Instrument Specification

for

Pressure Transmitters

for

A-3 Test Stand

Chemical Steam Generators

ISSUED/CEF

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National Aeronautics and Space Administration
John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

SIGNATURE RECORD

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DOCUMENT HISTORY LOG

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Release for RFI	RFI	05/06/2009	Initial Release for Procurement RFI through SEWP
Revision 0	0	10/21/2009	• Baseline Release for procurement. • Added Signature Page: Signatures Required: ○ Preparer(s): ○ Chief Engineer ○ Construction Manager ○ Safety & Mission Assurance • Added DOCUMENT HISTORY LOG • Added requirement 2.4.9 Response Time

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Attached Data Sheets

1.0 General

1.1 Scope of Work

This specification has been written for pressure transmitters utilizing digital pressure sensors rated 0-430 psig, 0-2,000 psig and 0-3000 psig as well as differential pressure transmitters rated for 0-2000 inH_2O.

The supplier shall design, fabricate, test, tag, package, and ship the ordered instrumentation in accordance with the requirements of this equipment specification and all documents specified herein.

The work includes the furnishing of all labor, technical, and professional services, materials, and performance of all incidentals in connection with the engineering, design, fabrication, testing, and delivery of process instrumentation for pressure measurement.

Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of the products, unless otherwise specified and documented by buyer purchase requirements and manufacturer drawings and specifications.

The manufacturer warrants the satisfactory and successful operation of all equipment furnished under this specification at the rating, conditions, and the type of service specified herein.

1.2 Work Not Included

Field installation
Field test
Final cleaning to SSTD-8070-0089-FLUIDS Level 1XX
Calibration other than specified in data sheets

2.0 Requirements

2.1 Installation Requirements

The equipment specified herein will be installed outdoors and shall operate satisfactorily under the following conditions:

Altitude of Site:	Sea Level
Barometric Pressure:	14.7 psia
Ambient (external) Temperature:	-40°F to 185°F
Humidity:	5% to 100% (relative)
Outdoor Conditions:	Class I, Division 1, Group B, C and D Classified Area
Location:	Stennis Space Center, Mississippi

2.2 *Service Requirements*

2.2.1 Scope: Each pressure transmitter shall be suitable for use with gaseous and liquid oxygen, gaseous and liquid nitrogen, isopropyl alcohol and steam, as well as air and water.

2.2.2 Oxygen Compatibility: All materials exposed to oxygen under any operating conditions, including failure modes, shall be compatible with it, and shall not react spontaneously.

2.2.3 Isopropyl Alcohol: Transmitters must be compatible with Isopropyl Alcohol in both materials and construction. All materials exposed to Isopropyl Alcohol under any operating condition, shall be compatible.

2.2.4 Hydrocarbons: Transmitters must be compatible with the byproducts of the combustion of hydrocarbon fuels.

2.2.5 Interchangeability: All units shall be designed to permit interchangeability of units with the same part number.

2.3 *Mechanical Requirements*

2.3.1 Design: Each pressure transmitter and its accessories shall be in accordance with the data sheets and the requirements specified herein. The pressure transmitter shall be capable of operating within the performance requirements specified throughout the full operating range. Vendors shall also provide all necessary engineering calculations.

2.3.2 Materials: Materials of construction shall be new and free of defects and imperfections. They shall retain satisfactory mechanical properties throughout the specified working temperature and pressure range. All pressure containing components shall conform to the requirements of ASME Code, Section VIII and ANSI B31.3. The equipment shall be manufactured from the materials specified on the data sheets. All alternate recommendations must be submitted in writing

to Buyer as part of the vendor's proposal. Alternate materials are prohibited unless approved by the Buyer.

2.3.3 Connections: All pressure transmitters, unless otherwise noted, shall be installed in 1/4" tubing and their pressure connection shall be ¼" NPT internal thread.

2.3.4 Mean Time Between Failure: All units shall exhibit mean time between failures (MTBF) of 100,000 hours or greater in accordance with MIL-HDBK-217, assuming 77°F ambient temperature.

