

Protocol for the Hydrogen Chloride and Water Vapour Proficiency Testing Scheme

Round 17 (Version2)

1. INTRODUCTION

- 1.1 This document describes the procedure which should be adopted by participants in the Hydrogen Chloride (HCl) and Water Vapour (H₂O) Proficiency Testing Scheme. In order to ensure comparability of the results, it is important that, as far as possible, the same protocol is adopted by all participants. It is also important, and in the true spirit of a PT scheme, that the measurements from the stack simulator are carried out in a manner which is as close as possible to that used under operational conditions. This increases the benefit that participants will gain from the scheme and will make the scheme more appropriate for use with quality control systems.

2. OUTLINE OF THE SCHEME

- 2.1 The scheme will use the stack simulator at the NPL site. The NPL stack simulator produces a wide range of simulated stack gases under controlled conditions. The simulator is a recirculating system, which recreates a cross section of a 1.5 m duct. Four standard 5-inch ports are available for sampling probes or cross stack instruments to be installed. The 5-inch ports will be available to participants, **normally on a basis of 1 port per participant**. In addition a number of extractive gas analysers may be connected to gas extraction ports. **The total maximum sample gas extraction rate per participating team must not exceed 40 liters per minute.** The gas extraction ports will be used for reference measurements and are not available to participants.

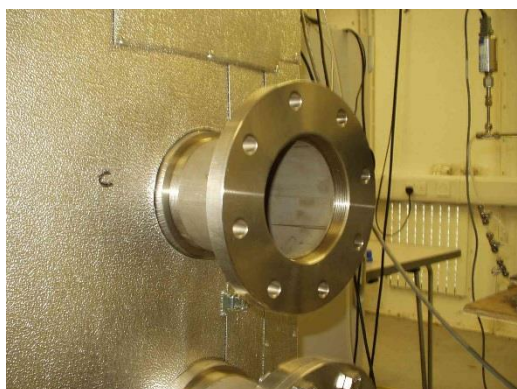
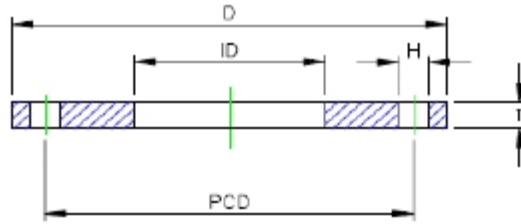


Figure 1: Stack simulator 5-inch port



N.B (ins)	Size (mm)	D (ins)	PCD (ins)	H (ins)	T (ins)	ID (ins)
5	125	10	8 1/4	11/16	9/16	5.66

Figure 2: BS10 table E flange size

Maximum probe length allowed = 0.9m

Minimum recommended probe length = 0.3m

- 2.2 During each day the stack simulator will be set to four different conditions typical of WI, LCP & Gas Turbine (GT) sites. The range of test concentrations to expect is shown in Table 1.

Pollutant	Maximum	Minimum	Unit
HCl	50	1	PPM
H ₂ O	20	1	%
O ₂	21	1	%
CO ₂	15	1	%

Table 1: Range of test concentrations to expect in stack simulator

3. PROTOCOL

- 3.1 Teams will be allocated a day in which to undertake testing on the stack simulator. As up to four teams will be working on the stack simulator at any one time it is requested that each team be limited to a maximum of 2 people. To enable teams to complete the testing in the allotted time you will be asked to observe the following timetable:

Time	Activity
08:00 – 10:00	Instrumental setup
10:00 – 10:30	Test 1
10:30 – 11:30	Instrumental setup
11:30 – 12:00	Test 2
12:00 – 13:00	Instrumental setup
13:00 – 13:30	Test 3
13:30 – 14:30	Instrumental setup
14:30 – 15:00	Test 4
15:00 – 16:00	Pack up and depart

This timetable will be strictly enforced. If a team is not ready for testing then they will have to forfeit that test to ensure that they are ready in time for the next test.

Participants will be able to arrive on the day before testing after 16:00 to set up their equipment to ensure it is fully warmed up before testing. Teams will have to be off site by 18:00.

- 3.2 Teams should arrive at NPL as if they were arriving at a real test site to undertake measurements according to the Standard Reference Method wet chemical methods described in BS EN 1911:2010 for HCl and BS EN 14790:2017 for H₂O. Participants may also make measurements using real-time continuous methods if they so wish. **Participants must ensure that the combined sampling rate of their equipment does not exceed 40 litres per minute.** All participants should follow their own UKAS accredited procedures. The working area should be kept tidy with cylinders secured safely and trip hazards minimised.
- 3.3 NPL will not provide tubing, Swagelok, extension reels and other connectors. NPL will provide one 110V socket, two 220V sockets and a bench top (120cm x 70cm) per team. **Participants should bring appropriate flanges to adapt the 5-inch ports to their gas sampling systems and, because the simulator is at a slight positive pressure, have the means to seal a sample probe in the stack.**
- 3.4 The monitoring location is at ground level with power supplies less than 3 metres from the sample ports. Power supplies are adjacent to participant work locations.
- 3.5 Parking for vans/mobile laboratories is adjacent to the stack simulator with distance to sample ports being no more than 10 metres.
- 3.6 For the safety of other participants please vent all instrument exhausts outside the confines of the stack simulator.
- 3.7 Teams must sign the NPL risk assessment before commencing work.
- 3.8 Participants wishing to work from mobile laboratories and not within the confines of the simulator please advise NPL as soon as possible with power requirements. We will endeavour to provide suitable supply.

