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**John C. Stennis Space Center**  
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**SSTD-8070-0094-COMPNTS**

**Rev. B**

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# **COMPLIANCE IS MANDATORY**

## **John C. Stennis Space Center Bourdon Tube Pressure And Vacuum Gauges For Use In Facility Piping Or Tubing Systems**

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<b>SUBJECT: Bourdon Tube Pressure &amp; Vacuum Gauges For Facility Piping Or Tubing Systems</b>	

## Document History Log

Change/ Revision	Change Date	Originator/ Phone	Description
Basic	01/22/2013	D. Dike/ ext. 2803	Initial release, superseding SSC 66-200. Updated material and pressure calls out in Paragraph 5.0. Added phenolic case to Paragraph 8.0. Added bar requirement in Paragraph 12.0. Added 0-160 to Table 1 plus allow 0-50 in place of 0-60. Added Paragraph 10.0 to include MS as well as NPT threads. Changed Paragraph 13.0. Capillary bleeder, tip bleeds and clarify top bleed requirements in Paragraph 14.0. In Paragraph 15.0 updated testing clean to specify allowable testing fluids and cleaning requirements. In Paragraph 16.0 revised tagging paragraph on nameplate requirements. <i>CEF Archive Note: SSC 66-200 superseded COE Contract 2890, Section PI, except information concerning 0-10" water column gauge; and Paragraphs "a" through "e" of the following COE Contracts: 1550, Section 62-09; and 1580, Section 6-10 and 2090, Section 59-09.</i>
A	01/24/2018	D. Dike / Ext. 2803	5-year review. Updated cover sheet to reflect approval by NASA SSC Center Operations Design and Construction Project Management Division; and concurrence by NASA SSC Center Operations Directorate Operations and Maintenance Division and NASA SSC Engineering & Test Directorate. Administrative changes throughout document. Updated references. Section 1.0: Added "4½" dial size"; and deleted "facility" in lieu of "the Test Complex critical system". Section 4.0: Added paragraph c. Section 5.0: Modified to clarify material specifications. Section 10.0: In paragraph a, added "or ½" " to connection socket specifications, and deleted "for gauges with ranges up to and including 800 psig." Section 10.0: Deleted paragraph b. Section 12.0: Added 0-100 scale range.

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B	01/24/2022	M. Sabbagh Ext. 3325	Five-year review. Updated cover sheet approval titles. Confirmed references and acronyms. Minor administrative changes.
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## 1.0 PURPOSE

This John C. Stennis Space Center (SSC) standard (SSTD) establishes the requirements for Bourdon tube type 4½” dial size pressure and vacuum gauges that are to be used in the Test Complex critical system piping and tubing systems.

### **NOTE:**

This SSTD applies to all new Bourdon tube type pressure and vacuum gauges and to the necessary replacement of such existing gauges. This SSTD does not necessitate replacement of non-conforming gauges considered in good condition just to meet this SSTD’s requirements.

## 2.0 APPLICABILITY

This SSTD applies to all SSC National Aeronautics and Space Administration (NASA) organizations, resident agencies, contractors, and sub-contractors involved with Bourdon tube type pressure and vacuum gauges.

## 3.0 REFERENCES

All references are assumed to be the latest version unless otherwise indicated.

ASME B40.100, *Pressure Gauges and Gauge Attachments*

MIL-P-8184B, *Plastic Sheet, Acrylic, Modified*

SPR 1440.1, *SSC Records Management Program Requirements*

SSTD-8070-0005-CONFIG, *SSC Preparation, Review, Approval, and Release of SSC Standards*

SSTD-8070-0126-PIPE, *Tubing Systems for Facility Systems, Special Test Equipment, and Aerospace Hardware*

## 4.0 RESPONSIBILITIES

- a. Users of this SSTD shall comply with its requirements, ensure use of the correct version of this SSTD and the documents it references, and inform the appropriate organization of needed changes in accordance with SSTD-8070-0005-CONFIG.
- b. Responsibilities for the use and control of this SSTD and for the review and approval of revisions or cancellation of this SSTD shall be as specified in SSTD-8070-0005-CONFIG and the applicable documents referenced therein.
- c. Pressure gauge connections specified for use in Test Complex critical systems shall comply with the pressure requirements specified in SSTD-8070-0126-PIPE.