2.3.5 Over Pressure Protection: All transmitters shall be able to withstand over pressure events up to 1.5 times the Upper Range Limit at 1,000,000 cycles without damage to the sensor and without the need to re-calibrate.

2.3.6 Sensor Diaphragm: All transmitters shall be constructed with 2 mil thick Hastelloy C-276 diaphragms.

2.3.7 Repair: If any special tools are required for assembly and/or disassembly, they shall be included with the transmitters.

2.4 Electrical Requirements

2.4.1 Pressure transmitters shall operate within the requirements specified in this specification and on the data sheet herein.

2.4.2 Calibration: Each transmitter shall be calibrated in accordance with Vendor's data sheets

2.4.3 Non-Linearity and Hysteresis: The combined effects of zero-based non-linearity, hysteresis, and repeatability over the full pressure range of the transmitter, shall produce no deviation greater than 0.065% of span.

2.4.4 Ambient Temperature Effects: Total effects per 50°F change shall not exceed 0.084% of span + 0.03% of the Upper Range Limit.

2.4.5 Stability: The output signal shall not drift more than 0.1% of the Upper Range Limit per 60 months.

2.4.6 Power Supply Effects: The output signal shall not vary by more than 0.005% per Volt over an input voltage span of 21.6 VDC to 32VDC.

2.4.7 Signal Output: All transmitters shall be 4-20mA "Loop Powered" devices that are "HART" protocol capable.

2.4.8 Failure Alarm: All transmitters must be configurable to fail "High" or "Low" upon detection of a CPU or hardware failure.

2.4.9 Response Time: Response time is defined as the time required for the 4-20mA output signal to reach 90% of the process pressure. Response time requirements a given on the individual "Data Sheets."

2.5 Environmental Requirements

2.5.1 Ambient Temperature: The transmitter shall be able to withstand continuous exposure to ambient temperatures between -40 and 185°F without damage or subsequent change in performance.

2.5.2 Process Temperature: The transmitter shall be able to withstand continuous exposure to process temperatures between -40 and 248°F without damage or subsequent change in performance.

2.5.3 Humidity: The transmitter shall perform within the stated requirements of this specification in a relative humidity of 100% at ambient temperatures up to 104°F. Performance shall not be affected by condensation due to temperature changes.

2.6 Fabrication

The transmitter shall incorporate a standard capsule assembly constructed of materials meeting NACE MR01-75 including: 316L stainless steel capsule body; Hastelloy C-276 process isolation diaphragms; 316 stainless steel pressure flanges, process connectors and drain/vent valves; stainless steel bolts (studs) and hardware; Teflon (TFE) coated stainless steel process gaskets.

2.7 Inspection and Testing

2.7.1 Each pressure transmitter delivered to Stennis Space Center shall be subjected to nondestructive examination in accordance with ASME B31.1 and codes governing design, manufacture, and application of pressure containing parts.

2.7.2 The supplier shall perform all tests required by the referenced codes, standards, and regulations, as well as any tests mentioned in the data sheets or this specification.

2.7.3 Pressure Testing: Pressure retaining components shall withstand the proof pressure stated in the data sheets without change in performance characteristics or bursting. Unless otherwise specified, each gauge pressure transmitter shall be capable of withstanding a miminum of 1.5 times full range pressure and each differential pressure transmitter shall be able to withstand a static pressure of 2000PSIG without rupturing the diaphragm or housing.

2.7.4 Cleaning: Each pressure transmitter shall be capable of being cleaned to NASA/SSC 79-001, Level 1XX and also particle contamination not exceeding 100 microns in size. SSTD-8070-0089-FLUIDS has been included in the attachments.

2.8 Identification

Each pressure transmitter shall be permanently marked with the following information:

Manufacturer
Model Number
Serial Number
Maximum Working Pressure (MWP)

3.0 Packaging

The pressure transmitter shall be packaged in accordance with good commercial practice. Packaging shall be adequate to protect the hardware during handling, shipping, and storage.

