Considerations for defining the dispense zone

Understanding the 3M™ Adhesive Mix Monitor and Sensor Response

The sensor response generated by the 3M™ Adhesive Mix Model can be interpreted to indicate two things: estimated mix ratio and adhesive cure. While actively dispensing adhesive, the sensor response indicates the estimated mix ratio. When you stop dispensing, the mixed adhesive will begin to cure, this will cause the sensor response to change based on the cure kinetics of the adhesive.

The mix ratio is expressed as a base part fraction, which indicates the proportion of Part B in the total mixture by volume. For instance, a 2:1 (B:A) mix ratio corresponds to a base part fraction (BPF) of 0.67. The formula for calculating the BPF for your mix ratio is as follows:

$$Base\ Part\ Fraction\ (by\ volume) = \frac{Part\ B}{(Part\ B + Part\ A)}$$

Upon loading the adhesive model into the processing unit, the system manager displays the suggested mix ratio and sets default upper and lower limits. These upper and lower limits can be adjusted to best fit your dispensing process. When dispensing outside of these limits the processing unit LED will illuminate red, when dispensing adhesive inside of these limits the processing unit LED will illuminate green.

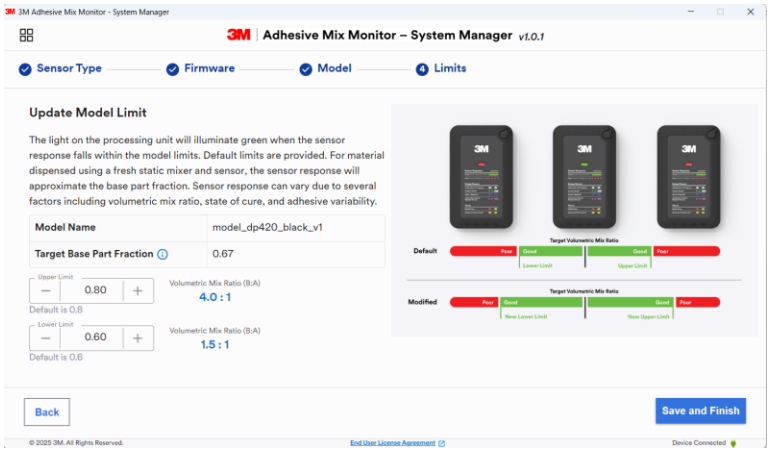


Figure 1: An example from System Manager that illustrates how a user can set the upper and lower limits of the sensor response.

Set your dispense zone limits based on the volumetric mix ratio

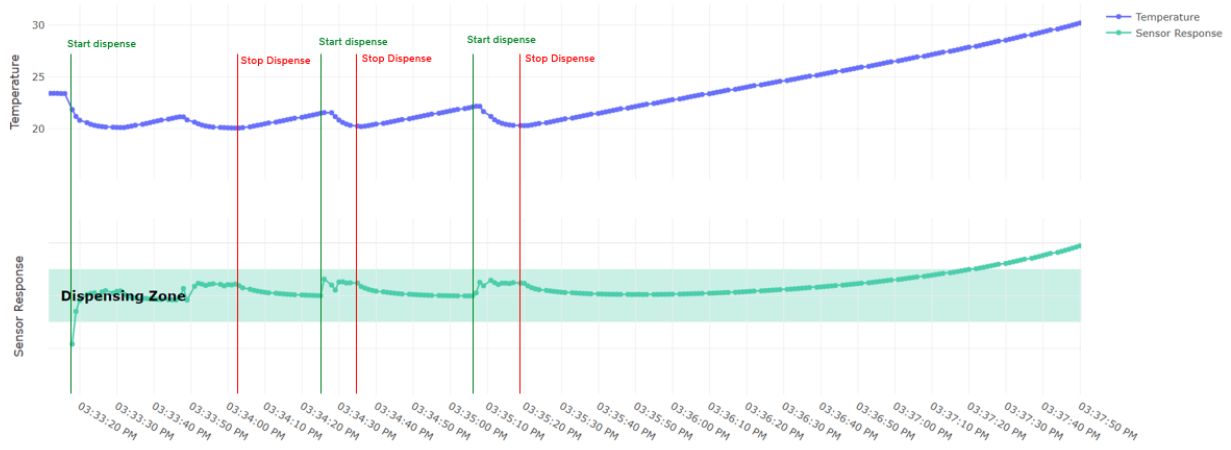
Pre-determined limits are based on material properties at different mix ratios tested by 3M and deemed reliable; their accuracy and completeness are not guaranteed. Additional factors, including application-specific details unknown to 3M, may necessitate different limits. To determine the proper limits of the dispense zone it is recommended to do quality assurance testing at different mix ratios to ensure that the upper and lower mix ratio limits meet the specified quality standards.

For example, if peel test performance is a critical quality metric, it would be recommended to conduct peel tests at the upper and lower bounds of the dispense zone and adjust the limits based on the test results.

Set your dispense zone limits based on purge guidance

The adhesive mix monitor can give you information about the cure kinetics of your adhesive once you have stopped dispensing. Depending on the type of adhesive being used, you may observe variations in the sensor response, either increasing or decreasing, as indicated by the raw data stream. Furthermore, for fast-curing adhesives, an increase in temperature can be detected from the exotherm of the reaction.

The example below shows a visual representation of what the raw data stream can look like once a user has stopped dispensing.



By performing additional dispensing tests, it is possible to identify the point at which the adhesive cures within the static mixer and sensor, rendering it no longer "dispensable." These tests can establish an upper or lower limit for the dispense zone. When this threshold is reached, the operator is alerted by a red LED indicator on the processing unit, signaling the need to purge the adhesive. The operator can then introduce fresh adhesive into the static mixer and sensor, effectively purging the system. This proactive approach helps minimize production downtime caused by clogged static mixers.

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