WORK PROCEDURE FOR

VALIDATION OF EQUIPMENT ASSOCIATED WITH MEASUREMENT SYSTEMS FOR THE CALCULATION OF MASS, VOLUME AND ENERGY FLOWRATE OF GAS

PART 2: GENERIC TEST PROCEDURE

June 2010

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FORWARD

This Work Procedure was approved by the Uniform Network Code (UNC) Offtake Committee on 10 June 2010 for use by managers, engineers and supervisors throughout the NTS and the DNs.

This is an Offtake Subsidiary Document as defined in Section N 1.2 of the Offftake Arrangements Document (OAD) of the UNC. These documents are revised, when necessary, by the Offtake Committee in accordance with OAD N 8.5. Users shall ensure that they are in possession of the latest edition by referring to the Joint Office of Gas Transporters website.

Compliance with this document does not confer immunity from prosecution for breach of statutory or other legal obligations.

BRIEF HISTORY

First published as T/PR/ME2 Part3	March 2001	EPSG/L00/215
Editorial update to reflect demerger November 2000	June 2001	
Editorial update to reflect Safety Case version 3 taking into account issues as detailed in the comments below. Additionally, compliance with mandatory terms along with the removal of no specific normative phrases.	July 2004	
Editorial update to comply with GRM	October 2004	EPSG/A04/10116
Rebranded	February 2006	
Re-branded and approved by the Offtake Committee	June 2010	

DISCLAIMER

This Offtake Subsidiary Document is provided for use by the Transporters and such of their contractors as are obliged by the terms and conditions of their contracts to comply with this document. Where this document is used by any other party it is the responsibility of that party to ensure that this document is correctly applied.

MANDATORY AND NON-MANDATORY REQUIREMENTS

In this document:

shall: indicates a mandatory requirement.

should: indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment shall be completed to show that the alternative method delivers the same, or better, level of protection.

WORK PROCEDURE FOR

VALIDATION OF EQUIPMENT ASSOCIATED WITH MEASUREMENT SYSTEMS FOR THE CALCULATION OF MASS, VOLUME AND ENERGY FLOWRATE OF GAS

PART 2: GENERIC TEST PROCEDURES

INTRODUCTION

This Work Procedure has been produced to ensure that validation of gas flow metering systems is performed consistently by the Transporters.

1. SCOPE

This Work Procedure shall be used to demonstrate that instrumentation and equipment associated with measurement systems for the calculation of mass, volume or energy flowrate of gas are functioning correctly, thus ensuring that the complete metering system continues to perform within the uncertainty requirements as defined in the Gas Requirements Manual (GRM) or equivalent .

This Work Procedure forms a suite to cover the validation of differing types of metering systems installed at connections to the Transporters' above 7 bar networks:

Part 1: General Requirements

Part 2: Generic Test Procedures

Part 3: Flow Weighted Average Calorific Value Offtakes

Part 4: Power Stations (with Daniel S500 flow computers using firmware AGI 3V0_0)

Part 5: Very Large Daily Metered Consumers (with Flow Computers)

Parts 4 and 5 are not Offtake Subsidiary Documents and are therefore governed by the relevant Transporters outside UNC governance.

This Work Procedure is to be used by the Transporters for the following types of connection:

a) NTS to LDZ transfer

b) Inter-LDZ transfer

c) NTS supplied very large daily metered consumers (VLDMC)

d) LTS supplied very large daily metered consumers (VLDMC)

This Work Procedure may also be used to validate 3rd party measurement systems for the calculation of mass, volume and energy flowrate of gas connected to the national balancing point (NBP) in the absence of any other procedures.

Part 2 of these procedures should apply to the following:

a) Supply point meters where Parts 4 and 5 do not apply

b) Third party meters where alternative procedures are not available.

c) NTS to LDZ and Inter-LDZ transfes where it is agreed with the upstream party that the application of T/PR/ME/2 part 3 is substantially inappropriate for the technical solution deployed. In such cases, formal agreement of the full complement of necessary tests, any relevant refinement to the test(s) and appropriate pass/fail criteria shall be sought.