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## 5.0 MATERIAL

The Bourdon tube shall be phosphor bronze (maximum pressure of 1,000 psig) Type 316 stainless steel or K Monel for gauges with ranges up to and including 20,000 psig.

### **NOTE:**

No part of the gauge which comes in direct contact with the pressure medium shall be made from 400 series stainless steel.

## 6.0 ACCURACY

- a. The gauges shall be capable of meeting the Grade A accuracy requirements of ASME B40.100, which state each gauge shall be subjected to a pressure equal to the maximum scale pressure.
- b. Pressure shall be maintained for a period of at least five (5) hours. Within ten (10) minutes after the pressure is released and without any adjustments, the gauge shall be tested over its entire scale, with readings taken in both the up and down direction at several points.
- c. The error in any reading shall not exceed  $\pm 1$  percent of the maximum pressure for which the scale is graduated.
- d. The accuracy test shall be performed with the gauge and fluid at a temperature of 68°F,  $\pm 10^\circ\text{F}$ .

## 7.0 EXCESSIVE PRESSURE RANGES

The gauge shall be capable of withstanding the following excessive pressures for a period of thirty (30) minutes without any resulting damage or change in accuracy:

- a. 1.3 times the maximum scale pressure for gauges with ranges up to and including 800 psig.
- b. 1.1 times the maximum scale pressure for gauges with ranges above 800 psig and up to and including 5,000 psig.

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- c. 1.0 times the maximum scale pressure for gauges with ranges above 5,000 psig and up to and including 20,000 psig.

**NOTE:**

The gauge that should be used in a particular system is one in which the maximum scale pressure is 1½ to 2 times the average operating pressure of the system, except for the 0-20,000 gauge, which shall be 1⅓ to 2.

**8.0 CASE AND CRYSTAL**

- a. The case shall be solid front with a 50 percent minimum area weathertight blow-out back.
- b. The case shall be aluminum or phenolic. The aluminum case shall have a threaded aluminum ring for in-line or wall mounting and with a hinged steel ring for flush mounted gauges. The case and ring shall be anodized or bonderized and finished in black baked enamel.
- c. The crystal shall be shatterproof glass or acrylic plastic per MIL-P-8184B.

**9.0 MOUNTING**

The gauge shall have a back flange and bottom connection for in-line or wall mounting, or a front flange and back connection for panel mounting.

**10.0 CONNECTIONS**

- a. The connection socket shall have either ¼” or ½” SAE AS4395 threads or ¼” or ½” male National Piping Thread (tapered thread NPT).
- b. Location of the connection on back mount gauges shall be on the lower back of the gauge unless center mount is specified by the Purchase Order.

**11.0 DIMENSIONS**

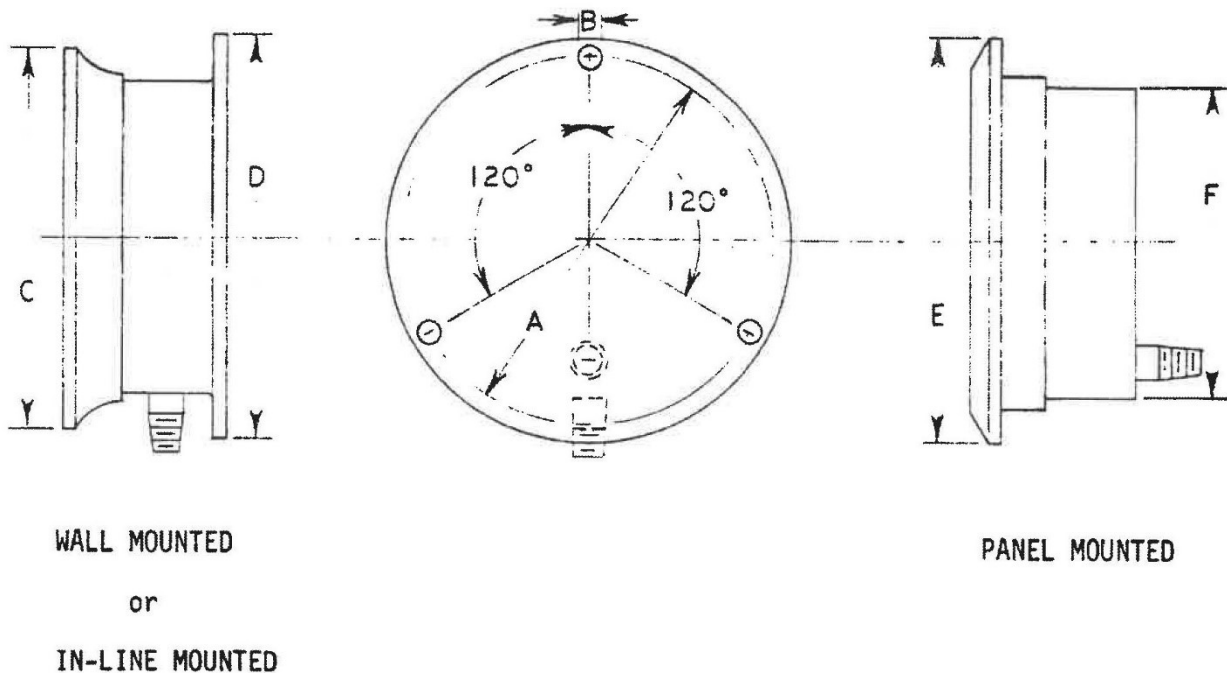
- a. Flanges of all gauges shall have three (3) mounting holes on a common bolt circle, 120 degrees apart with one (1) hole on the vertical center-line at the top. (See Figure 1.)

