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7<sup>th</sup> January 2010

Dear Roger,

GAS ACT 1986: SECTION 12  
THE GAS (CALCULATION OF THERMAL ENERGY) REGULATIONS 1996  
REGULATION 6(c):  
APPROVAL OF CALORIFIC VALUE MEASUREMENT APPARATUS:  
DANIEL MODEL 700 GAS CHROMATOGRAPH

The Daniel Model 700 Gas Chromatograph (subsequently referred to as the "Danalyzer") is approved for use by National Grid Gas plc, registered in England and Wales with company number 2006000 (National Grid Gas plc), a gas transporter in relation to the Distribution Networks, for the determination of calorific values for the purpose of calculating the number of kilowatt hours under section 12 of the Gas Act 1986.

The Danalyzer and integrated controller (Model 2350A) shall comply with, and shall be operated in accordance with, the requirements listed in the annex and schedule to this letter.

The approval is subject to the continued acceptable performance of the Danalyzer in respect of determining calorific values of natural gas.

Yours sincerely,

Senior Manager  
GB Markets

**ATTACHMENTS:**  
**ANNEX DATED 7<sup>th</sup> January 2010 (3 PAGES)**  
**SCHEDULE 7<sup>th</sup> January 2010 (2 PAGES)**

## ANNEX

### Requirements in respect of the Daniel Model 700 Gas Chromatograph and the Daniel MON 2000 and/or DANINT operating software.

1. The Danalyzer shall comply with, and be operated in accordance with, the details in the Danalyzer (Model 700) instruction manual, reference number 3-9000-521 Revision N dated September 2007, a copy of which should be retained by National Grid Gas plc and be readily available at site. Any subsequent modification to the Danalyzer shall be notified to Ofgem for evaluation;
2. The integrated controller shall be operated in accordance with the details in the instruction manual, detailed above, and instructions within the MON 2000 software, reference number number 3-9000-522 Revision Q dated April 2009, copies of which should be retained by National Grid Gas plc and be readily available at site. Any subsequent modification of these instructions shall be notified to Ofgem for evaluation;
3. The Danalyzer shall operate with application "700OFG0809" Revision 3.4 and BOS 3.34 P002. This application allows up to forty limit alarms.
4. The ranges of concentration of the individual components of natural gas for which the instrument is suitable shall be those given below for the specified calibration gas (currently referred to as "Calibration Gas 4");

#### Calibration Gas 4

Component	Standard mole%	Tolerance +/- Mole%	Lower limit mole%	Upper limit mole%
2 Methyl-Pentane or n-hexane	0.11	0.015	0	0.35
Propane	3.30	0.15	0	7.00
i-Butane	0.50	0.03	0	1.00
n-Butane	0.50	0.03	0	1.00
neo-Pentane	0.11	0.015	0	0.35
i-Pentane	0.11	0.015	0	0.35
n-Pentane	0.11	0.015	0	0.35
Nitrogen	4.50	0.25	0	10.00
Methane	80.47	0.60	78.0	100.0
Carbon dioxide	3.30	0.15	0	7.00
Ethane	7.00	0.30	0	18.00

The minimum operating temperature for this calibration gas mixture is 10 °C;  
The maximum fill pressure for this calibration gas is 40 barg;

5. The CV of the attached calibration gas, as recorded on the certificate should be entered into the controller as a user defined numeric with an allowed deviation of 0.25%.
6. Physical constants and data for individual components of the gas shall be taken from ISO 6976-1995, except that the calorific value assigned to the C6+ component shall be that of n-hexane. Where the certifying laboratory of the calibration gas is not accredited for any component the traceability of the value shall be demonstrated before gases are used;
7. At intervals not exceeding six months National Grid Gas plc shall demonstrate that the gas conveyed is suitable under condition 4 above and the continued applicability of the use of the calorific value of n-hexane in condition 5 above by suitable detailed analyses of high pressure gas samples taken from each input to its transportation system. The results of the tests shall be submitted to Ofgem within the first seven days of the month following the period to which the results relate;
8. The Danalyzer shall be connected to a stable, uninterruptible electrical power supply;
9. Supply pipes and valves, and purge facilities, shall be provided to allow the gas examiner to inject a test gas into the instrument;
10. Alarms shall be set on the total un-normalised concentration at +/-10 mole% and for each component of the gas at the minimum and maximum concentrations approved for the calibration gas which is in use. Where the lower limit is zero then the alarm may be set at an actual concentration which is not greater than 0.01 mole%;
11. National Grid Gas plc shall adjust, certify and calibrate the Danalyzer, and shall maintain the premises provided, in accordance with the Schedule hereto which may be replaced from time to time;
12. A room shall be provided with an environment at a minimum temperature of 15°C for the gas examiner's working conditions; the maximum temperature of the Danalyzer environment shall not exceed 40°C,;
13. Cylinders of gases required for calibration and for official test purposes and the associated regulators and supply pipes shall be maintained at such temperatures as are necessary to prevent condensation of any component of the gas;
14. The controller may be configured using the Daniel Mon 2000 software or by using the push-buttons mounted on the front panel. The configuration of the Model 2350A controller/Danalyzer in respect of the parameters specified below in the left hand column shall be set according to the notation in the right hand column:

Component Data Tables	1
Name (user)	1
Tot Runs	3 or 4 or 5 or 6 or 7
Avg Runs:	2
Resp. Factor % Dev	10%
AutoCal	ON
Calibration Report	Cal Selected
Normalize Results	ON

