



# T M K U P C E N T U M



10120 Houston Oaks Dr., Houston, TX 77064  
 Phone: +1(281) 949 1023 Website: tmk-ipsco.com Fax: +1(281) 445 4040

## Section 1: Executive Summary

**Report Date:** December 12, 2018

**Test Dates:** October 22, 2018 – November 17, 2018

**Client:** TMK–Premium Services  
 Morozova Str. 30, Taganrog, RUSSIA 347928

**Project Number:** RDP–105–18–1017

**Pipe Specifications:** 13.375 In. OD–72 lb.–P110

**Connection Identification:**

Connection Specifications and Ratings		
<b>Connection OD:</b>	14.375 in	
<b>Connection Length:</b>	12.205 in	
<b>Make – Up Loss:</b>	5.984 in	
<b>Drift:</b>	12.159 in	
<b>Connection ID:</b>	12.291 in	
<b>Thread Compound Used:</b>	BESTOLIFE 72733	
<b>Torque (min. /opt. /max.):</b>	43,100 / 47,900 / 52,700 ft–lbs	
	<b>Connection data sheet ratings</b>	<b>Min. Test Rating (% of PBYS)</b>
<b>API Burst Pressure:</b>	7,390 psi	(100%)
<b>API Collapse Pressure:</b>	2,890 psi	(100%)
<b>Tensile Load:</b>	2,285,000 lbs	(95%)
<b>Compression Load:</b>	1,828,000 lbs	(80%)
<b>Bending (Dogleg):</b>	22° / 100 ft	10° / 100 ft

Table 1-1: Connection Specifications

TMK IPSCO Confidential and Proprietary Information	TEST: TMK UP CENTUM 13.375X72 P110			PG: 1.1 of 1.10
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## Specimen Preparation & Test Locations

<b>Mechanical Property Testing:</b>	TMK–IPSCO R&D Center, 10120 Houston Oaks Dr., Houston, TX 77064
<b>Specimen Machining and Surface Treatments:</b>	Custom Threading (CTI), 5835 Cheswood, Houston, TX 77087
<b>Make and Breaks:</b>	TMK–IPSCO R&D Center, 10120 Houston Oaks Dr., Houston, TX 77064
<b>Sealability (Series B):</b>	Stress Engineering Services (SES), 42403 Old Houston Highway, Waller, TX 77484

Table 1-2: Specimen Preparation and Test Locations

## Test Procedure

<b>Test Type:</b>	CAL IV Series B (1 specimen rehearsal)
<b>Planned deviations from API RP 5C5:</b>	Testing is planned for Specimen 1 only Additional M&B Cycle on B-side
<b>Number of Specimens:</b>	1 (Specimen 1)
<b>Test Temperatures:</b>	96°F (35.5°C) for Ambient Temperature Testing 356 °F (180 °C) for Elevated Temperature Testing/ Bake Out
<b>Test Pressure Medium:</b>	Nitrogen Gas

## Testing Dates & Location

Specimen	Make & Break	Bake-Out	Series B (90/60)	Series B (100/80)
Location	TMK IPSCO	SES	SES	SES
1	10/22/2018	11/01/2018	11/12/2018	11/17/2018

Table 1-3: Test Schedule

## Identification of Test Personnel

<b>Engineer in Charge (EIC):</b>	Alexey Prokofyev
<b>Project Manager:</b>	Manish Nawal, Ryan Schmidt (SES)
<b>Test Engineer:</b>	Kevin Henry
<b>Technicians:</b>	Donald Anderson, Christopher Coode, Henry Divin (SES), Tod Phillips (SES), and Steve Busa (SES)

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### 3<sup>rd</sup> Party Monitoring

Not Applicable

### Deviations and Anomalies

Specimen 1 Test Series B (first test) – At Load Step (LS) 218, leak-tube displacement (1.4 cc) exceeded the API criterion during the 10-minute hold. The hold was then extended to a 15- minute hold and then by a series of rolling 5-minute holds per API 5C5. Leak-tube displacement during the final three 5-minute holds (0.2 cc) was within the API criterion, with a total extended hold time of 20 minutes. The test was then continued.