2. REFERENCES

This document makes reference to documents listed in Appendix A of Part 1. Unless otherwise specified, the latest editions of the documents apply, including addenda and revisions.

3. DEFINITIONS

For the purpose of this Work Procedure, the definitions given in Part 1 apply.

4. GENERAL PREPARATIONS AND PRECAUTIONS

This Work Procedure has been produced to ensure that validation of instrumentation associated with the flow measurement of gas at pressures above 7 bar is adequate to demonstrate compliance with regulatory or commercial requirements for uncertainty of measurement.

This Work Procedure has been produced in a generic format for easy application to any type of gas measurement system not identified in the other parts associated with this procedure.

a) Procedures Before and After Maintenance

i) Inform the affected system operator that maintenance is to be carried out on a site, and the effect on any values;

ii) Where possible, the validation shall be carried out on an offline metering stream. If this is not possible then:

- Where applicable, the flow control valves shall be isolated from their automatic controlling signal(s);
- Where applicable, the flow computer shall be placed in maintenance mode. The gas volume and energy flowrates shall be recorded at the start and end of testing;
- Reconciliation of the amount of gas flowed shall be determined on a linear basis of the start/stop gas flowrates.

5. TESTING

The procedures detailed in Appendix B are a complete set of procedures for all items of equipment associated with measurement systems for the calculation of gas flowrates at pressures above 7 bar. However, not all of the procedures are required at all metering installations and, therefore, the relevant procedures shall be identified.

The relevant procedures shall be undertaken at a frequency agreed by the Transporters.

All results shall be recorded on a test results form and signed by the tester and, where appropriate, by a witness. All records shall be retained for future inspection and audit.

APPENDIX A - SUMMARY OF TEST PROCEDURES

Gas Flow Computer

- Analogue-Digital Conversion (ADC) Check
- Calorific Value Computation Check (Calorimeter)
- Configuration Check
- Digital-Analogue Conversion (DAC) Check
- Density Computation Check (AGA 8)
- Density Computation Check (Densitometer)
- Differential Pressure Cell Switch Point Check
- Flow Rate Check
- Flow Totalisation Check
- ISO 6976 Computation Check
- Relative Density Computation Check (Relative Density Transducer)
- RTD Input Check

Secondary Instrumentation

- Densitometer Check (Vacuum)
- Densitometer Check (High Purity Nitrogen Test)
- Differential Pressure Transmitter Atmospheric Footprint Check
- Gas Chromatograph Spot Check
- Gas Chromatograph – ISO 6976 Computation Check
- Gauge Pressure Transmitter Check
- Relative Density Transducer Check
- Temperature Element Spot Check

Primary Instrumentation

- Orifice Plate Inspection
- Turbine Meter Inspection

APPENDIX B - TEST PROCEDURES

GAS FLOW COMPUTER

ANALOGUE-DIGITAL CONVERSION (ADC) CHECK

This check is carried out to verify the accuracy of the analogue to digital conversion for each flow computer by simulating an input signal across the operating range and comparing each displayed input value with calculated values.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.03% of input span

FALLBACK PROCEDURE: Check the flow computer settings. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

a) Connect a certified current source across the terminals after isolating the circuit;

b) Connect a certified DMM either in series with the circuit to measure the current directly, or across the terminals containing a precision resistor to measure a voltage.

TEST PROCEDURE

a) Inject currents corresponding to 0%, 25%, 50%, 75% and 100% of ADC span;

b) Compare the flow computer displayed values with the calculated values;

c) Record all results on the test form.

REINSTATEMENT

a) Make good all metering cubicle wiring

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

CALORIFIC VALUE COMPUTATION CHECK (CALORIMETER)

This check is carried out to verify that the flow computer is calculating calorific value correctly by comparing the displayed value with a calculated value.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.001% of reading

FALLBACK PROCEDURE: Check all the data values used within the flow computer. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Connect a suitable certified signal source in place of the calorimeter;

b) Adjust output of source to suitable values;

c) Compare the flow computer calculated calorific values with the calculated expected values;

d) Record all results on the test form.

