

## SCHEDULE 8

Regulation 16(2)Regulation 17(2)(d)

## Data quality objectives

## PART 1

Group A pollutants and PM<sub>2.5</sub>**Group A pollutants (other than benzene and carbon monoxide) and PM<sub>2.5</sub>**

1. The data-quality objectives set out in the following table, for the required accuracy of assessment methods, of minimum time coverage and of data capture of measurement are laid down to guide quality assurance programmes—

	<i>Sulphur dioxide, nitrogen dioxide and oxides of nitrogen</i>	<i>Lead, PM<sub>2.5</sub> and PM<sub>10</sub></i>
<i>Continuous measurement</i>		
Accuracy	15%	25%
Minimum data capture	90%	90%
<i>Indicative measurement</i>		
Accuracy	25%	50%
Minimum data capture	90%	90%
Minimum time coverage	14% (One measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)	14% (One measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)
<i>Modelling</i>		
Accuracy:		
Hourly averages	50%–60%	
Daily averages	50%	
Annual averages	30%	50%
<i>Objective estimation</i>		
Accuracy	75%	100%

2. The accuracy of the measurement is defined as that set out in the ‘Guide to the Expression of Uncertainty of Measurements’ (ISO 1993)(1) or in ISO 5725-1 ‘Accuracy (trueness and precision) of measurement methods and results’ (ISO 1994). The percentages in the table are given for individual measurements averaged, over the period considered, by the limit value, for a 95% confidence interval (bias + two times the standard deviation). The accuracy for continuous measurements shall be interpreted as being applicable in the region of the appropriate limit value.

(1) Copies of International Standards Organisation publications may be purchased from the British Standards Institution (‘BSI’) Sales Department either by telephone (0208 996 9001) or by post from the BSI, Standards House, 389 Chiswick High Road, London W4 4AL, <http://www.bsi-global.com>.

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3. The accuracy for modelling and objective estimation is defined as the maximum deviation of the measured and calculated concentration levels, over the period considered by the limit value, without taking account the timing of the events

4. The requirements for minimum data capture and time coverage do not include losses of data due to the regular calibration or the normal maintenance of the instrumentation.

5. The Secretary of State may allow for random measurements to be made instead of continuous measurements for lead, PM<sub>2.5</sub> and PM<sub>10</sub> by methods for which accuracy within the 95% confidence interval with respect to continuous monitoring has been demonstrated to be within 10%. Random sampling shall be spread evenly over the year.

### **Benzene and carbon monoxide**

6. The data quality objectives set out in the following table, for allowed uncertainty of assessment methods, of minimum time coverage and of data capture of measurement are provided to guide quality assurance programmes—

	<i>Benzene</i>	<i>Carbon monoxide</i>
<i>Fixed measurements</i>		
Uncertainty	25%	15%
Minimum data capture	90%	90%
Minimum time coverage	35% urban background and traffic sites (distributed over the year to be representative of various conditions for climate and traffic); 90% industrial sites	
<i>Indicative measurements</i>		
Uncertainty	30%	25%
Minimum data capture	90%	90%
Minimum time coverage	14% (one day's measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)	14% (one measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)
<i>Modelling</i>		
Uncertainty:		
Eight-hour averages		50%
Annual averages	50%	
<i>Objective estimation</i>		
Uncertainty	100%	75%

7. The uncertainty (on a 95% confidence interval) of the assessment methods shall be evaluated in accordance with the 'Guide to the Expression of Uncertainty of Measurements' (ISO 1993) or the methodology of ISO 5725:1994. The percentages for uncertainty in the table in paragraph 6 are given for individual measurements averaged over the period considered by the limit value, for a

95% confidence interval. The uncertainty for the fixed measurements shall be interpreted as being applicable in the region of the appropriate limit value.

8. The uncertainty for modelling and objective estimation is defined as the maximum deviation of the measured and calculated concentration levels, over the period considered by the limit value, without taking into account the timing of the events.

9. The requirements for minimum data capture and time coverage do not include losses of data due to the regular calibration or the normal maintenance of the instrumentation.

10. The Secretary of State may allow for random measurements to be made instead of continuous measurements for benzene if the uncertainty, including the uncertainty due to random sampling, meets the quality objective of 25%. Random sampling shall be spread evenly over the year.

## PART 2

### Group B pollutants, polycyclic aromatic hydrocarbons and total gaseous mercury

11. The data quality objectives set out in the following table are provided to guide quality assurance—

	<i>Benzo(a)pyrene</i>	<i>Arsenic, cadmium and nickel</i>	<i>Polycyclic aromatic hydrocarbons and total gaseous mercury</i>	<i>Total deposition</i>
<i>Uncertainty</i>				
Fixed and indicative measurements	50%	40%	50%	70%
Modelling	60%	60%	60%	60%
<i>Minimum data capture</i>	90%	90%	90%	90%
<i>Minimum time coverage</i>				
Fixed measurements	33%	50%		
Indicative measurements <sup>(1)</sup>	14%	14%	14%	33%

(1) Indicative measurement being measurements which are performed at reduced regularity but fulfil the other data quality objectives.