### Testing Summary

#### **Specimen Preparation**

Test specimens were machined from Tenaris (Heat# 77296) casing stock and Valourec (Heat# 218816) coupling stock. The pins were machined according to drawing no: TMK UP CENTUM 340.001 V13, Revision 1 and couplings were machined according to drawing no: TMK UP CENTUM 340.002 V13, Revision 1. All test specimens satisfied the thread and seal interference ranges outlined in API RP 5C5:2017.

Specimen/Side	Box Finish	Pin Finish
Specimen 1	Zn Phosphate	As Machined

Table 1-4: End Surface Finish

#### **Make & Break Testing**

Test specimens were made up using horizontal tongs with 2.0 max RPM. API modified thread compound (BestOLife 72733) per the quantities listed in Table 1-5 were used.

	Dope Quantity on Pin (g)	Dope Quantity on box (g)
Minimum	28±1	57±1
Maximum	33±1	69±1

Table 1-5: Make & Break Dope Quantity

Recommended torque values ranged between 43,100 and 52,700 ft-lb (58,500 and 71,500 N.m). A detailed description of the recommended make-up torque ranges are indicated in Table 1-6. Make-up and break-out cycles for each full-scale test specimen are shown in Table 1-7.

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	Nm		ft-lb	
Minimum recommended torque	58,500		43,100	
Optimum recommended torque	65,000		47,900	
Maximum recommended torque	71,500		52,700	
	Minimum	Maximum	Minimum	Maximum
High Make-Up Torque range	68,900	71,500	50,900	52,800
Low Make-Up Torque range	58,500	61,100	43,200	45,100

Table 1-6: Make-Up Torque Ranges

Specimen #	End A	End B
1	FMU	3+FMU

Table 1-7: Make-up and break-out cycles

### Bake out

Specimen 1 was baked out at 375°F (190°C) for 24 hours with Load cycles as shown in Table 1-8.

Cycle	Machine Load, kips	Internal Pressure, psi	Hold time	Temperature
Heating up to 180±15°C (356 ±27°F)				
1	1300	0	1 hour	180±15°C (356±27°F)
	-1000		1 hour	
2	1300		1 hour	
	-1000		1 hour	
3	1300		1 hour	
	-1000		1 hour	
4	1300		1 hour	
	-1000		1 hour	
5	1300		1 hour	
	-1000		1 hour	

Table 1-8: Bake-Out Cycles



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### Sealability Testing

The load ratings specified in Table 1-1 were used on specimen 1. The applied loads (tension/compression) and pressures for each specimen assembly are provided in Figure 1-1 through **Error! Reference source not found.** All specimens met the displacement requirements per API RP 5C5:2017.