REINSTATEMENT

a) Reinstate all equipment and flow computer settings;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

CONFIGURATION CHECK

This check is carried out to ensure that the flow computer locations contain the data required to perform all computer functions correctly by checking each location against an approved list.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: Computer configuration report to match approved computer listing.

FALLBACK PROCEDURE: Advise site manager of any discrepancies. On instruction, alter computer data or approved list as required.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Obtain approved computer configuration data;

b) Check all locations for the flow computer against the approved configuration data;

c) Record all results on the test form.

REINSTATEMENT

Enter details of completion in the stream log book.

GAS FLOW COMPUTER

DIGITAL-ANALOGUE CONVERSION (DAC) CHECK

This check is carried out to verify the computer digital to analogue conversion accuracy by varying the output value over its operating range and comparing the measured output values with expected values generated by the computer.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.25% of output span

FALLBACK PROCEDURE: Ensure test loop impedance mimics actual system impedance. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

Connect a certified DMM either in series with the circuit to measure the current directly, or across the terminals containing a precision resistor to measure a voltage.

TEST PROCEDURE

a) Enter keypad values corresponding to 0%, 25%, 50%, 75% and 100% of the selected DAC output;

b) Compare the measured output current with the calculated expected output current;

c) Record all results on the test form.

REINSTATEMENT

a) Reinstate all metering cubicle wiring;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

DENSITY COMPUTATION CHECK (AGA 8)

This check is carried out to verify that the flow computer is calculating upstream density correctly to AGA 8 by entering raw gas analysis data and comparing the displayed value with a calculated value.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.001% of reading

FALLBACK PROCEDURE: Check all the data values used within the flow computer. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Enter a suitable gas composition, pressure and temperature into the flow computer;

b) Calculate the upstream density and compressibility using the appropriate version of AGA 8 and the data as entered above and compare with the flow computer displayed value;

c) Record all results on the test form.

REINSTATEMENT

a) Reinstate all equipment and flow computer settings;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

DENSITY COMPUTATION CHECK (DENSITOMETER)

This check is carried out to verify that the flow computer is calculating upstream density correctly by comparing the displayed value with a calculated value.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.001% of reading

FALLBACK PROCEDURE: Check all the data values used within the flow computer. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Connect a certified frequency generator in place of the densitometer input;

b) Adjust frequency of generator to suitable values;

c) Compare the flow computer calculated densities with the calculated expected values;

d) Record all results on the test form.

REINSTATEMENT

a) Reinstate all equipment and flow computer settings;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

DIFFERENTIAL PRESSURE CELL SWITCH POINT CHECK

This check is carried out to ensure that the switch between differential pressure cells occurs at the correct differential pressure.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.25% of calibrated span

FALLBACK PROCEDURE: Check all the data values used. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

a) For the differential pressure switch up:

   i) Lift the knife connector on the Test Point terminals;

   ii) Connect a certified current source to the flow computer side of the Test Points terminals;

   iii) Switch on current source and set to 4mA;

b) For the differential pressure cell switch down:

   i) Lift the knife connector on the Test Point terminals;

   ii) Connect a certified current source to the flow computer side of the Test Point terminals;

   iii) Switch on current source and set to 20mA.

TEST PROCEDURE

a) Note the in use differential cell from computer location;

b) Slowly apply a rising/falling simulated differential pressure using the current source;

c) Note the applied current at the point that the in use differential pressure changes;

d) Compare the desired switch point with the measured switch point for both rising and falling;

e) Record all results on the test form.

REINSTATEMENT

a) Close all knife edge connectors and remove the test equipment;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

FLOW RATE CHECK

This check is carried out to verify that the computer is calculating stream flow rates correctly by keypad "setting" flow conditions and comparing displayed flow rates with calculated values.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.001% of reading

FALLBACK PROCEDURE: Check all the data values used within the flow computer. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Enter suitable data into the flow computer to simulate a flowrate. Record the flow computer displayed flowrates;

b) Calculate the flowrates using the appropriate calculation/version and data entered above and compare with the flow computer displayed value;

c) Record all results on the test form.