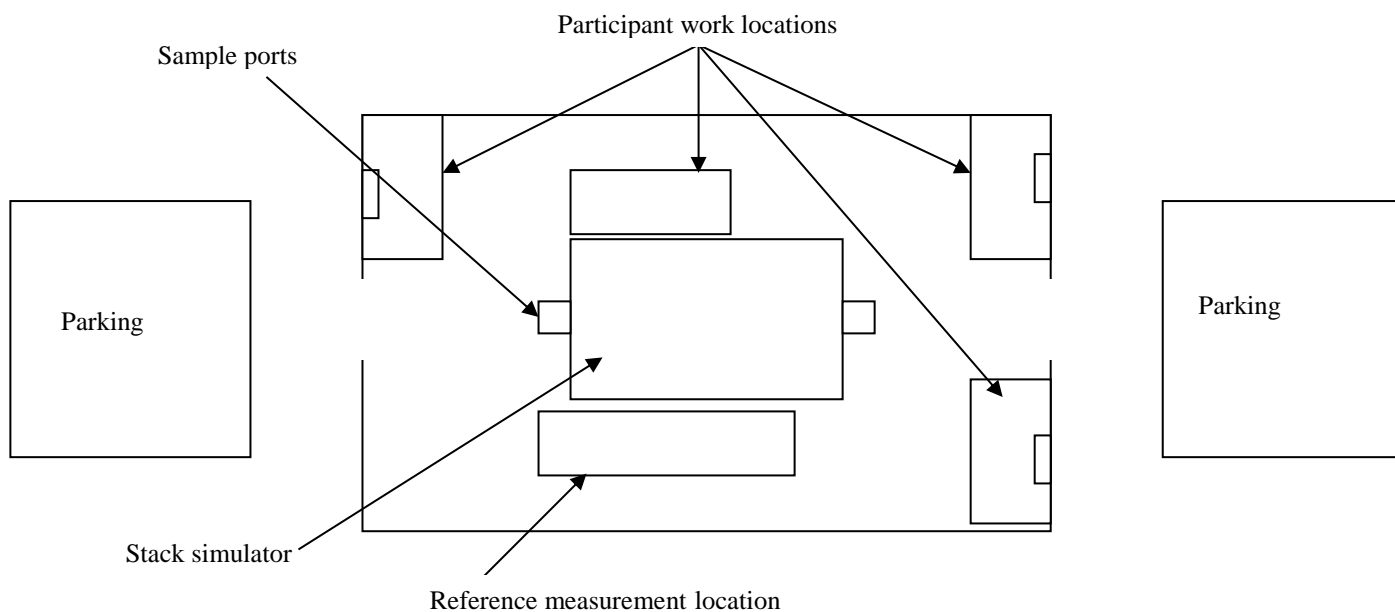


Figure 3: Stack simulator outline plan

4 COLLUSION

- 4.1 Participants are requested not to discuss results during the proficiency tests.
- 4.2 A member of the proficiency test team will make spot readings from participants' instruments, if available, during each proficiency test.

5 REPORTING RESULTS

- 5.1 **HCl** data should be expressed as mg HCl per m³ on a dry gas basis, at standard conditions of 273 K and 101.3 kPa, uncorrected for oxygen.
- 5.2 **H₂O** data should be expressed as a percentage, at standard conditions of 273 K and 101.3 kPa.

On the day

- 5.3 Teams are required to provide raw sample volumes and measurement times for each test. This should be given to the organiser at the end of the day.

Within 20 working days

- 5.5 Within twenty working days test teams are required to provide measured concentration results, along with the measurement uncertainty as required by the MCERTs performance standard. Results to be e-mailed to results@stack-pt-schemes.net and gabrielle.stevenson@npl.co.uk.

5.6 Participants are also requested to fill in the attached pro-forma and return it to the PT Scheme Coordinator on the day or email within 20 working days to results@stack-pt-schemes.net and gabrielle.stevenson@npl.co.uk.

6 Appeals or Complaints

6.1 Appeals or complaints should be directed to the PT Scheme Coordinator through the following e-mail address:

info@stack-pt-schemes.net

Hydrogen Chloride and Water Vapour Measurement PT Scheme Reporting Sheet

Date	
Company	
Team Members	
MCERTs Level 2 signature	

	Instrument and serial number
HCl dry gas meter	
H₂O dry gas meter, if separate sampling trains are used	
HCl analyser, if applicable	
H₂O analyser, if applicable	
O₂ analyser, if applicable	
Sample Conditioning system, if applicable	

Calibration Gas, if applicable	Cylinder Number	Certified concentration	Uncertainty, % or +/-	Calibration approach, i.e. zero and span, bracketing etc.
HCl				
H₂O				
O₂				

Return to:

David.butterfield@npl.co.uk **David Butterfield (PT Scheme Coordinator)**

or

results@stack-pt-schemes.net and gabrielle.stevenson@npl.co.uk