MATERION

TECH BRIEFS

Transverse Tensile Properties of ToughMet® 3 Alloy Rod

A series of tensile tests were performed to determine transverse tensile properties of Materion's ToughMet 3 alloy rod products. The ToughMet products tested were 2.5" to 6.0" diameter rods of CX105, AT90, AT110, TS95, TS120U, TS130, and TS160U tempers. To obtain longitudinal and radial-transverse samples, sub-sized tensile bars[1] were machined from each rod at mid-radius. Each sample was tested according to ASTM-E8-16a to determine average transverse tensile strength, 0.2% offset yield strength, total % elongation. In addition, transverse stress strain curves were developed for individual ToughMet tempers[2]. Finally, the results were compared with longitudinal data to determine an estimated relationship between the properties of perpendicular orientations[3].

TENSILE PROPERTIES

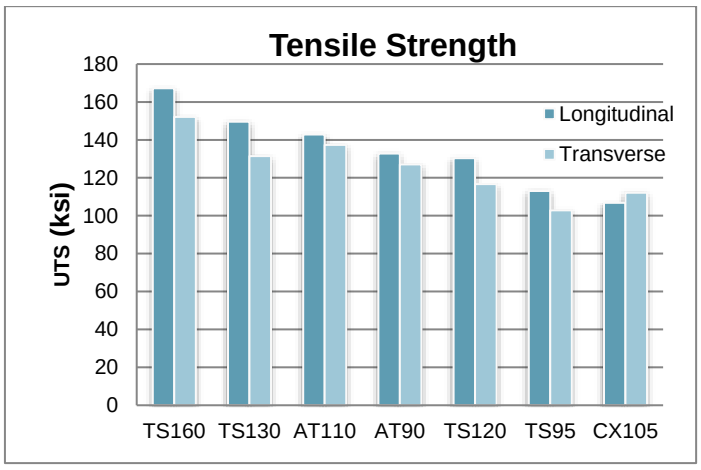

Figure 1. Mean ultimate tensile strengths for ToughMet 3 alloy tempers in longitudinal and transverse directions

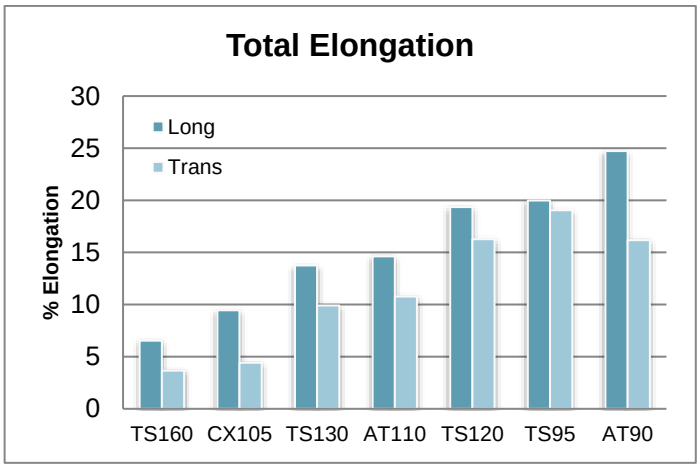

Figure 3. Mean elongation measured for ToughMet 3 alloy tempers in longitudinal and transverse directions

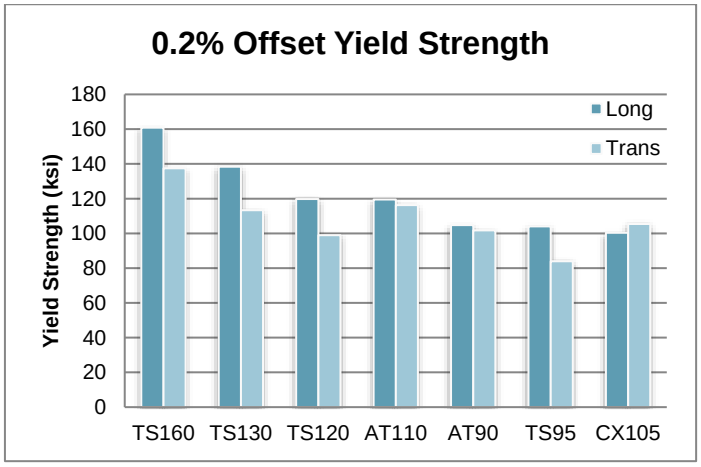

Figure 2. Mean 0.2% offset yield strength for ToughMet 3 alloy tempers in longitudinal and transverse directions

