The processed results files contain a number of parameters. This file describes how they were measured or calculated.

t [s]: Time at which measurement was performed, in number of seconds since the start of the test. Measured by the fatigue machine.

N [cycles]: Number of cycles. Measured by the fatigue machine.

P [N]: Force. Measured by the fatigue machine.

d [mm]: Displacement. Measured by the fatigue machine.

C [mm/N]: Compliance. Calculated by assuming that the P-d behaviour is linear between d_{min} and d_{max} and applying: $C = \frac{d_{\max} - d_{\min}}{P_{\max} - P_{\min}}$.

a [mm]: Crack length. Calculated by a power-law curve fit through the measured a vs N data. I.e. $a = \alpha N^{\beta}$.

dadN [mm/cycle]: Crack growth rate, calculated by taking the derivative of the power-law fit of the crack length. I.e. $\frac{da}{dN} = \alpha\beta N^{(\beta-1)}$.

G_max [N/mm]: Strain energy release rate (SERR) at maximum displacement. Calculated following ASTM D5528-01 according to: $G = \frac{nPd}{2wa}$ where w is the specimen width and n is a calibration parameter equal to the slope of the log C vs log a line (see ASTM D5528-01) determined separately for each specimen.

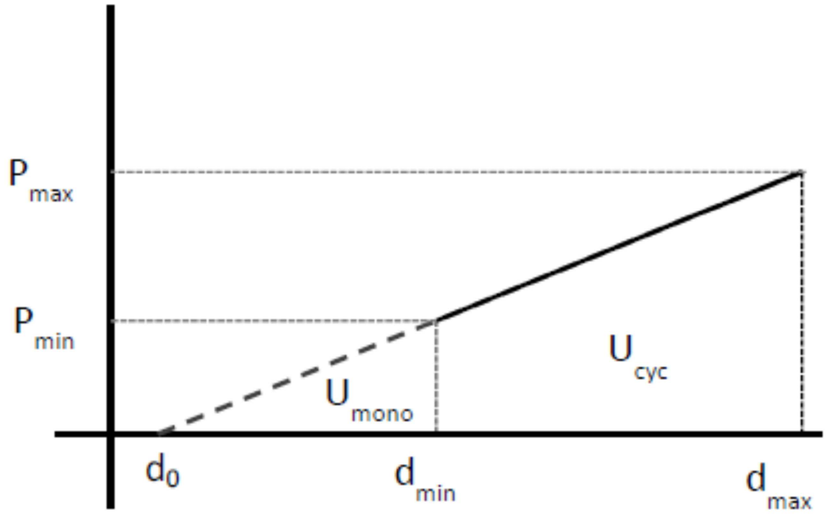
Delta_sqrt(G) [N/mm]: SERR range, calculated as: $\Delta\sqrt{G} = \left(\sqrt{G_{\max}} - \sqrt{G_{\min}}\right)^2$.

R [-]: Stress ratio, calculated as $\frac{P_{\min}}{P_{\max}}$.

Cyclic_energy [mJ]: Cyclic energy, calculated as $\frac{1}{2}\left[\left(P_{\max} - P_{\min}\right)\left(d_{\max} - d_{\min}\right) + P_{\min}\left(d_{\max} - d_{\min}\right)\right]$.

Monotonic_Energy [mJ]: Monotonic energy, calculated as $\frac{1}{2}P_{\min}\left(d_{\min} - d_0\right)$, where d_0 is the displacement for which P is zero; found by extrapolation of a linear fit between (d_{min},P_{min}) and (d_{max},P_{max}).

See also the figure on the next page for the definition of the cyclic energy (U_{cyc}) and the monotonic energy (U_{mono}).



Calculation of the energy loss:

For the displacement controlled specimens, for both the cyclic and the monotonic energy, curve fits were found for the energy as a function of cycle number. These fits were then differentiated in order to find the energy loss. The values obtained in this manner have been included in the dataset in the file dUdN.csv.

The total energy was found as the sum of the monotonic and cyclic energy, and the process as described above was then used to find the loss of total energy.

For the force controlled specimens, the cyclic energy loss was calculated as:

$$\frac{dU_{cyc}}{dN} = \frac{\left[\frac{1}{2}P_{\max}\left(d_N - d_{N+\Delta N}\right)\right] - \left[\frac{1}{2}P_{\min}\left(d_N - d_{N+\Delta N}\right)\right]}{\Delta N}$$

and the total energy loss was calculated as

$$\frac{dU_{tot}}{dN} = \frac{\frac{1}{2}P_{\max}\left(d_N - d_{N+1}\right)}{\Delta N}$$

a curve was fit through this data in order to smooth it.

The loss of monotonic energy was calculated as $\frac{dU_{tot}}{dN} - \frac{dU_{cyc}}{dN}$