

HASTELLOY[®] C-22HS[®] alloy

Resistance to Sour Gas Environments

Sour Gas Testing – NACE TM0177 Test Levels II and III, Method A, Solution A, Applied Stress = 100% YS

Material Condition	Heat	Coupling	Result*
Cold-worked	Heat 1	Coupled to Carbon Steel	Pass
		NOT Coupled to Carbon Steel	Pass
	Heat 2	Coupled to Carbon Steel	Pass
		NOT Coupled to Carbon Steel	Pass
	Heat 3	Coupled to Carbon Steel	Pass
		NOT Coupled to Carbon Steel	Pass

*Triplicate tests

Sour Gas Testing – NACE TM0198 Slow Strain Rate Tensile, Level VII, Without (w/o) Elemental Sulfur

Material Condition	Environment*	Time to Failure (h)	Elong. (%)	R.A. (%)	Time to Failure Ratio	Elong. Ratio	R.A. Ratio	Secondary Cracking
Cold-worked	Air	8.9	12.8	63.4	-	-	-	-
	Level VII w/o S	8.4	12.1	63.2	0.95	0.95	1.00	No

*Air – single test; Level VII w/o S – triplicate tests

Sour Gas Testing – NACE TM0198 Slow Strain Rate Tensile, Level VII, With Elemental Sulfur

Material Condition	Environment*	Time to Failure (h)	Elong. (%)	R.A. (%)	Time to Failure Ratio	Elong. Ratio	R.A. Ratio	Secondary Cracking
Cold-worked	Air	8.9	12.8	63.4	-	-	-	-
	Level VII w/S	8.2	11.7	62.4	0.92	0.91	0.98	No

*Air – single test; Level VII w/S – triplicate tests

Sour Gas Testing – NACE TM0198 Slow Strain Rate Tensile, Level VII, Test Environment: 25% NaCl, 1000 psi (6.9 MPa) H₂S + 1000 psi (6.9 MPa) CO₂, Material Condition: Cold-worked

Test Temperature	Environment*	Time to Failure (h)	Elong. (%)	R.A. (%)	Time to Failure Ratio	Elong. Ratio	R.A. Ratio	Secondary Cracking
500°F 260°C	Air	5.4	7.8	50.2	-	-	-	-
	Test Environment	5.2	7.6	50.3	0.96	0.97	1.00	No
550°F 288°C	Air	5.3	7.6	51.2	-	-	-	-
	Test Environment	5.4	7.8	49.6	1.02	1.02	0.97	No

*Air – single test; Test Environment – triplicate tests

Sour Gas Testing – NACE Standard 90 day C-Ring Test, 25% NaCl, 500 psi (3.5 MPa) H₂S + 500 psi (3.5 MPa) CO₂, 401°F (205°C), Test Level VII, Elemental Sulfur = 1 g/l and 5 g/l, Applied Stress = 100% YS**

Material Condition	Heat	Yield Strength (ksi)	Result*
Cold-worked	Heat 1	205.2	1 g/l S: Pass 5 g/l S: Pass
	Heat 2	186.6	1 g/l S: Pass 5 g/l S: Pass
	Heat 3	187.9	1 g/l S: Pass 5 g/l S: Pass

*Triplicate tests **With stirring

Sour Gas Testing – NACE Standard 90 day C-Ring Test, 25% NaCl, 1000 psi (6.9 MPa) H₂S + 1000 psi (6.9 MPa) CO₂, 550°F (288°C), Test Level VII, Applied Stress = 100% YS

Material Condition	Heat	Yield Strength (ksi)	Result*
Cold-worked	Heat 1	205.2	Pass
	Heat 2	186.6	Pass
	Heat 3	187.9	Pass

*Triplicate tests