# FL-05M1/FL-4405

**Density:** 7.46 g/cm$^3$

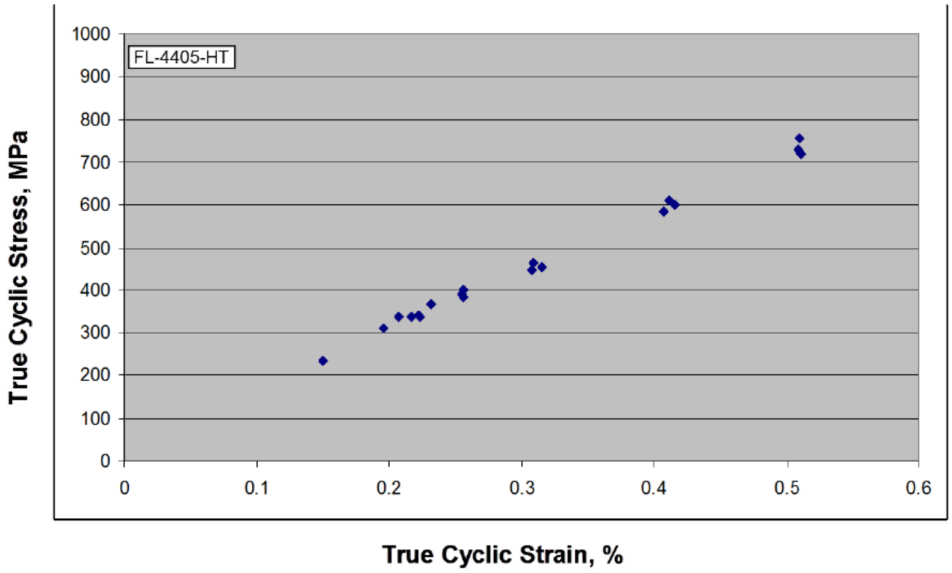
**Material:** Prealloyed Steel (0.85% Mo, 0.20% Mn, balance Fe) + mixed additions of 0.38%Graphite and 0.75% lubricant.

**Treatment:** Warm Die Compact, Sinter at 1120°C, Austenitise at 900°C for 1 hour, Oil quench, Temper at 177°C for 1 Hpur

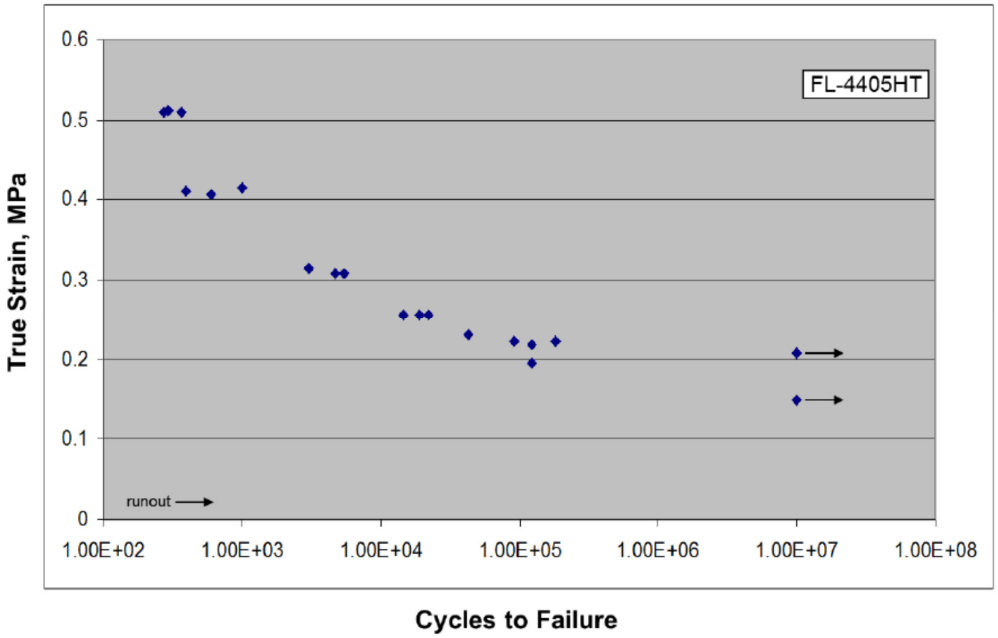
## Table – Strain and Stress Amplitudes vs. Reversals to Failure