### Series B: Specimen 1 (90% Tension, 60% Compression)

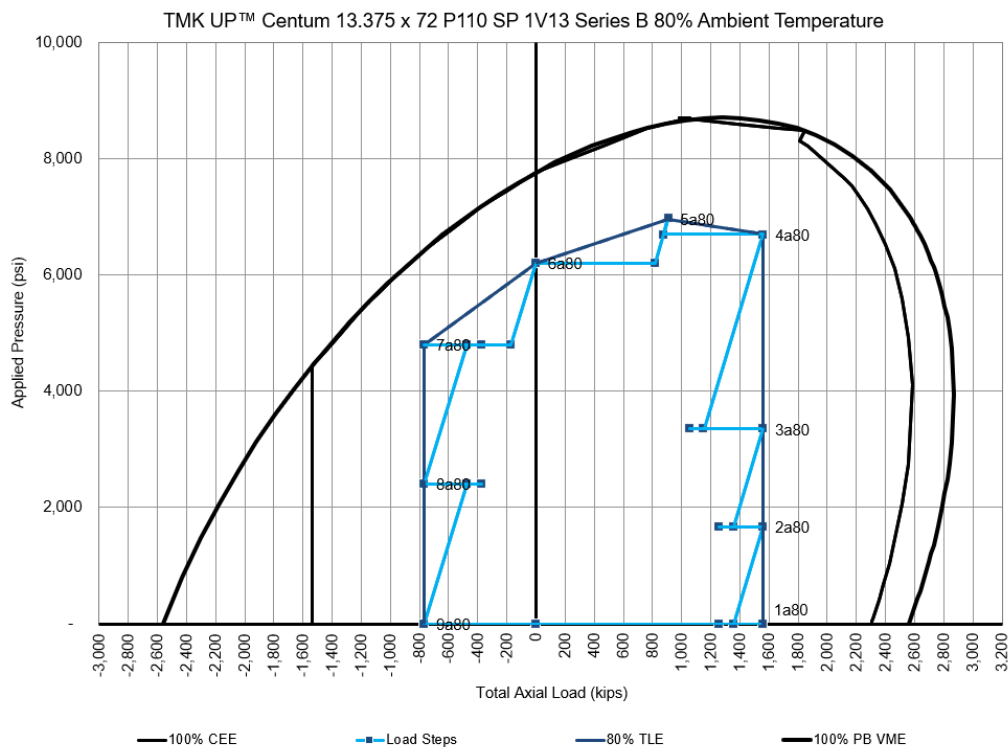


Figure 1-1: Test Envelope for TMK UP Centum Specimen 1 Series B (80% Ambient)

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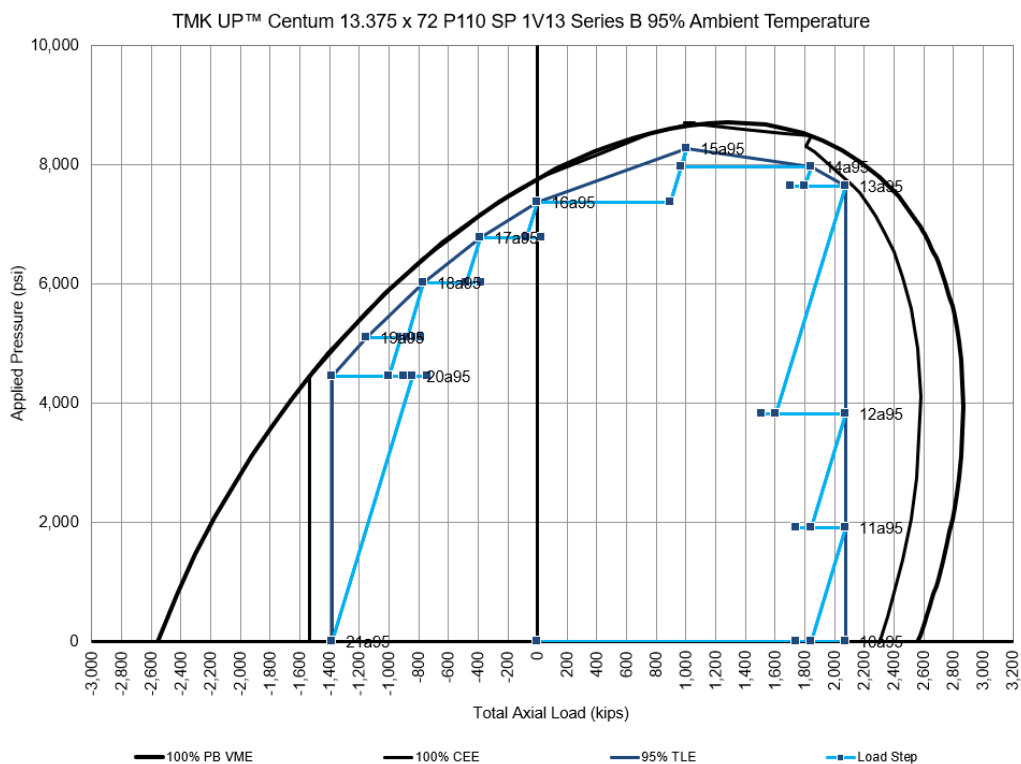


Figure 1-2: Test Envelope for TMK UP Centum Specimen 1 Series B (95% Ambient)

