     | 932S, 933S |
| 449   | Cell length   | cm    | –               | FLOAT    | RW     | 93XS       |
| 451   | High scale of current output channel 1                  | **    | –               | FLOAT    | RW     | 93XS, 934  |
| 453   | High scale of current output channel 2                  | **    | –               | FLOAT    | RW     | 93XS, 934  |
| 455   | High scale of current output channel 3                  | **    | –               | FLOAT    | RW     | 93XS, 934  |
| 457   | High scale of current output channel 4                  | **    | –               | FLOAT    | RW     | 93XS, 934  |
| 459   | Matrix row 1 element 1 (932S, 933S)<br>K-value 1 (931S) | –     | –               | FLOAT    | RW     | 93XS       |
| 461   | Matrix row 1 element 2 (932S, 933S)<br>K-value 2 (931S) | –     | –               | FLOAT    | RW     | 93XS       |
| 463   | Matrix row 1 element 3                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 465   | Matrix row 1 element 4                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 467   | Matrix row 1 element 5                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 469   | Matrix row 1 element 6                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 471   | Matrix row 2 element 1                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 473   | Matrix row 2 element 2                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 475   | Matrix row 2 element 3                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 477   | Matrix row 2 element 4                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 479   | Matrix row 2 element 5                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 481   | Matrix row 2 element 6                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 483   | Matrix row 3 element 1                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 485   | Matrix row 3 element 2                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 487   | Matrix row 3 element 3                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 489   | Matrix row 3 element 4                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 491   | Matrix row 3 element 5                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 493   | Matrix row 3 element 6                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 495   | Matrix row 4 element 1                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 497   | Matrix row 4 element 2                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 499   | Matrix row 4 element 3                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 501   | Matrix row 4 element 4                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 503   | Matrix row 4 element 5                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 505   | Matrix row 4 element 6                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 507   | Matrix row 5 element 1                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 509   | Matrix row 5 element 2                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 511   | Matrix row 5 element 3                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 513   | Matrix row 5 element 4                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 515   | Matrix row 5 element 5                                  | –     | –               | FLOAT    | RW     | 932S, 933S |
| 517   | Matrix row 5 element 6                                  | –     | –               | FLOAT    | RW     | 932S, 933S |

| Reg # | Description / Definition                              | Units | Scaling | Reg Type | Access | Analyzer   |
|-------|---|-------|---------|----------|--------|------------|
| 519   | Matrix row 6 element 1                                | –     | –       | FLOAT    | RW     | 932S, 933S |
| 521   | Matrix row 6 element 2                                | –     | –       | FLOAT    | RW     | 932S, 933S |
| 523   | Matrix row 6 element 3                                | –     | –       | FLOAT    | RW     | 932S, 933S |
| 525   | Matrix row 6 element 4                                | –     | –       | FLOAT    | RW     | 932S, 933S |
| 527   | Matrix row 6 element 5                                | –     | –       | FLOAT    | RW     | 932S, 933S |
| 529   | Matrix row 6 element 6                                | –     | –       | FLOAT    | RW     | 932S, 933S |
| 531   | Units conversion factor for UV species 1              | ***   | –       | FLOAT    | RW     | 93XS       |
| 533   | Units conversion factor for UV species 2              | ***   | –       | FLOAT    | RW     | 932S, 933S |
| 535   | Units conversion factor for UV species 3              | ***   | –       | FLOAT    | RW     | 932S, 933S |
| 537   | Units conversion factor for UV species 4              | ***   | –       | FLOAT    | RW     | 932S, 933S |
| 539   | Units conversion factor for UV species 5              | ***   | –       | FLOAT    | RW     | 932S, 933S |
| 541   | Units conversion factor for UV species 6              | ***   | –       | FLOAT    | RW     | 932S, 933S |
| 543   | Zero-calibration drift specification for UV species 1 | *     | –       | FLOAT    | RW     | 93XS       |
| 545   | Zero-calibration drift specification for UV species 2 | *     | –       | FLOAT    | RW     | 932S, 933S |
| 547   | Zero-calibration drift specification for UV species 3 | *     | –       | FLOAT    | RW     | 932S, 933S |