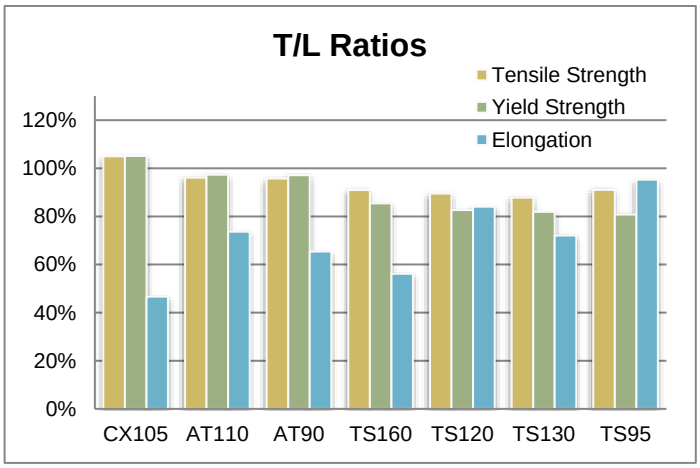

Figure 4. Transverse tensile properties shown as a percentage of mean longitudinal values

[1] 0.25" diameter, 2.00" length

[2] Stress-strain data available upon request

[3] Circumferential-transverse properties were not tested

MATERION PERFORMANCE ALLOYS
6070 Parkland Boulevard
Mayfield Heights, OH 44124 USA
phone: 216.383.6800 fax: 216.383.4005
email: BrushAlloys-Info@Materion.com

TECHNICAL INQUIRIES
phone: 800.375.4205
216.692.3108

MATERION CORPORATION
www.materion.com/alloys

AT0068/1017

STRESS VS. STRAIN CURVES

Engineering stress vs. strain curves were generated for each sample. To develop average curves for each temper, raw stress-strain data was used for interpolation between stress values at chosen strain values, and the calculated stresses were averaged. Refer to the Table 1 for the number of specimens tested per temper.

It is also important to note that the tensile specimen size has been shown to have an effect on tensile results. Since sub-sized tensile bars were used in this study, there may be inconsistencies between properties obtained with standard size tensile bars and the data presented in this Technical Review.

Table 1.—Number of samples and heats tested

Temper	Heats	Longitudinal	Transverse
AT110	4	8	8
AT90	2	4	4
CX105	2	4	4
TS120	3	6	6
TS130	3	6	6
TS160	3	6	6
TS95	3	6	6

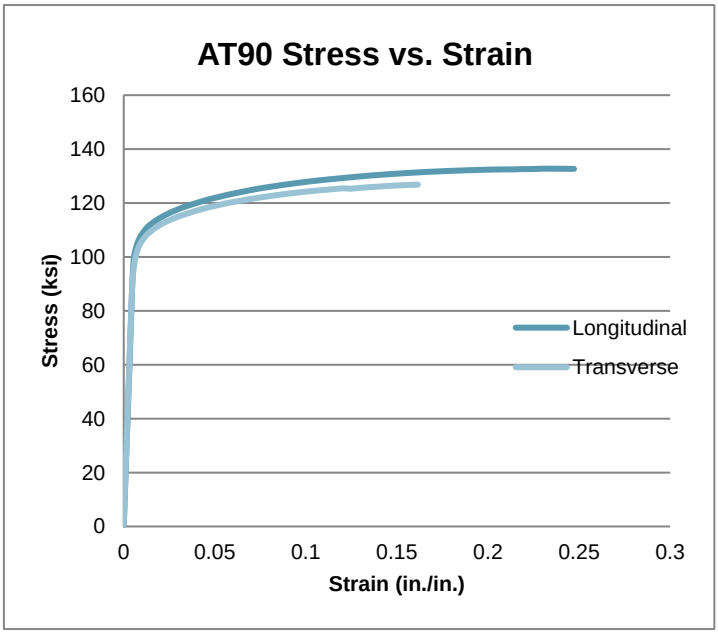

Figure 5. Longitudinal and transverse stress-strain curves for ToughMet 3 AT90 alloy

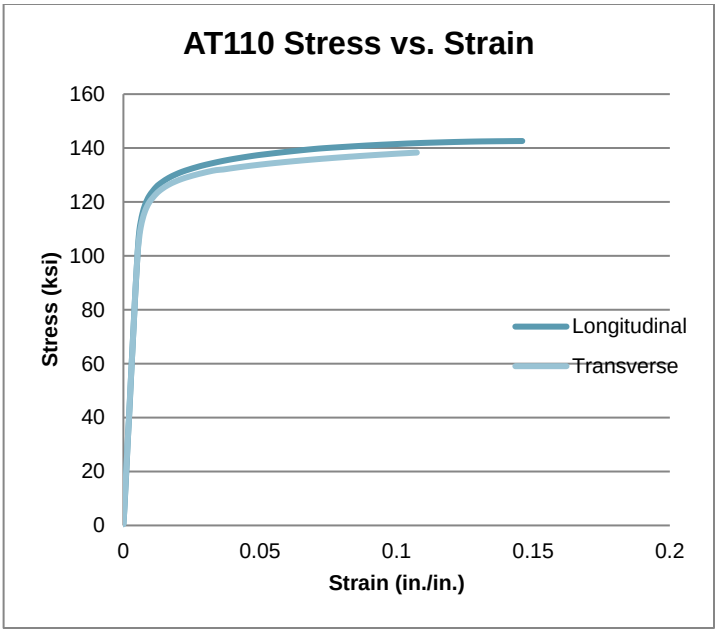

Figure 6. Longitudinal and transverse stress-strain curves for ToughMet 3 AT110 alloy

