

CANNON-MUSKEGON CORPORATION

A Subsidiary of SPS Technologies

CM 939 WELDABLE™ TEST PROGRAM AND MECHANICAL PROPERTIES TO DATE.

"Dumbbell" test bars cast by Rolls-Royce (Indianapolis)

Heat Treatment 4 Step

CM V-5 heats 5V0018 and 5V0019

TENSILE	CM 939 WELDABLE™					TENSILE IN 939 (TYPICAL)				TENSILE GTD 222 (TYPICAL)			
Test Temperature	ID	0.2% YS (ksi)	UTS (ksi)	% Elong	% RA	0.2% YS (ksi)	UTS (ksi)	% Elong	% RA	0.2% YS (ksi)	UTS (ksi)	% Elong	% RA
RT (70°F)	5V0018G	107.8	163.6	10.0	10.0	121	168	7	9	97	148	11	14
	5V0019R	109.0	164.4	10.4	10.7								
1400°F	5V0018H	89.4	127.2	6.7	8.2	100	111	2	4	73	92	5	9

CREEP-RUPTURE CM 939 WELDABLE™							STRESS-RUPTURE IN 939 (TYPICAL)			STRESS-RUPTURE GTD 222 (TYPICAL)		
Test Condition	ID	Rupture Life, Hrs.	% Elong [4D]	% RA	Time to 1% Creep	Time to 2% Creep	Rupture Life Hrs.	% Elong [4D]	% RA	Rupture Life Hrs.	% Elong [4D]	% RA
1500°F/30.0 ksi [816°C/207 MPa]	5V0018A	3000 +			1636.8		[1510]*	[6]*	[13]*			
	5V0019J	3000 +			1418.1							
1600°F/27.0 ksi [871°C/186 MPa]	5V0018B	705.8	10.8	14.5	171.1	317.3	645	5	5			
	5V0019K	690.8	8.7	15.1	151.4	305.5						
1650°F/20.0 ksi [899°C/138 MPa]	5V0018C	925.2	11.7	13.7	283.7	555.3				[235]*	[8]*	[13]*
	5V0019L	968.8	10.4	17.4	253.7	587.0						
1650°F/25.0 ksi [899°C/172 MPa]	5V0018D	252.9	12.2	18.9	48.7	90.9	214	4	4	45 **	14 **	34 **
	5V0019M	215.0	9.7	15.9	41.0	81.6						
1700°F/12.0 ksi [927°C/83 MPa]	5V0018E	2674.7	12.4	12.1	1511.4	2028.4						
	5V0019N	2900 +			1718.0	2309.1						
1700°F/15.0 ksi [927°C/103 MPa]	5V0018F	1109.5	11.3	15.5	355.8	658.8						
	5V0019P	1012.0	10.0	13.6	469.6	694.7						

+ [All creep-rupture tests in progress.]

Machining & Testing Source: Joliet Metallurgical Laboratories.

* Machined from slabs - optimised heat treatment.

** Average Data CM

Heats 3V1321

3V1322

3V1351

3V1439

Ken Harris,
V.P./Director of Technology
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