4.0 Submittals

4.0.1 The Vendor shall supply the following information:

a. Physical configuration and dimensioned cross-sectional drawings.
b. Description of the principal of operation.
c. Electrical schematic.
d. Application notes if special techniques or equipment are involved in the calibration or use of the transmitter.
e. List of required deviations - see NOTE below.
f. Materials of construction.
g. Proper installation mounting diagrams

NOTE: If the supplier has an existing transmitter which substantially but not entirely meets all of the requirements of this specification, the supplier is

encouraged to submit a proposal on such a transmitter. The proposal should reference by paragraph number of this specification those requirements which cannot be entirely met. The proposal should state to what extent the transmitter can meet the requirements in question and should state the reasons for not meeting other requirements. The Buyer will evaluate all such proposals and determine whether the transmitter can be granted deviations to the specification.

4.0.2 The Buyer will review Vendor's submittal for principle and important dimensions and for conformance with design requirements. The Buyer's approval of Vendor's drawings, calculations, procedures, or other submittals does not relieve the Vendor of responsibility to ensure that the equipment meets the requirements of this specification and applicable code requirements, nor does it relieve the Vendor of responsibility for accuracy of dimensions, performance, or design details.

4.0.3 All submitted information/material shall be mailed to:

National Aeronautics and Space Administration
Bldg 3225, Room 48A
John C. Stennis Space Center
Stennis Space Center, Mississippi 39529-6000
Attn: Mr. Joseph W. Lacher

4.0.4 The Vendor shall submit a Certificate of Conformance stating that the furnished equipment meets the requirements of this specification.

5.0 Warranty

All equipment to be furnished under this section of the specifications shall be guaranteed against defective materials, design, and workmanship for a period of three years from the date of purchase with the first two years being on-site. Upon receipt of notice from the Buyer of failure of any part of the guaranteed equipment during the guaranty period, new replacement parts shall be furnished by the Vendor at no additional cost to the Buyer. The Vendor shall acknowledge his responsibility under these guaranty provisions by letter, stating that the equipment and materials referred to herein are guaranteed and the inclusive dates for the guaranty period.

The supplier shall warrant the satisfactory and successful operation of all equipment furnished under this specification at the conditions and type of service specified herein.

SSC A-3 FACILITY
PRESSURE TRANSMITTERS
DATA SHEET – REV0

GENERAL

PRESSURE RANGE	0-2000 PSIG
TYPE	Digital Pressure Sensor
MOUNTING	Vertical pipe
PRESSURE BODY MATERIAL	316L stainless steel
DIAPHRAGM MATERIAL	Hastelloy C-276
CLEAN LEVEL	SSC 79-001, Level 3
PROOF PRESSURE	Minimum of 3000PSIG
MECHANICAL SHOCK	30 G's for 11 ms
MAXIMUM DELIVERY TIME	6 weeks

PHYSICAL

ENCLOSURE TYPE	Explosion proof for Class 1, Div 1 Group B, C and D
MECHANICAL CONNECTION	¼" NPT internal thread
ELECTRICAL CONNECTION	½" NPT internal thread

PERFORMANCE

OPERATING TEMP RANGE	Given in specification
COMPENSATED TEMP RANGE	Given in specification
LINEARITY	Given in specification
REPEATABILITY	Given in specification
HYSTERESIS	Given in specification
OUTPUT LOAD RESITANCE	0 to 1335 ohms for operation
RESOLUTION	40,000 counts
RESPONSE TIME	Less than 125mSecs
THERMAL SENSITIVITY SHIFT	Given in specification
THERMAL ZERO SHIFT	Given in specification
INSULATION RESISTANCE	Greater than 10 K megohms at 50Vdc at 70°F.
CALIBRATION	Given in specification

SSC A-3 FACILITY
PRESSURE TRANSMITTERS
DATA SHEET – REV0

GENERAL

PRESSURE RANGE	0-430 PSIG
TYPE	Digital Pressure Sensor
MOUNTING	Vertical pipe
PRESSURE BODY MATERIAL	316L stainless steel
DIAPHRAGM MATERIAL	Hastelloy C-276
CLEAN LEVEL	SSC 79-001, Level 3
PROOF PRESSURE	Minimum of 3000PSIG
MECHANICAL SHOCK	30 G's for 11 ms
MAXIMUM DELIVERY TIME	6 weeks