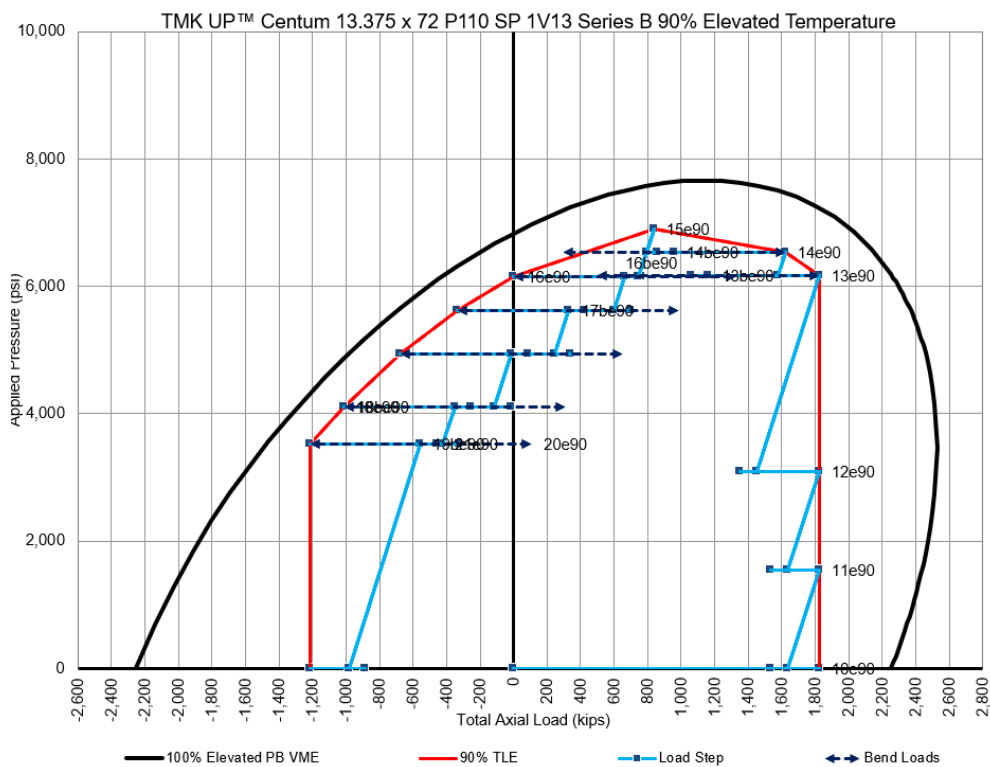


Figure 1-3: Test Envelope for TMK UP Centum Specimen 1 Series B (90% Elevated)

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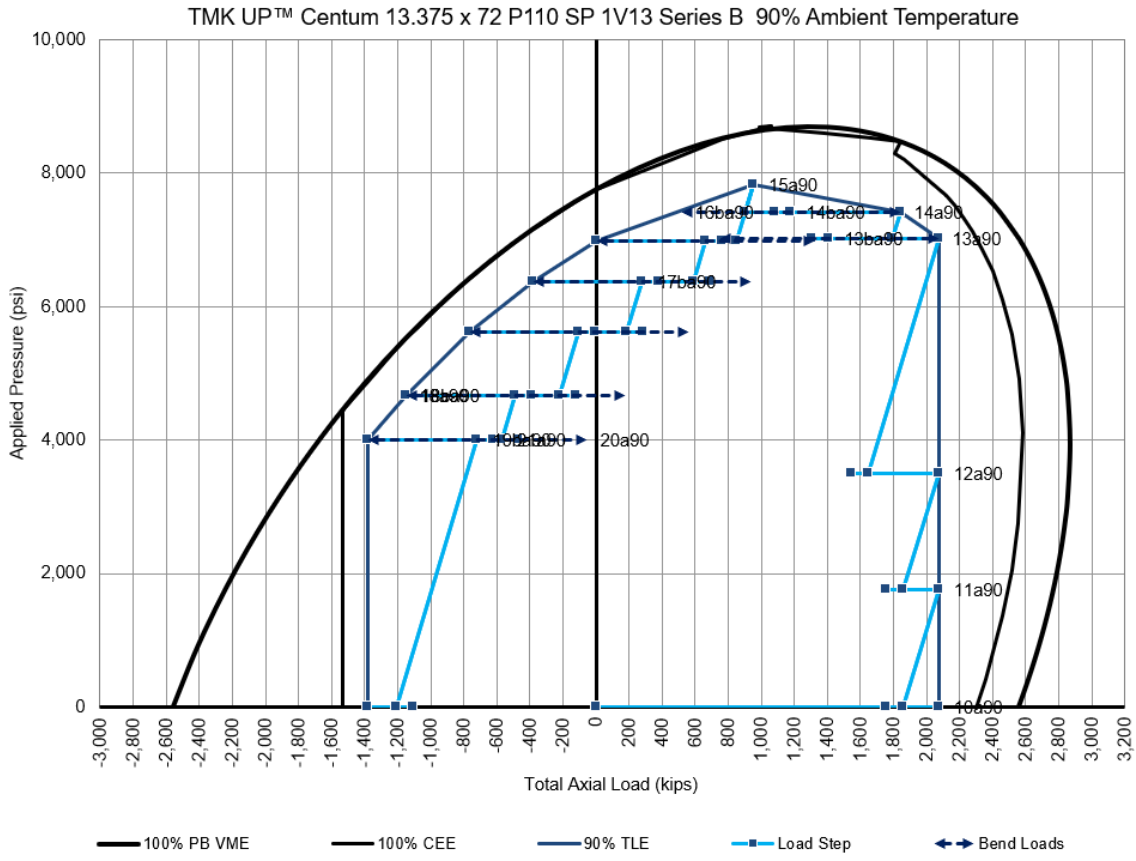