12. The uncertainty (expressed at a 95 % confidence level) of the methods used for the assessment of ambient air concentrations shall be evaluated in accordance with the CEN Guide to the Expression of Uncertainty in Measurement (ENV 13005-1999)(2), the methodology of ISO 5725:1994, and the guidance provided in the CEN Report, 'Air quality — Approach to uncertainty estimation for

(2) European Committee for Standardisation (CEN) publication (copies may be obtained from CEN at 36, Rue de Stassart, B-1050, Brussels, Belgium <http://www.cenorm.be>).

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ambient air reference measurement methods' (CR 14377:2002E). The percentages for uncertainty in the table in paragraph 11 are given for individual measurements, which are averaged over typical sampling times, for a 95 % confidence interval. The uncertainty of the measurements shall be interpreted as being applicable in the region of the appropriate target value. Fixed and indicative measurements shall be evenly distributed over the year in order to avoid skewing of results.

**13.** The requirements for minimum data capture and time coverage do not include losses of data due to regular calibration or normal maintenance of the instrumentation. Twenty-four-hour sampling is required for the measurement of benzo(a)pyrene and polycyclic aromatic hydrocarbons. With care, individual samples taken over a period of up to one month may be combined and analysed as a composite sample, provided the method ensures that the samples are stable for that period. The three congeners benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene may be difficult to resolve analytically in which case they may be reported as sum. The Secretary of State shall endeavour, in so far as practicable, to undertake twenty-four hour sampling for the measurement of arsenic, cadmium and nickel concentrations. Sampling shall be spread evenly over the weekdays and the year. For the measurement of deposition rates, the Secretary of State shall endeavour, in so far as practicable, to obtain monthly or weekly samples throughout the year.

**14.** The Secretary of State may allow for use of wet only instead of bulk sampling if it can be demonstrated that the difference between them is within 10 %. Deposition rates shall generally be given as  $\mu\text{g}/\text{m}^2$  per day.

**15.** The Secretary of State may apply a minimum time coverage lower than indicated in the table, but not lower than 14 % for fixed measurements and 6 % for indicative measurements provided that he is satisfied that it can be demonstrated that the 95 % expanded uncertainty for the annual mean, calculated from the data quality objectives in the table according to ISO 11222:2002 — 'Determination of the uncertainty of the time average of air quality measurements' will be met.

## PART 3

### Ozone and nitrogen dioxide assessed at ozone sampling points

**16.** The data quality objectives set out in the following table, for allowed uncertainty of assessment methods, of minimum time coverage and of data capture of measurement, are provided to guide quality-assurance programmes—

	<i>For ozone, NO and NO2 assessed at ozone sampling points</i>
<i>Continuous fixed measurement</i>	
Uncertainty of individual measurements	15%
Minimum data capture	90% during summer; 75% during winter
<i>Indicative measurement</i>	
Uncertainty of individual measurements	30%
Minimum data capture	90%
Minimum time coverage	>10% during summer
<i>Modelling</i>	
Uncertainty:	
1 hour averages (daytime)	50%

	<i>For ozone, NO and NO2 assessed at ozone sampling points</i>
8 hours daily maximum	50%
<i>Objective estimation</i>	
Uncertainty	75%

**17.** The uncertainty (on a 95% confidence interval) of the measurement methods shall be evaluated in accordance with the principles laid down in the ‘Guide to the Expression of Uncertainty of Measurements’ (ISO 1993), or the methodology in ISO 5725-1 ‘Accuracy (trueness and precision) of measurement methods and results’ (ISO 1994) or equivalent. The percentages for uncertainty in the table are given for individual measurements, averaged over the period for calculating target values and long-term objectives, for a 95% confidence interval. The uncertainty for continuous fixed measurements shall be interpreted as being applicable in the region of the concentration used for the appropriate threshold.

**18.** The uncertainty for modelling and objective estimation means the maximum deviation of the measured and calculated concentration levels, over the period for calculating the appropriate threshold, without taking into account the timing of events.

**19.** “Time coverage” means the percentage of time considered for settling the threshold value during which the pollutant is measured.

**20.** “Data capture” means the ratio of the time for which the instrument produces valid data, to the time for which the statistical parameter or aggregated value is to be calculated.

**21.** The requirements for minimum data capture and time coverage do not include losses of data due to the regular calibration or normal maintenance of the instrumentation.