Testing of R-43V / OOM112 oxygen sensors in GE Healthcare Giraffe Omnibed Devices

To investigate ongoing calibration issues reported by customers, EnviteC supplied 6 sample pairs of OOM112 oxygen sensors with varying output voltages on 9/7/19 (Order VB136078 / Delivery Note VL172365).

Serial numbers SAMPLE1 – SAMPLE6 – output >31 mV
Serial numbers SAMPLE7 – SAMPLE12 – output <29 mV

These were sent to the Medical Engineering Departments of 2 different hospitals that have reported problems.

One of the hospitals (our ref 00005430) reported back on 4 pairs and were in a position to try calibration on 4 different GE devices:

Ident	**Model**	**Control PCB Firmware**	**Servo O2 Firmware**
Device 1	Omnibed Warmer (new)	3.05	1.60
Device 2	Giraffe (older model – monochrome display)	2.04	1.60
Device 3	Giraffe (newer model – colour display)	3.05	1.60
Device 4	Giraffe (older model – monochrome display)	2.05	1.60

Their results are as follows:

	Serial No	**Serial No**	**Outputs**	**Outcome**
Device 1	SAMPLE 1	SAMPLE 2	Both > 31 mV	Calibrated 1st time and continued to function.
Device 2	SAMPLE 3	SAMPLE 4	Both > 31 mV	Several calibration failures until flushed with O2 then Air from flowmeters for approx. 2 minutes, then Calibration passed.
Device 3	SAMPLE 9	SAMPLE 10	Both < 29 mV	Won't calibrate despite flushing 1 hour with O2 and Air and >10 calibration attempts.
Device 4	SAMPLE 11	SAMPLE 12	Both < 29 mV	Won't calibrate despite flushing 1 hour with O2 and Air and >10 calibration attempts.

The engineer's opinion is that anything less that 33 mV causes calibration problems. He also believes that the voltage from a Viamed sensor drops significantly under load when installed into the device.

The second hospital (our ref 00005430) reported back on 2 pairs of sensors, the firmware revisions were not known.

	Serial No	**Serial No**	**Outputs**	**Outcome**
Pairing 1	SAMPLE 5	SAMPLE 6	Both > 31 mV	Calibrated without issues
Pairing 2	SAMPLE 7	SAMPLE 8	Both < 31 mV	Failed to calibrate after multiple attempts

The Giraffe Service Manual, page 4-17 and the Omnibed Service Manual, page 4-20 both state that an O2 Cal Lost error will be generated if the output <33 mv: *"Servo oxygen unit has never been calibrated. Unit will not operate until initial calibration is performed. Cell voltage less than 33 mV."* This appears to set the minimum spec as 33 mV.

			displayed, replace the Servo O2 board.
O2 Cal Lost-No O2	Servo oxygen unit has never been calibrated. Unit will not operate until initial calibration is performed.	Perform oxygen calibration.	Run calibration.
	Cell voltage less than 33 mV.	Earlier software versions did not store voltages this low.	Replace display software with 1.62 or higher.

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All customers that have reported problems with Viamed sensors report no such issues with the original GE sensors and also claim that the outputs of GE sensors are higher, typically > 40 mV.

In conclusion, the preferred specification would include a lower limit of >35 mV whilst under load to account for variations in output due to fluctuations in atmospheric pressure, and to allow for some drift in output over the lifetime of the sensor.