

VAT

(Vehicle Acceleration Test Evaluation)

Bosch Standard Procedure for Safety Evaluation of unintended Vehicle Acceleration



Evaluation of unintended Vehicle Acceleration

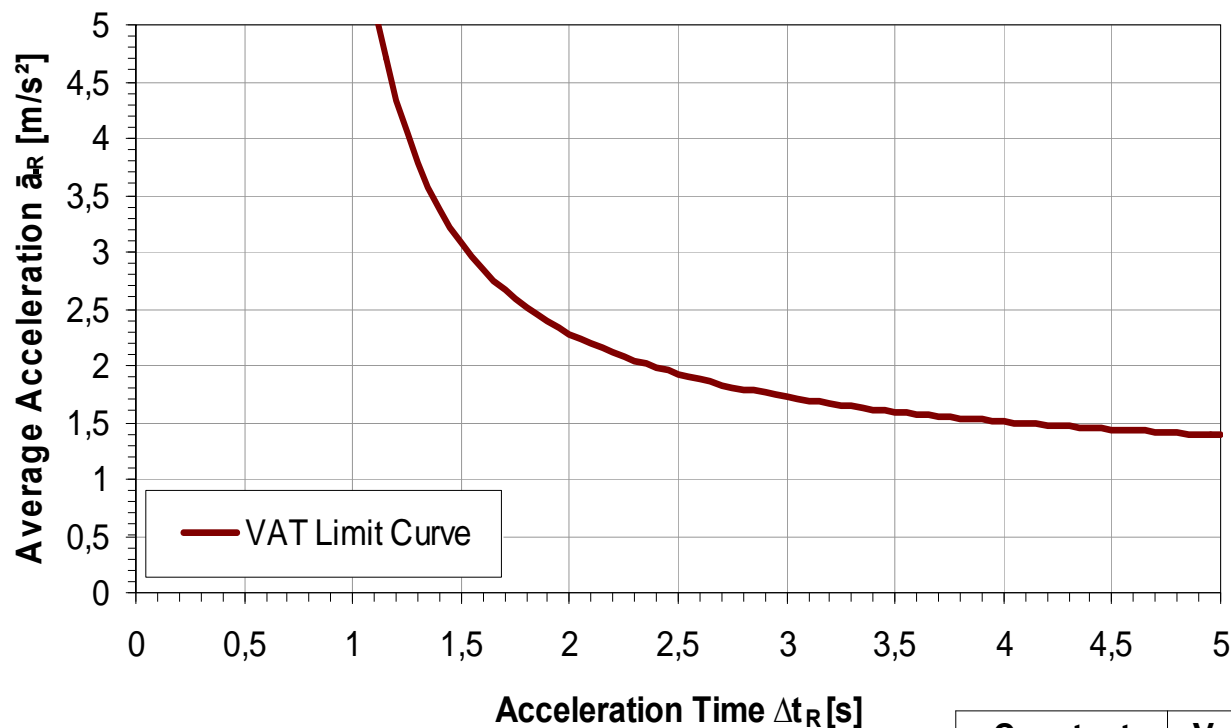
- This document describes the Bosch standard procedure to evaluate unintended vehicle acceleration for its permissibility regarding safety.
- E.g. in the scope of ECU-MST** the ECU* fault is simulated in a test case and the measured acceleration parameters are then evaluated.
- Therefore the raw measurement data from the test are converted to a normed format and then entered in an evaluation diagram containing a curve which defines the permissible acceleration limit
- The evaluation procedure and the limit curve in the following are referred to as "**VAT**" (**V**ehicle **A**cceleration **T**est **E**valuation) and "**VAT Limit Curve**", respectively
- Limit curve references evaluation of tests without active service brake intervention

ECU*: **E**lectronic **C**ontrol **U**nit

MST**: **M**onitoring **S**afety **T**est



Characteristic of VAT Limit Curve



Formula and Constants
of VAT Limit Curve:

$$\bar{a}_R = \frac{C}{3.6 \cdot (\Delta t_R - T_0)} + B$$

Constant	Value	Unit
C	6	km/h
B	1	m/s ²
T ₀	0.7	s

Evaluation Procedure – Determination of $a_{\text{filt}}(t)$

The **Filtered Vehicle Acceleration** $a_{\text{filt}}(t)$ is calculated as follows:

1. Measurement of an undelayed/unfiltered vehicle speed signal in 10ms raster (e.g. VehV_vSens directly from speed sensor).
2. Averaging of this vehicle speed signal over 9 measuring samples*
-> Filtered vehicle speed signal.
3. Conversion of filtered vehicle speed signal in an acceleration signal by differentiation.
4. Averaging of the acceleration signal over 9 measuring samples*
→ $a_{\text{filt}}(t)$.

* uneven number to avoid phase delay

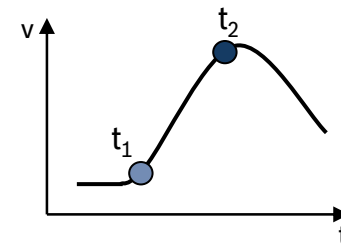
Evaluation Procedure – Determination of Δt_R

The **Acceleration Time Δt_R** is calculated as follows:

1. $a_{\text{filt}}(t)$ must be approximately 0 m/s² for min. 1s before error simulation is triggered (defined start conditions).
2. First event $a_{\text{filt}}(t) > 0.2$ m/s² after error simulation defines time marker t_1 .
3. First event $a_{\text{filt}}(t) < 0.2$ m/s² after error detection defines time marker t_2 .
4. Acceleration Time Δt_R is the time difference between t_1 and t_2 .

Summary:

- t_1 : $a_{\text{filt}}(t) > 0.2$ m/s², after error simulation
- t_2 : $a_{\text{filt}}(t) < 0.2$ m/s², after error detection
- $\Delta t_R = t_2 - t_1$



Evaluation Procedure – Determination of \bar{a}_R

The **Average Vehicle Acceleration** \bar{a}_R is calculated as the arithmetic average of all measurement samples of $a_{\text{filt}}(t)$ within the interval $[t_1, t_2]$.

Evaluation of Vehicle Acceleration " \bar{a}_R over Δt_R "

The acceleration parameters are entered in a diagram " \bar{a}_R over Δt_R " and evaluated according to their position relative to the *VAT Limit Curve*.