| 549   | Zero-calibration drift specification for UV species 4 | *     | –       | FLOAT    | RW     | 932S, 933S |
| 551   | Zero-calibration drift specification for UV species 5 | *     | –       | FLOAT    | RW     | 932S, 933S |
| 553   | Zero-calibration drift specification for UV species 6 | *     | –       | FLOAT    | RW     | 932S, 933S |
| 555   | Low scale of current output channel 1                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 557   | Low scale of current output channel 2                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 559   | Low scale of current output channel 3                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 561   | Low scale of current output channel 4                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 563   | High scale of voltage output channel 1                | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 565   | High scale of voltage output channel 2                | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 567   | High scale of voltage output channel 3                | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 569   | High scale of voltage output channel 4                | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 571   | Low scale of voltage output channel 1                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 573   | Low scale of voltage output channel 2                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 575   | Low scale of voltage output channel 3                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 577   | Low scale of voltage output channel 4                 | **    | –       | FLOAT    | RW     | 93XS, 934  |
| 579   | Compressibility correction factor                     | –     | –       | FLOAT    | RW     | 93XS       |
| 581   | Sigma of adaptive filtering                           | –     | –       | FLOAT    | RW     | 93XS       |
| 583   | Linearization coefficient 1 (932S)                    | –     | –       | FLOAT    | RW     | 932S, 933S |
|       | Absorbance offset 1 (933S)                            |       |         |          |        |            |
| 585   | Linearization coefficient 2 (932S)                    | –     | –       | FLOAT    | RW     | 932S, 933S |
|       | Absorbance offset 2 (933S)                            |       |         |          |        |            |
| 587   | Linearization coefficient 3 (932S)                    | –     | –       | FLOAT    | RW     | 932S, 933S |
|       | Absorbance offset 3 (933S)                            |       |         |          |        |            |
| 589   | Linearization coefficient 4 (932S)                    | –     | –       | FLOAT    | RW     | 932S, 933S |
|       | Absorbance offset 4 (933S)                            |       |         |          |        |            |
| 591   | Linearization coefficient 5 (932S)                    | –     | –       | FLOAT    | RW     | 932S, 933S |
|       | Absorbance offset 5 (933S)                            |       |         |          |        |            |



| Reg # | Description / Definition   | Units | Scaling | Reg Type | Access | Analyzer   |
|-------|--|-------|---------|----------|--------|------------|
| 593   | Linearization coefficient 6 (932S)<br>Absorbance offset 6 (933S)   | –     | –       | FLOAT    | RW     | 932S, 933S |
| 595   | Linearization compensation coefficient 7   | –     | –       | FLOAT    | RW     | 932S       |
| 597   | $\alpha$ coefficient in sensor2 result calculation   | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 599   | $\beta$ coefficient in sensor2 result calculation  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 601   | $\gamma$ coefficient in sensor2 result calculation   | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 603   | SH2 coefficient in sensor2 result calculation  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 605   | QH2 coefficient in sensor2 result calculation  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 607   | Compensation factor of UV species onto sensor1   | –     | –       | FLOAT    | RW     | 93XS       |
| 609   | Compensation factor of UV species onto sensor2   | –     | –       | FLOAT    | RW     | 93XS       |
| 611   | Compensation factor of UV species onto sensor3   | –     | –       | FLOAT    | RW     | 93XS       |
| 613   | Linearization coefficient 1 in sensor3 result calculation (differential signal type)<br>$\alpha$ coefficient in sensor3 result calculation (voltage signal type) | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 615   | Linearization coefficient 2 in sensor3 result calculation (differential signal type)<br>$\beta$ coefficient in sensor3 result calculation (voltage signal type)  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 617   | Linearization coefficient 3 in sensor3 result calculation (differential signal type)<br>$\gamma$ coefficient in sensor3 result calculation (voltage signal type) | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 619   | Linearization coefficient 1 in sensor1 result calculation  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 621   | Linearization coefficient 2 in sensor1 result calculation  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 623   | Linearization coefficient 3 in sensor1 result calculation  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 625   | Compensation factor of gas1 to sensor3 result (differential signal type)<br>SH2 coefficient in sensor3 result calculation (voltage signal type)                  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 627   | Compensation factor of gas2 to sensor3 result (differential signal type)<br>QH2 coefficient in sensor3 result calculation (voltage signal type)                  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 629   | Bench temperature control – Kp   | °C    | –       | FLOAT    | RW     | 93XS       |