Figure 1-4: Test Envelope for TMK UP Centum Specimen 1 Series B (90% Ambient)

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## Series B: Specimen 1 (100% Tension, 80% Compression)

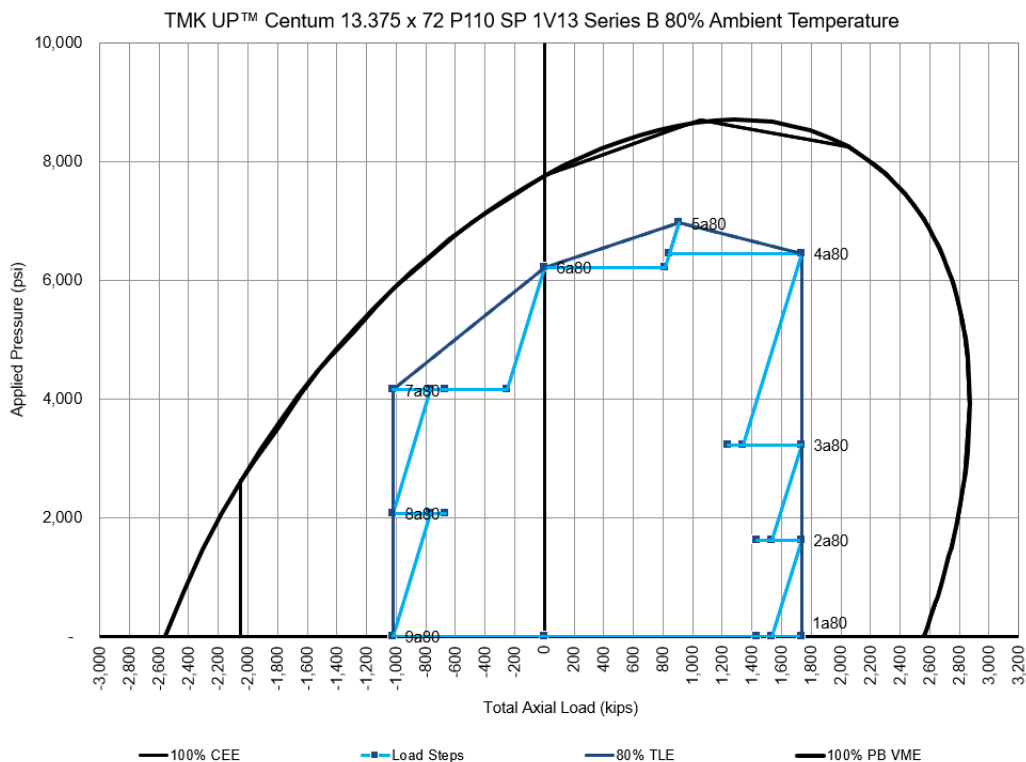


Figure 1-5: Test Envelope for TMK UP Centum Specimen 1 Series B (80% Ambient)