REINSTATEMENT

a) Reinstate all equipment and flow computer settings;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

FLOW TOTALISATION CHECK

This check is carried out to verify that the stream totalisers are functioning correctly by simulating flow over an accurately measured period of time and comparing the displayed total increments with calculated values.

NOTE This test should be left to run for at least six hours (overnight is most suitable).

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.01% of reading

FALLBACK PROCEDURE: Check all the data values used within the flow computer. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Record the flow computer’s totaliser values;

b) Start the test by inputting suitable values to simulate flowrate in the flow computer and at the same moment noting the test start time from an accurate chronometer, for instance the "speaking clock";

c) End the test by setting the flowrate to zero, simultaneously recording the stop time on the accurate chronometer.

NOTE This test should be left to run for at least six hours;

d) Record the flow computer's totaliser values;

e) Calculate the total flow values and compare with the flow computer totals;

f) Record all results on the test form.

REINSTATEMENT

a) Reinstate all equipment and flow computer settings;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

ISO 6976 COMPUTATION CHECK

This check is carried out to verify that the flow computer, where appropriate, is calculating values in accordance with ISO 6976.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.001% of reading

FALLBACK PROCEDURE: Check all the data values used within the flow computer. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Enter a suitable gas composition into the flow computer;

b) Compare the flow computer displayed values for CV, RD, base compressibility and base density with the calculated expected values;

c) Record all results on the test form.

REINSTATEMENT

a) Reinstate all equipment and flow computer settings;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

RELATIVE DENSITY COMPUTATION CHECK (RELATIVE DENSITY TRANSDUCER)

This check is carried out to verify that the flow computer is calculating relative density correctly by comparing the displayed value with a calculated value.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.001% of reading

FALLBACK PROCEDURE: Check all the data values used within the flow computer. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Connect a suitable certified signal source in place of the relative density transducer;

b) Adjust output of source to suitable values;

c) Compare the flow computer calculated relative densities with the calculated expected values;

d) Record all results on the test form.

REINSTATEMENT

a) Reinstate all equipment and flow computer settings;

b) Enter details of completion in the stream log book.

GAS FLOW COMPUTER

RTD INPUT CHECK

This check is carried out to verify the accuracy of resistance to temperature conversion for the flow computer by simulating temperature resistance inputs to the computer and comparing the display values with calculated expected values.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.2 C

FALLBACK PROCEDURE: Check flow computer settings. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

After isolating the circuit, connect a certified decade resistance box in place of the field RTD.

TEST PROCEDURE

a) Adjust the resistance box to 0%, 25%, 50%, 75% and 100% of the flow computer temperature span;

b) Compare the flow computer displayed values with the calculated expected values;

c) Record all results on the test form.

REINSTATEMENT

a) Reinstate all wiring;

b) Enter details of completion in the stream log book.

SECONDARY INSTRUMENTATION

DENSITOMETER CHECK (VACUUM)

This check is carried out to ensure that the densitometer is measuring density correctly by comparing the displayed value when the densitometer is at a vacuum with the certified value.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.01% of reading

FALLBACK PROCEDURE: Check the connections to the vacuum pump and frequency counter. Repeat the check. If still out of specification check configuration and/or contact the densitometer supplier.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

a) Isolate the densitometer from the process and slowly vent to atmosphere;

b) Connect a certified vacuum pump (capable of pulling a vacuum of better than 1 Torr) to the test point on the densitometer impulse line;

c) Connect a certified frequency (periodic time) counter across the test points.

TEST PROCEDURE

a) Allow vacuum pump to create a vacuum of better than 1 Torr within the densitometer installation;

b) Compare the displayed periodic time on the frequency counter with the value shown on the calibration certificate for the densitometer at a vacuum;

c) Record all results on the test form.

REINSTATEMENT

a) Remove all test equipment and reinstate all meter tube instrumentation;

b) Enter details of completion in the stream log book.