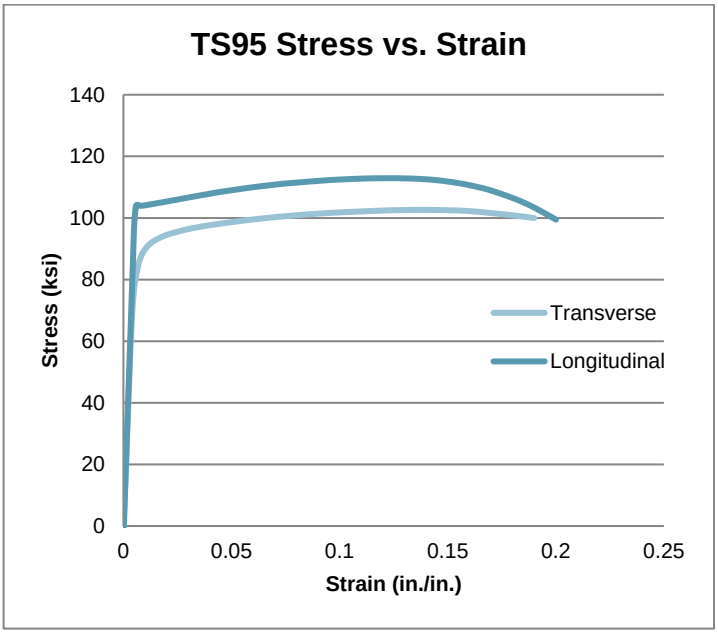

Figure 7. Longitudinal and transverse stress-strain curves for ToughMet 3 TS95 alloy

MATERION PERFORMANCE ALLOYS
6070 Parkland Boulevard
Mayfield Heights, OH 44124 USA
phone: 216.383.6800 fax: 216.383.4005
email: BrushAlloys-Info@Materion.com

TECHNICAL INQUIRIES
phone: 800.375.4205
216.692.3108

MATERION CORPORATION
www.materion.com/alloys

AT0068/1017

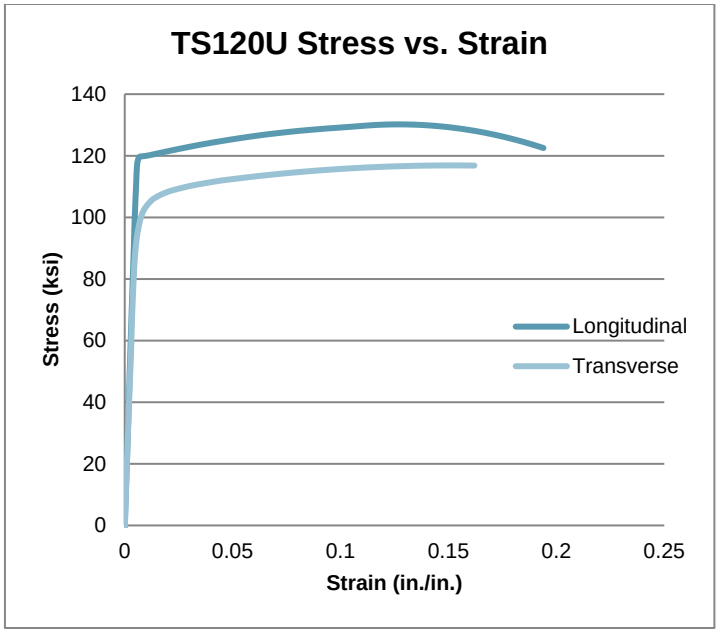

Figure 8. Longitudinal and transverse stress-strain curves for ToughMet 3 TS120U alloy