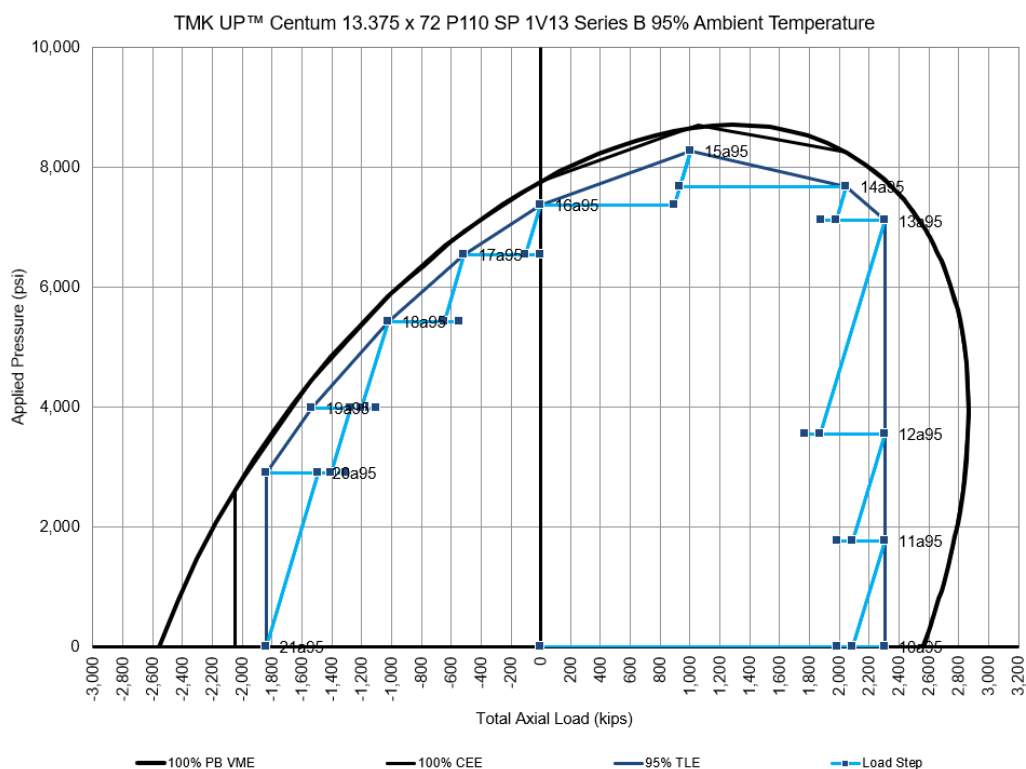


Figure 1-6: Test Envelope for TMK UP Centum Specimen 1 Series B (95% Ambient)

TMK IPSCO <i>Confidential and Proprietary Information</i>	<b>TEST:</b> TMK UP CENTUM 13.375X72 P110			<b>PG:</b> 1.8 of 1.10
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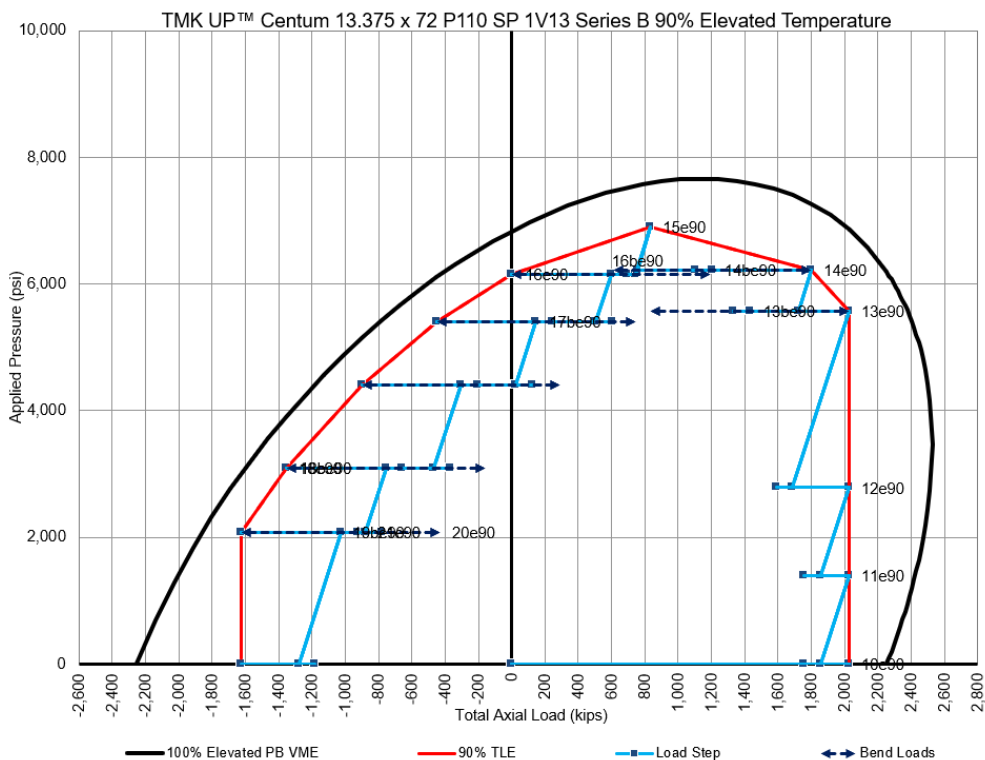