SECONDARY INSTRUMENTATION

DENSITOMETER CHECK (HIGH PURITY NITROGEN TEST)

This check is carried out to ensure that the densitometer is measuring density correctly by comparing the displayed value with the certified value when the densitometer is presented with high purity nitrogen. The test should be repeated as necessary at different pressure and/or temperatures to spot check the instrument's calibration characteristic.

This test assumes that a high purity nitrogen certificate for the densitometer under test has been made available from the manufacturer. This is generally available as standard.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.01% of reading

FALLBACK PROCEDURE: Check the connections, re-purge, check pressure and temperature are stable. Check for contamination. Check frequency counter and settings. Repeat the check. If still out of specification check configuration and/or contact the densitometer supplier.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

a) Arrange for main stream gas to flow to ensure that the temperature within the densitometer is that measured by the flow temperature RTD

b) Isolate the densitometer from the process and slowly vent to atmosphere;

c) Connect high purity nitrogen via a dead weight tester to the test point on the densitometer impulse line and thoroughly purge;

d) Once purged, lock the high purity nitrogen into the densitometer and allow for temperature stabilisation to occur.

e) Connect a suitable certified frequency counter across the test points and select the appropriate range for maximum resolution.

TEST PROCEDURE

a) Allow for stabilisation of pressure and temperature;

b) Log high purity nitrogen pressure;

c) Log temperature;

d) Using, for example the AGA 8 Detailed calculation method, together with the prevailing pressure and temperature, calculate the high purity nitrogen density. Alternatively, deduce the density at the prevailing pressure and temperature directly from pre-prepared and agreed high purity nitrogen tables;

e) Determine the density from the densitometer using the observed frequency and data from the specific densitometer high purity calibration certificate;

f) Compare the density from the densitometer with the value determined from the AGA 8 Detailed calculation method or the pre-prepared and agreed high purity nitrogen tables;

g) Record all results on the test form.

REINSTATEMENT

a) Remove all test equipment and reinstate all meter tube instrumentation;

b) Enter details of completion in the stream log book.

SECONDARY INSTRUMENTATION

DIFFERENTIAL PRESSURE TRANSMITTER FOOTPRINT CHECK

This check is carried out to ensure that differential pressure measurement is maintained to the required level of accuracy by applying known pressure across the calibrated range of the transmitter and comparing the displayed output with the calculated expected output.

NOTE No zero or span adjustments are allowed to be made.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.2% of calibrated span

FALLBACK PROCEDURE: Check all the data values used. Repeat the check. If still out of specification, replace the differential pressure transmitter.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

a) Isolate the differential pressure transmitter(s) from the process and slowly vent to atmosphere;

b) Connect a certified low pressure dead weight tester to the differential pressure transmitter(s) vent line;

c) Measure air temperature.

TEST PROCEDURE

a) Apply pressure at nominal points equivalent to 0%, 25%, 50%, 75% and 100% of the calibrated transmitter span (rising and falling);

b) Compare the flow computer displayed differential pressures with the calculated expected values;

c) Record all results on the test form.

REINSTATEMENT

a) Remove the test equipment and reinstate all meter tube instrumentation and flow computer data;

b) Enter details of completion in the stream log book.

SECONDARY INSTRUMENTATION

GAS CHROMATOGRAPH SPOT CHECK

This calibration check is carried out to ensure that the gas chromatograph's fully automatic calibration function is operating correctly and that the analysis parameters are transmitted to the flow computer.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: + <tolerance> of the analysed gas component.

FALLBACK PROCEDURE: Check calibration gas analysis certificate agrees with gas bottle ID number and chromatograph controller configuration. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book;

c) Ensure that the gas chromatograph main menu can be accessed prior to implementing this test.