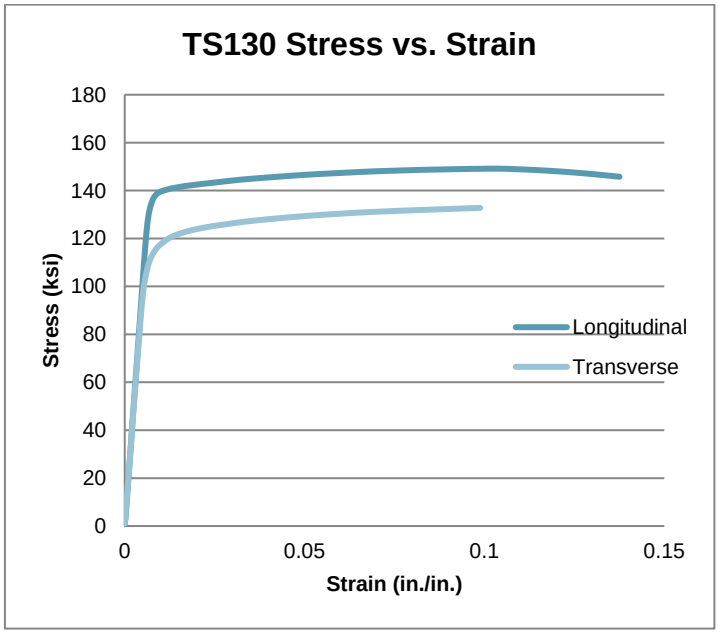

Figure 9. Longitudinal and transverse stress-strain curves for ToughMet 3 TS130 alloy

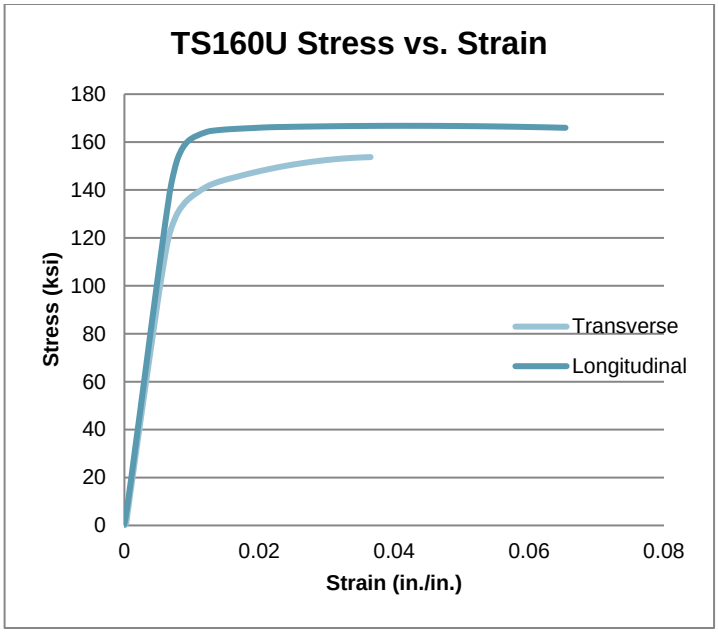

Figure 10. Longitudinal and transverse stress-strain curves for ToughMet 3 TS160U alloy

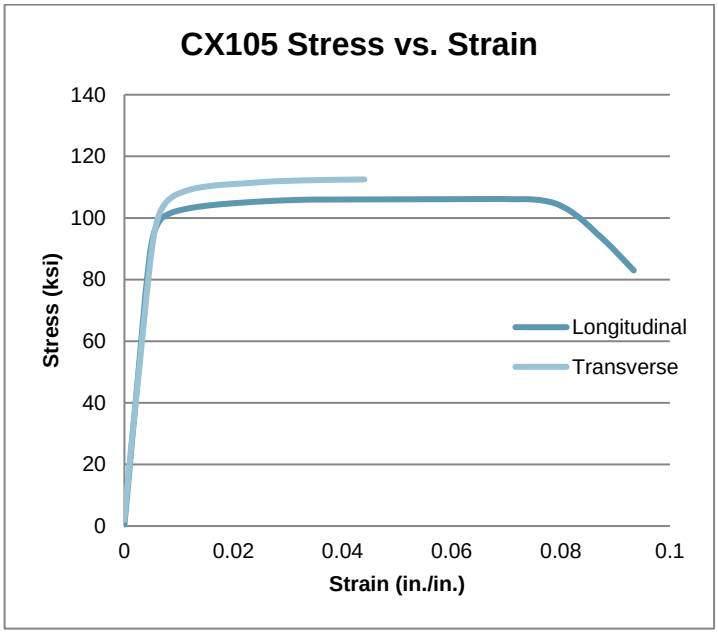

Figure 11. Longitudinal and transverse stress-strain curves for ToughMet 3 CX105 alloy

MATERION PERFORMANCE ALLOYS
6070 Parkland Boulevard
Mayfield Heights, OH 44124 USA
phone: 216.383.6800 fax: 216.383.4005
email: BrushAlloys-Info@Materion.com

TECHNICAL INQUIRIES
phone: 800.375.4205
216.692.3108

MATERION CORPORATION
www.materion.com/alloys

AT0068/1017