PHYSICAL

ENCLOSURE TYPE	Explosion proof for Class 1, Div 1 Group B, C and D
MECHANICAL CONNECTION	½" NPT external thread
ELECTRICAL CONNECTION	½" NPT internal thread

PERFORMANCE

OPERATING TEMP RANGE	Given in specification
COMPENSATED TEMP RANGE	Given in specification
LINEARITY	Given in specification
REPEATABILITY	Given in specification
HYSTERESIS	Given in specification
OUTPUT LOAD RESITANCE	0 to 1335 ohms for operation
RESOLUTION	40,000 counts
RESPONSE TIME	Less than 600mSecs
THERMAL SENSITIVITY SHIFT	Given in specification
THERMAL ZERO SHIFT	Given in specification
INSULATION RESISTANCE	Greater than 10 K megohms at 50Vdc at 70°F.
CALIBRATION	Given in specification

SSC A-3 FACILITY
PRESSURE TRANSMITTERS
DATA SHEET – REV0

GENERAL

PRESSURE RANGE	0-7200 PSIG
TYPE	Digital Pressure Sensor
MOUNTING	Vertical pipe
PRESSURE BODY MATERIAL	316L stainless steel
DIAPHRAGM MATERIAL	Hastelloy C-276
CLEAN LEVEL	SSC 79-001, Level 3
PROOF PRESSURE	Minimum of 3000PSIG
MECHANICAL SHOCK	30 G's for 11 ms
MAXIMUM DELIVERY TIME	6 weeks

PHYSICAL

ENCLOSURE TYPE	Explosion proof for Class 1, Div 1 Group B, C and D
MECHANICAL CONNECTION	½" NPT external thread
ELECTRICAL CONNECTION	½" NPT internal thread

PERFORMANCE

OPERATING TEMP RANGE	Given in specification
COMPENSATED TEMP RANGE	Given in specification
LINEARITY	Given in specification
REPEATABILITY	Given in specification
HYSTERESIS	Given in specification
OUTPUT LOAD RESITANCE	0 to 1335 ohms for operation
RESOLUTION	40,000 counts
RESPONSE TIME	Less than 600mSecs
THERMAL SENSITIVITY SHIFT	Given in specification
THERMAL ZERO SHIFT	Given in specification
INSULATION RESISTANCE	Greater than 10 K megohms at 50Vdc at 70°F.
CALIBRATION	Given in specification

SSC A-3 FACILITY
DELTA PRESSURE TRANSMITTERS
DATA SHEET – REV0

GENERAL

PRESSURE RANGE	0-2000 inH_2O
TYPE	Digital Pressure Sensor
MOUNTING	Vertical pipe
PRESSURE BODY MATERIAL	316L stainless steel
DIAPHRAGM MATERIAL	Hastelloy C-276
CLEAN LEVEL	SSC 79-001, Level 3
STATIC PRESSURE	Minimum of 2000PSIG
MECHANICAL SHOCK	30 G's for 11 ms
MAXIMUM DELIVERY TIME	6 weeks

PHYSICAL

ENCLOSURE TYPE	Explosion proof for Class 1, Div 1 Group B, C and D
MECHANICAL CONNECTION	¼" NPT internal thread
ELECTRICAL CONNECTION	½" NPT internal thread

PERFORMANCE

OPERATING TEMP RANGE	Given in specification
COMPENSATED TEMP RANGE	Given in specification
LINEARITY	Given in specification
REPEATABILITY	Given in specification
HYSTERESIS	Given in specification
OUTPUT LOAD RESISTANCE	0 to 1335 ohms for operation
RESOLUTION	40,000 counts
RESPONSE TIME	Less than 600mSecs
THERMAL SENSITIVITY SHIFT	Given in specification
THERMAL ZERO SHIFT	Given in specification
INSULATION RESISTANCE	Greater than 10 K megohms at 50Vdc at 70°F.
CALIBRATION	Given in specification