TEST PROCEDURE

a) Halt the chromatograph analysis;

b) Ensure that the printer is connected to the gas chromatograph and is on-line;

c) Once analysis has halted, initiate the automatic calibration function from the gas chromatograph controller main menu and leave to run until the display indicates calibration activities are complete;

d) Obtain the final analysis result from the serial printer;

e) Compare the analysis result from the chromatograph with the calibration gas certificate;

f) Record the following information on the test form:

   i) Analysed gas component mole percentage;

   ii) Calibration gas certified mole percentage;

   iii) The mole percentage uncertainty obtained from the calibration gas certificate;

   iv) The deviation between analysed gas component and calibration gas certified component;

   v) Any pertinent observations.

REINSTATEMENT

Enter details of completion in the stream log book.

NOTE The above procedure performs a spot check of the gas chromatograph only. A more detailed evaluation of the chromatograph should be performed at an appropriate frequency as determined by statutory or commercial requirements.

SECONDARY INSTRUMENTATION

GAS CHROMATOGRAPH – ISO 6976 COMPUTATION CHECK

This check is carried out to verify that the gas chromatograph is calculating values in accordance with ISO 6976.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.005% of reading

FALLBACK PROCEDURE: Check all the data values used and the analysis report. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

TEST PROCEDURE

a) Obtain an analysis report from the chromatograph controller;

b) Compare the chromatograph results for CV, RD, base compressibility and base density with the calculated expected values;

c) Record all results on the test form.

REINSTATEMENT

Enter details of completion in the stream log book.

SECONDARY INSTRUMENTATION

GAUGE PRESSURE TRANSMITTER CHECK

This calibration is carried out to ensure that the pressure measurement is maintained to the required level of accuracy by applying known pressure across the calibrated range of the transmitter and comparing the displayed output with the expected calculated output.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.2% of the calibrated span

FALLBACK PROCEDURE: Check measurements and associated data. Adjust transmitter zero and span, to bring output within tolerance and recheck.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

a) Isolate the pressure transmitter being tested and vent;

b) Connect a certified dead weight tester to the pressure transmitter vent;

c) Measure ambient temperature.

TEST PROCEDURE

a) Apply pressure at nominal points equivalent to 0%, 25%, 50%, 75% and 100% of the calibrated transmitter span (rising and falling);

b) Compare the flow computer displayed pressures with the calculated expected values;

c) Record all results on the test form.

REINSTATEMENT

a) Make good all metering cubicle wiring and the pressure transmitter installation;

b) Enter details of completion in the stream log book.

SECONDARY INSTRUMENTATION

RELATIVE DENSITY TRANSDUCER CHECK

This check is carried out to ensure that the transducer is measuring relative density correctly by comparing the displayed value with a calculated value.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 80 ns

FALLBACK PROCEDURE: Check the connections to the test bottles and frequency counter. Repeat the check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out;

b) Record the test in the stream log book.

HOOK-UP PROCEDURE

a) Isolate the pressure transmitter being tested and vent;

b) Connect a certified dead weight tester to the pressure transmitter vent;

c) Measure ambient temperature.

TEST PROCEDURE

a) Connect the high purity nitrogen test gas to the input line and open the test gas isolation valve (the test gas regulator pressure should be set at a value similar to the process gas regulator pressure). Allow at least 20 minutes for the gas to purge through;

b) Observe the reading on the frequency counter. When the reading has stabilised to ± 1ns record the value;

c) Isolate the high purity nitrogen test gas and connect the high purity test methane gas. Open the isolation valve and allow at least 20 minutes for the test gas to purge through;

d) Observe the reading on the frequency counter. When the reading has stabilised to ± 1ns record the value;

e) Compare the recorded values with the calculated expected values;

f) Record all results on the test form.

REINSTATEMENT

a) Make good all metering cubicle wiring and the pressure transmitter installation;

b) Enter details of completion in the stream log book.

SECONDARY INSTRUMENTATION

TEMPERATURE ELEMENT SPOT CHECK

This test is carried out to verify the accuracy of the stream temperature measurement by comparing the displayed temperature with the temperature indicated by a certified thermometer.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: ± 0.5 C

FALLBACK PROCEDURE: Check the value being displayed on the flow computer. If still out of tolerance carry out procedure for RTD or ADC Input Check and repeat the spot check.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure appropriate permitry is issued for the work to be carried out; and

b) Record the test in the stream log book.

