

Why it is necessary to manually enter the gas temperature, ambient temperature, and relative humidity on VT Plus HF when there is no manual entry in the VT Mobile?

Application Note

Overview

The Fluke Biomedical VT Plus HF Gas Flow Analyzer has no automatic measurement of temperature or relative humidity in its design. This was corrected when the Fluke Biomedical VT Mobile Gas Flow Analyzer was introduced. The VT Mobile has an optional temperature and relative humidity sensor, which tends to be overlooked, but is necessary for accurate gas flow measurement, whether used for ventilator (breath-by-breath) or continuous flow devices.

NOTE: In this example, the IMT Medical PF300 Flow Analyzer Ventilator tester is called out, however, medical device brand and model-specific service manuals often call for a specific test equipment or include the statement “or equivalent.” The VT Plus HF qualifies as an equivalent test instrument in all cases for medical gas flow/pressure measurements. Besides demonstrating why it might be necessary to enter changes in gas temperature multiple times when using the VT Plus HF Gas Flow Analyzer, this case study illustrates how equivalent test instruments can successfully be used.

Case Study

A home care equipment service depot services a large number of continuous positive airway pressure (CPAP) devices, home care ventilators and oxygen concentrators, using the VT Plus HF. Recently they have had problems calibrating the new ResMed Astral 150 home care ventilator.

Preliminary technical support

The ResMed service manual called for a flow measuring device whose flow accuracy matched the IMT Medical PF300 specifications. The calibration software that runs on a PC, actually shows the connections one has to make between the ventilator and the flow measuring device, and depicts an IMT Medical PF300.

The service company contacted the Fluke Biomedical local distributor who explained that it is possible to make the exact setup connections to



the VT Plus HF, using the low flow, high flow and low pressure ports. But since the service company thought that the VT Plus HF specs were the reason they couldn't make the Astral 150 pass the calibration procedure, they thought they might have to get an IMT Medical PF300.

When ResMed realized that a large group of hospital and independent service technicians wanted to use their own devices (in the Scandinavian countries the VT Plus HF dominates the market), they made changes to their calibration software so that it allows a larger span for the measurement specs, which opens up for other test devices, like the VT Plus HF.

The Astral 150 still didn't pass the calibration procedure for the service depot, so the Fluke Biomedical local distributor went to check this out, bringing a newly calibrated VT Plus HF with them.

On-site evaluation

The Fluke Biomedical local distributor was told that the Astral 150 would take about 2 hours to

calibrate, and if any part of the calibration fails, it is necessary to start all over again

After watching the service company technician perform the calibration, the following was noted:

- The Astral 150 calibration software is very picky, therefore it is essential that the gas temperature and ambient temperature of the VT Plus HF is set to actual values. A Fluke DMM with temperature measurement capability was added to the breathing circuit of the Astral 150 just at the connection to the VT Plus flow inlet. When the gas and ambient temperature were corrected on the service company's VT Plus HF unit, the Astral 150 passed the calibration by a tiny margin. As noted, the software is picky.
- The service company's VT Plus HF was connected to the newly calibrated VT Plus HF, flow was generated though both of them using a CPAP device. The flow readings on both units corresponded extremely well with each other, showing that there was nothing wrong with the customer's VT Plus HF.

Root cause

Because the Astral 150 has a built-in turbine as a gas source, and because the ventilator and its turbine heat up during the use of the device, the temperature of the gas flowing out of the turbine and ventilator increase. To keep flow measured by the VT Plus HF accurate, it is necessary to manually correct the gas temperature, ambient temperature (room temperature) and relative humidity on the VT Plus HF multiple times during testing. When this operator manual requirement is met, the measurements made for gas flow are accurate and match the product specifications.

End result

After visiting the customer, the root cause of the problem was identified, which was the need to manually correct for temperature changes on a regular basis.

The home care equipment service depot was afraid they would have to buy an IMT Medical PF300, as the Astral 150 service manual more or less called out for this test device. They now, however, feel confident with their VT Plus HF. In addition, they are planning to purchase another one to keep pace with increasing demand, since the VT Plus HF is used for testing other CPAP devices, home care ventilators and oxygen concentrators.

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