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Int	24
CVTable_pri	Trc15_Trm15
CVUnits_pri	MJ_per_M3
Time	06:00
User defined numeric - 'CV Cal Gas'	CV recorded on certificate
User defined numeric - 'CV Dev'	0.25

In the component data table all response factors must be set to "Variable" and the measurement method shall be set to "Area";

15. National Grid Gas plc shall initiate testing under The Gas (Calculation of Thermal Energy) Regulations 1996, para 6(e), using the Daniel MON 2000 software or any version of the DANINT operating software approved by Ofgem for that purpose;
16. The Model 2350A controller shall be connected to data management hardware on site to collect data for official purposes at intervals no greater than 24 hours. This hardware shall also have a Remoteware client installed to enable dial-in to initiate the following:
  - a) Archiving of the analysis and calibration records from the controller to an on-site hard drive and recovery of files to an office Remoteware server on a daily basis;
  - b) Initiation and archiving of the 35-day test records from the controller to an on-site hard drive and recovery of the file to an office Remoteware server;
17. National Grid Gas plc shall carry out acceptance/linearity testing of the Danalyzer in accordance with the performance evaluation document ISO 10723 following the installation of a Danalyzer, or any maintenance and/or replacement of the detector and/or amplifier system. This test shall be carried out with the required standard gases formulated on the basis of the concentration ranges for which the instrument has been approved. Provided that the results of the test procedure show that the bias error on the calculated calorific value of line gas shall not exceed 0.10 MJ/m<sup>3</sup> for line gas compositions allowed, National Grid Gas plc may then certify that Danalyzer for use for the determination of calorific values for the purposes of section 12 of the Gas Act 1986;
18. The software installed on any data management hardware attached to a Danalyzer and for use by National Grid Gas plc to obtain calorific values for the purposes of Section 12, and facilitate the gas examiners' tests of the Danalyzer under section 13, of the Gas Act 1986, shall consist of versions of the DANINT operating software which have been submitted to and approved by Ofgem.
19. National Grid Gas plc shall ensure that the Daniel MON 2000 or DANINT operating software, including the gas examiners' test procedures, operates properly on any data management hardware attached to a Danalyzer and for use by National Grid Gas plc to obtain calorific values for the purposes of section 12 of the Gas Act 1986 and that printouts from both the Danalyzer controller and from the data management system shall be available.

## SCHEDULE

**Premises and Logs for, Adjustment, Certification and Calibration of, Danalyzer Gas Chromatograph (being the calorific value measurement apparatus to be provided and maintained by National Grid Gas plc pursuant to a Direction given under regulation 6(b) and (c) of the Gas (Calculation of Thermal Energy) Regulations 1996).**

### 1. Premises

The premises to be provided by National Grid Gas plc shall be such that:

- a) The room containing the calorific value measurement apparatus has a stable and secure electrical power supply; and
- b) The room is free from the effects of vibration and electrical interference.

### 2. Logs

Logs shall be kept of:

- a) The average of the calorific values for each gas day (“the average calorific value”) taken from the calorific value measurement apparatus. Any such average calorific values which have been manually recalculated shall be clearly marked as such;
- b) All maintenance of the calorific value measurement apparatus;
- c) Times at which, and the duration for which, the flow of gas past the sampling place is interrupted;
- d) Times at which, and the duration for which, particular calorific value measurement apparatus is used to measure calorific values for the purpose of determining average calorific values;
- e) Details of all tests; and
- f) All other information relevant to the operation of the calorific value measurement apparatus.

### 3. Certification of the Danalyzer

Following the installation of a Danalyzer, or any maintenance and/or replacement of the detector and/or amplifier system, the instrument shall be tested for linearity of response to changing concentration of each component determined by the instrument. These tests shall be carried out in accordance with the performance evaluation document ISO 10723 with the required standard gases formulated on the basis of the concentration ranges for which the instrument has been approved. If the results of the test procedures show that the bias error on the calculated calorific value of line gas will not exceed  $0.10 \text{ MJ/m}^3$ , then the instrument may be accepted and

certified for use in determining the calorific values of gas for the purposes of section 12 of the Gas Act 1986.

4. Calibration of the Danalyzer

Gas containing known and traceable component concentrations ("calibration gas"), appropriate to the gas under test according to the criteria given at the time of approval of the instrument, as specified in directions given by the Authority pursuant to regulation 6(c) of the Gas (Calculation of Thermal Energy) Regulations 1996, shall be used to calibrate the instrument daily in accordance with the manufacturer's instructions. Whenever a calibration gas of a different composition is to be used the component concentrations must be entered into the controller before the first calibration using that gas.

5. Permitted Tolerance

(a) On each occasion that National Grid Gas plc carries out a test of the apparatus and equipment under regulation 6(e) of the Gas (Calculation of Thermal Energy) Regulations 1996 or a certification test under this Schedule, National Grid Gas plc shall check the component concentrations for the calibration gas in use held in memory against the certified values. If any incorrect values are found, then all calibrations using those values are invalid and the apparatus is deemed to have been outside the permitted tolerance since the time of the first invalid calibration. The certified component concentrations for the calibration gas in use shall be entered into the memory of the instrument, the correct entry verified, and a re-calibration carried out. The logs shall be updated accordingly.

(b) On each occasion that any test of the apparatus and equipment is carried out the difference between the certified calorific value and the calculated calorific value shall be calculated. If this difference exceeds  $0.14 \text{ MJ/m}^3$  then the apparatus is deemed to be outside the permitted tolerance.