| Test # ID | Stress (MPa) | TRUE Stress (MPa) | Strain (%) | TRUE Strain (%) | Plastic Strain (%) | Elastic Strain (%) | Reversals to Failure |
|---|---|---|---|---|---|---|---|
| 10 | 715 | 719 | 0.5129 | 0.5116 | 0.0404 | 0.4712 | 594 |
| 11 | 753 | 756 | 0.5113 | 0.51 | 0.0141 | 0.4959 | 544 |
| 9 | 726 | 729 | 0.5101 | 0.5088 | 0.0308 | 0.4781 | 736 |
| 7 | 599 | 602 | 0.4169 | 0.416 | 0.0216 | 0.3944 | 1,988 |
| 8 | 606 | 609 | 0.413 | 0.4121 | 0.0129 | 0.3992 | 798 |
| 6 | 582 | 584 | 0.4078 | 0.4069 | 0.0238 | 0.3831 | 1,204 |
| 1 | 456 | 457 | 0.3162 | 0.3157 | 0.0158 | 0.2999 | 6,002 |
| 2 | 464 | 466 | 0.3095 | 0.309 | 0.0036 | 0.3054 | 10,878 |
| 3 | 448 | 449 | 0.3087 | 0.3082 | 0.0136 | 0.2947 | 9,324 |
| 13 | 397 | 398 | 0.2566 | 0.2563 | 0 | 0.2612 | 38,000 |
| 12 | 382 | 383 | 0.2562 | 0.2558 | 0.0045 | 0.2513 | 43,916 |
| 5 | 388 | 389 | 0.2554 | 0.2551 | 0.0001 | 0.255 | 29,496 |
| 14 | 367 | 367 | 0.2315 | 0.2313 | 0 | 0.2409 | 86,378 |
| 15 | 337 | 338 | 0.2233 | 0.223 | 0.0013 | 0.2217 | 182,966 |
| 16 | 338 | 339 | 0.2229 | 0.2226 | 0.0007 | 0.2219 | 363,902 |
| 17 | 336 | 337 | 0.2174 | 0.2172 | 0 | 0.2206 | 249,300 |
| 4 | 335 | 335 | 0.2076 | 0.2074 | 0 | 0.2198 | 20,000,000 |
| 18 | 310 | 311 | 0.1955 | 0.1953 | 0 | 0.2038 | 243,932 |
| 19 | 234 | 234 | 0.1501 | 0.15 | 0 | 0.1537 | 20,000,000 |

## True Cyclic Stress-Strain Curve



## Constant amplitude Strain-Life Curve




## Cyclic Properties (see relevant column)

| Cyclic Properties | FL-4405AS | FL-4405HT | FLN2-4405AS | FL-5305SH |
|---|---|---|---|---|
| Cyclic Yield Strength, (0.2% offset) $K'(0.002)^{n'}$ | 407.8 | NPD | 395 | NPD |
| Cyclic Strength Coefficient, $K'$ (MPa) | 1071 | NPD | 2961 | NPD |
| Cyclic Strain Hardening Exponent, $n'$ | 0.1573 | NPD | 0.3395 | NPD |
| | | | | |
| Fatigue Strength Coefficient, $s'_f$ (MPa) | 834 | 1727 | 727.7 | 3265 |
| Fatigue Strength Exponent, $b$ | -0.102 | -0.141 | -0.114 | -0.177 |
| Fatigue Ductility Coefficient, $e'_f$ | 0.106 | NPD | 0.017 | NPD |
| Fatigue Ductility Exponent, $c$ | -0.5 | NPD | -0.3 | NPD |

*Constant amplitude fatigue life curve:* $\Delta\varepsilon/2 = \sigma'f/E\ (2Nf)b + \varepsilon'f\ (2Nf)c$

*Cyclic stress-strain curve:* $\Delta\varepsilon/2 = \sigma/2E + (\Delta\sigma/2K')^{1/n'}$

*NPD = No Plastic Deformation*