Figure 1-7: Test Envelope for TMK UP Centum Specimen 1 Series B (90% Elevated)

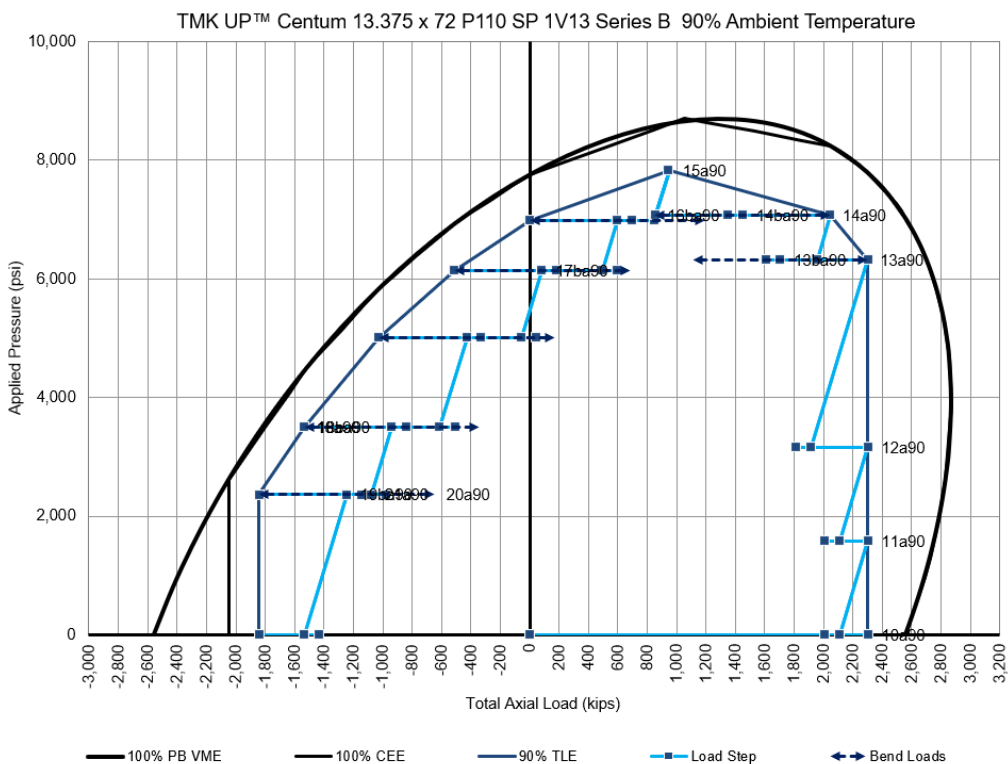


Figure 1-8: Test Envelope for TMK UP Centum Specimen 1 Series B (90% Ambient)

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# TMK UP CENTUM



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### Supplemental Testing

Not Applicable

### Conclusion

The 13.375" x 72# P110 TMK UP Centum connection Specimen 1 was successfully qualified in accordance with API RP 5C5:2017 requirements per the test proposal TP PS-36-01-2018 Revision 4 with 100% tension and 80% compression efficiencies. The internal pressures correspond to 100% PBYS.

### Approval Signatures

**Prepared By:**  
**Connection Test Engineer**

\_\_\_\_\_  
Kevin Henry

\_\_\_\_\_  
Date

**Reviewed By:**  
**Design Engineer (EIC)**

\_\_\_\_\_  
Alexey Prokofyev

\_\_\_\_\_  
Date

**Approved By:**  
**General Manager of R&D**

\_\_\_\_\_  
Dhiren Panda

\_\_\_\_\_  
Date

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