TEST PROCEDURE

a) Place a certified digital thermal probe in an oil filled thermowell adjacent to the RTD under test. Ensure that the test and duty thermowells contain an approved inert thermally conductive fluid to the appropriate level. Should a test thermowell not be available, place the RTD under test into a suitable container of water, together with the digital thermal probe. Allow for temperature stabilisation to occur.

b) Compare the flow computer displayed temperature with the calculated expected value;

c) Record all results on the test form.

REINSTATEMENT

a) Ensure field equipment is returned to operational status;

b) Enter details of completion in the stream log book.

PRIMARY INSTRUMENTATION

ORIFICE PLATE INSPECTION

This check is carried out to verify that the orifice plate and carrier are maintained in good condition and are in compliance with the calibration certificate.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA Orifice plate should be undamaged and comply with its current ISO 5167 calibration certificate.

FALLBACK PROCEDURE Replace the orifice plate with a certified replacement.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure a complete set of spares is available for the orifice and carrier prior to starting the checks;

b) Obtain a copy of the calibration certificate for operational and any replacement orifice plates;

c) Ensure appropriate permitry is issued for the work to be carried out;

d) Record the test in the stream log book.

TEST PROCEDURE

a) Visually inspect the orifice plate and check that the upstream face is not coated with grease, oil or carbon deposits. Clean as necessary using a soft cloth and a suitable solvent, taking care not to damage the upstream face and square edge of the plate;

b) Note whether the orifice plate has sustained any damage on the upstream edge of the orifice bore which should be sharp and without any wire edges, burrs or visible defects;

c) Note whether the upstream face of the orifice plate appears flat;

d) Note orifice plate orientation with respect to flow direction any any drain hole is suitably located;

e) Visually inspect the orifice fitting noting whether areas of corrosion are present;

f) Visually inspect the orifice carrier, seal ring, and top cover plate and gasket; and

g) Record the following on the test form:

   i) Orifice plate certifying authority;

   ii) Certificate number;

   iii) Certificate date;

   iv) Orientation of orifice plate within the carrier;

   v) Whether the orifice plate carrier operation is satisfactory;

vi) Visually inspected conditions of the orifice plate;

vii) Comments pertinent to the conditions of the orifice plate and carrier.

NOTE The orifice plate should be returned to an appropriate facility for recertification annually and no less frequently than 12 months.

REINSTATEMENT

a) Reinstate all equipment;

b) Enter details of completion in the stream log book.

PRIMARY INSTRUMENTATION

TURBINE METER INSPECTION

This check is carried out to verify that the orifice plate and carrier are maintained in good condition and are in compliance with the calibration certificate.

FREQUENCY OF TEST: <As Agreed>

GUIDELINE ACCEPTANCE CRITERIA: Turbine meter should be undamaged and comply with its current calibration certificate.

FALLBACK PROCEDURE: Replace the turbine meter with a certified replacement.

PREPARATIONS/PRECAUTIONS

In addition to the general preparations/precautions, the following shall also apply:

a) Ensure a spare turbine meter is available prior to starting the checks;

b) Obtain a copy of the calibration certificate for operational and any replacement turbine meters;

c) Ensure appropriate permitry is issued for the work to be carried out;

d) Record the test in the stream log book.

TEST PROCEDURE

a) Visually inspect the turbine wheel for missing blades, accumulation of solids, erosion or other damage that would affect the turbine wheel balance and the blade configuration

b) Visually inspect meter internals, flow passageways, drains, breather holes and lubrication systems to ensure there is no accumulation of debris

c) Ensure that the turbine spins freely and that its spin down time is not significantly different from that which is expected

d) Record all results on the test form.

REINSTATEMENT

a) Install replacement turbine meter;

b) Return previously installed meter to an accredited calibration facility for recertification;

c) Reinstate all equipment;

d) Record the test in the stream log book.