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b. The gauges shall meet the following dimensions as shown in Figure 1:

Nominal Size of Gauge	4½"
Diameter of Bolt Circle (A)	5¾"
Diameter of Bolt Holes	7/32"
Maximum Diameter of Flange and Rig (C, D, E)	6½"
Maximum Diameter of Case (F)	5"

**Figure 1**



## 12.0 DIAL

- a. The dial shall be laminated white plastic with uniform spacing of graduations covering an arc of at least 270 degrees.
- b. The value of the smallest graduation shall be equal to or less than those in Table 1.

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- c. The dial shall have two (2) bands of graduation. The outer band shall be for psi and shall be black in color. The inner band shall be for bar and shall be red in color.

**Table 1**

<b>Scale Range (psig)</b>	<b>Smallest Graduations (psig)</b>
0-15	¼
0-30*	¼*
0-50	½
0-100	1
0-160	2
0-200	2
0-300	2
0-400	5
0-600	5
0-800	10
0-1,000	10
0-1,500	10
0-2,000	20
0-3,000	25
0-5,000	50
0-10,000	100
0-15,000	100
0-20,000	200
<i>*This applies to vacuum gauges also, for which the range is 0-30 inches of mercury, and the smallest graduation is ¼ inch of mercury.</i>	

### **13.0 MICROMETER ADJUSTABLE POINTER**

All gauges shall have micrometer adjustable pointers.

### **14.0 TIP BLEEDS**

Pressure gauges shall be supplied with a tip bleed on the end of the Bourdon Tube. A capillary bleed connected at the base of the Bourdon Tube is not acceptable. The tip bleed shall be accessible from the back side of the gauge.

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## 15.0 TESTING AND CLEANING

Pressure gauges shall be tested with gas or water only. No testing with oil is allowed. If tested with water, then the manufacturer shall remove all water by cleaning.

## 16.0 TAGGING

- a. Each pressure gauge shall be supplied with a metal nameplate permanently fastened to the right side or back of the case.
- b. The nameplate shall be permanently marked with the following lines of identification information:

<b>Identification Information</b>	
Line 1	Manufacturer
Line 2	Purchase Order Number
Line 3	Bourdon Tube Material
Line 4	Manufacturer's Part Number
Line 5	Accuracy

## 17.0 RECORDS AND FORMS

Records and forms required by the procedures of this standard shall be maintained in accordance with SPR 1440.1. All records and forms are assumed to be the latest edition unless otherwise indicated. Forms may be obtained from the SSC Electronic Forms repository or from the NASA SSC Forms Management Officer. Quality Records are identified in the SSC Master Records Index.

## 18.0 ACRONYMS AND ABBREVIATIONS

<b>ASME</b>	American Society of Mechanical Engineers
<b>°F</b>	Degree Fahrenheit
<b>"</b>	Inch
<b>MIL</b>	Military
<b>NASA</b>	National Aeronautics and Space Administration
<b>NPT</b>	National Piping Thread
<b>psig</b>	pounds per square inch gauged
<b>SAE</b>	Society of Automotive Engineers
<b>SPR</b>	Stennis Procedural Requirements
<b>SSC</b>	John C. Stennis Space Center
<b>SSTD</b>	John C. Stennis Space Center Standard

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