| 631   | Cell or oven temperature control – Kp  | °C    | –       | FLOAT    | RW     | 93XS, 934  |
| 633   | Sensor3 signal gain  | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 635   | Sensor1 signal gain (differential signal type)<br>Sensor1 factory calibration pressure in mmHg (voltage signal type)   | –     | –       | FLOAT    | RW     | 93XS, 934  |
| 637   | Bench temperature control – Ti   | sec   | –       | FLOAT    | RW     | 93XS       |
| 639   | Cell or oven temperature control – Ti  | sec   | –       | FLOAT    | RW     | 93XS, 934  |
| 641   | Custom UV result factor 1  | –     | –       | FLOAT    | RW     | 932S, 933S |
| 643   | Custom UV result factor 2  | –     | –       | FLOAT    | RW     | 932S, 933S |
| 645   | Custom UV result factor 3  | –     | –       | FLOAT    | RW     | 932S, 933S |
| 647   | Custom UV result factor 4  | –     | –       | FLOAT    | RW     | 932S, 933S |
| 649   | Probe temperature control – set-point (931S, 932S, 934)<br>Column temperature control – set-point (933S)   | °C    | –       | FLOAT    | RW     | 93XS, 934  |
| 651   | Probe temperature control – Kp (931S, 932S, 934)<br>Column temperature control – Kp (933S)   | °C    | –       | FLOAT    | RW     | 93XS, 934  |
| 653   | Probe temperature control – Ti (931S, 932S, 934)<br>Column temperature control – Ti (933S)   | sec   | –       | FLOAT    | RW     | 93XS, 934  |
| 655   | Probe temperature control – start-up duty cycle (931S, 932S, 934)<br>Column temperature control – start-up duty cycle (933S)                                     | %     | –       | FLOAT    | RW     | 93XS, 934  |

| Reg # | Description / Definition                       | Units | Scaling | Reg Type | Access | Analyzer   |
|-------|--|-------|---------|----------|--------|------------|
| 657   | Span gas concentration for UV species 1        | *     | –       | FLOAT    | RW     | 93XS       |
| 659   | Span gas concentration for UV species 2        | *     | –       | FLOAT    | RW     | 93XS       |
| 661   | Span gas concentration for UV species 3        | *     | –       | FLOAT    | RW     | 93XS       |
| 663   | Span gas concentration for UV species 4        | *     | –       | FLOAT    | RW     | 93XS       |
| 665   | Span gas concentration for UV species 5        | *     | –       | FLOAT    | RW     | 93XS       |
| 667   | Span gas concentration for UV species 6        | *     | –       | FLOAT    | RW     | 93XS       |
| 669   | Turn-on threshold for concentration alarm 1    | *     | –       | FLOAT    | RW     | 93XS, 934  |
| 671   | Turn-on threshold for concentration alarm 2    | *     | –       | FLOAT    | RW     | 93XS, 934  |
| 673   | Turn-off threshold for concentration alarm 1   | *     | –       | FLOAT    | RW     | 93XS, 934  |
| 675   | Turn-off threshold for concentration alarm 2   | *     | –       | FLOAT    | RW     | 93XS, 934  |
| 677   | UV species 3 to UV species 1 correction factor | –     | –       | FLOAT    | RW     | 933S       |
| 679   | UV species 3 to UV species 2 correction factor | –     | –       | FLOAT    | RW     | 933S       |
| 681   | Concentration result of UV species 1           | *     | –       | FLOAT    | RO     | 93XS       |
| 683   | Concentration result of UV species 2           | *     | –       | FLOAT    | RO     | 932S, 933S |
| 685   | Concentration result of UV species 3           | *     | –       | FLOAT    | RO     | 932S, 933S |
| 687   | Concentration result of UV species 4           | *     | –       | FLOAT    | RO     | 932S, 933S |
| 689   | Concentration result of UV species 5           | *     | –       | FLOAT    | RO     | 932S, 933S |
| 691   | Concentration result of UV species 6           | *     | –       | FLOAT    | RO     | 932S, 933S |
| 693   | Concentration result of sensor1                | %     | –       | FLOAT    | RO     | 93XS, 934  |
| 695   | Concentration result of sensor2                | %     | –       | FLOAT    | RO     | 93XS, 934  |
| 697   | Concentration result of sensor3                | %     | –       | FLOAT    | RO     | 93XS, 934  |
| 699   | Custom concentration result of UV species      | *     | –       | FLOAT    | RO     | 932S, 933S |
| 701   | T&H concentration result of UV species 1       | *     | –       | FLOAT    | RO     | 93XS       |
| 703   | T&H concentration result of UV species 2       | *     | –       | FLOAT    | RO     | 932S, 933S |
| 705   | T&H concentration result of UV species 3       | *     | –       | FLOAT    | RO     | 932S, 933S |
| 707   | T&H concentration result of UV species 4       | *     | –       | FLOAT    | RO     | 932S, 933S |
| 709   | T&H concentration result of UV species 5       | *     | –       | FLOAT    | RO     | 932S, 933S |
| 711   | T&H concentration result of UV species 6       | *     | –       | FLOAT    | RO     | 932S, 933S |
| 713   | T&H concentration result of sensor1            | %     | –       | FLOAT    | RO     | 93XS, 934  |
| 715   | T&H concentration result of sensor2            | %     | –       | FLOAT    | RO     | 93XS, 934  |
| 717   | T&H concentration result of sensor3            | %     | –       | FLOAT    | RO     | 93XS, 934  |
| 719   | T&H custom concentration result of UV species  | *     | –       | FLOAT    | RO     | 932S, 933S |