OXIGRAF

Application Note

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Tuning Filter 13 Parameters for Improved Response Time in Oxigraf Sensors

Oxigraf gas sensors have time response filters for speeding up the rise and fall time of the gas concentration signal. The filter, selected by index 13, is implemented as a first-order hold with partial velocity correction followed by a baseline noise suppressor. Two parameters control the gain of the prediction filter and the baseline noise threshold. These parameters can be adjusted to compensate for slow response time of the sensor and associated pneumatic delays. The filters for O2 and CO2 are independent and must be individually configured.

The prediction gain determines how much the rise or fall time is decreased at the expense of overshoot and noise. A typical value for the CO2 sensor is 450, but the exact value depends on the pneumatic setup. The baseline threshold parameter sets the amplitude threshold for switching to a low pass filter to quiet the baseline. If the AC signal amplitude is less than the parameter value then the filter is on. When a large change in gas concentration is detected the filter is switched off.

The OEMX monitor program provides a convenient means of adjusting the filter parameters. Apply a concentration step input to the system while observing the result using the OEMX graph function. Set the filter index to 13, prediction gain to 500, and the baseline to 0 and check the response. Adjust the prediction gain to get the desired rise and fall time without too much overshoot. Then adjust the baseline threshold to quiet the signal during periods of constant gas concentration. Don't make the baseline threshold too large, as that will mask small changes in output.

In the current firmware the ESC A command only supports changing the time response filter index for the O2 and CO2 measurements. The two additional parameters that control the peaking and baseline noise are not accessible via the standard user interface serial protocol. They can be accessed using a special factory test mode that may not be portable to future firmware versions.

1. Send the ESC T4351; command to put the sensor in factory test mode.

2. A specific parameter can then be written using the ESC M <address> <data>; where <address> is the decimal parameter identifier and <data> is the signed 16 bit decimal value. Note that the command format is similar to the other commands in that there are no spaces and the "<" and ">" characters are not part of the command.

3. After all parameters are set execute the Save command to update the backup parameters in the sensor EEPROM.

4. The value of any parameter can be checked using the ESC L <address>; command.

The filter 13 parameters have the following addresses:

405: Oxygen filter selection index (0 – 13)
406: Oxygen prediction gain, arbitrary units, typical value = 100.
407: Oxygen prediction threshold, 0.01% O2 units, typical value = 100
425: CO2 filter selection index (0 – 13)
426: CO2 prediction gain, arbitrary units, typical value = 700
427: CO2 prediction threshold, 0.01% CO2 units, typical value = 125

Use the factory test mode with care as the sensor can be made to fail if other registers are modified.