

CHAPTER 4 : ANALYTICAL SYSTEMS

1 Scope :

1.1 This chapter describes the analysis system mentioned in para 3.3 of Chapter 3 of this Part.

2 Analytical System

A schematic diagram of the analytical and sampling system using HCLA or equivalent systems for measuring NO_x is shown in Figure 1.

SP - Stainless steel sample probe to obtain samples from exhaust system. A closed end, multi-hole straight probe extending at least 80% across the exhaust pipe is recommended. The exhaust gas temperature at the probe shall be not less than 343 K (70° C).

HSL 1 - Heated sampling line, temperature shall be kept at 453 K - 473 K (180° C - 200° C): the line shall be made in stainless steel or PTFE.

F1 - Heated pre-filter, if used; temperature shall be the same as HSL1.

T1 - Temperature readout of sample streams entering oven compartment.

V1 - Suitable valving for selecting sample, span gas or air or gas flow to the system. The valve shall be in the oven compartment or heated to the temperature of the sampling line HSL1.

V2,V3 - Needle valves to regulate calibration gas and zero gas.

F2 - Filter to remove particulates. A 70 mm diameter glass fibre type filter disc is suitable. The filter shall be readily accessible and changed daily or more frequently, as needed.

PI - Heated sample pump

G1 - Pressure gauge to measure pressure in sample line HC-analyser.

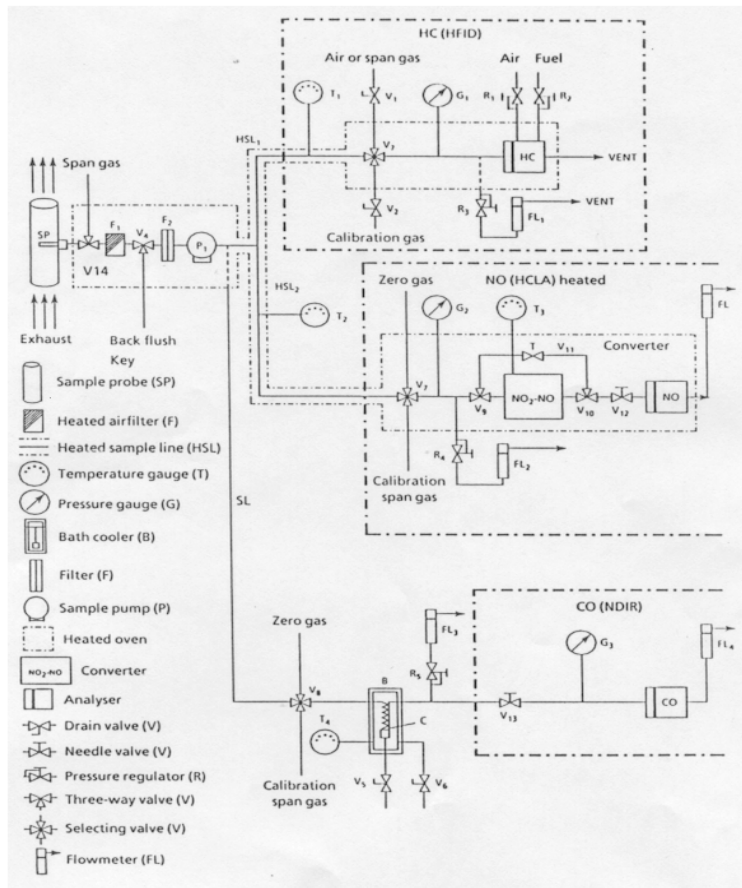
R3 - Pressure regulator valve to control pressure in sample line and flow to detector.

HFID - Heated flame ionization detector for hydrocarbons. Temperature of oven shall be kept at 453 K - 473 K (180° C - 200° C).

FL1,FL2,FL3 - Flow meter to measure sample by-pass flow.

RI,R2 - Pressure regulators for air and fuel.

- HSL2 - [Icated sampling line, temperature shall be kept between 368 K - 473 K (95° C - 200° C); the line shall be made in stainless steel or PTFE.
- HCLA - Heated chemiluminescence analyser for oxides of nitrogen.
- T2 - Temperature readout of sample stream entering HCLA analyser.
- T3 - Temperature readout of NO₂ - NO converter.
- V9, V10 - Three-way valve to by-pass NO₂ - NO converter.
- V11 - Needle valve to balance flow through NO₂ - NO converter and by-pass.
- SL - Sample line. The line shall be made in PTFE or in stainless steel. It may be heated or unheated.
- B - Bath to cool and condense water from exhaust sample. The bath shall be maintained at a temperature of 273 K - 277 K (0° C - 4° C) by ice or refrigeration...
- C - Cooling coil and trap sufficient to condense and collect water vapour (optional with water insensitive analyser).
- T4 - Temperature readout of bath temperature.
- V5, V6 - Toggle valves to drain condensate traps and bath.
- R4, R5 - Pressure regulator to control sample flow.
- V7, V8 - Bail valve or solenoid valves to direct sample, zero gas or calibrating gas streams to the analysers.
- V12, V13 - Needle valves to regulate flows to the analysers.
- CO - NDIR analyser for carbon monoxide.
- NOx - HCLA analyser for oxides of nitrogen.
- FL4, FL5 - By-pass flowmeter.
- V4, V 14 - Three-way ball or solenoid valves. The valves shall be in an oven compartment or heated to the temperatures of the sampling line LISLI.



FLOW DIAGRAM OF EXHAUST GAS ANALYSIS SYSTEM FOR CO, NO_x AND HC (ANALYSIS BY HCLA AND HEATED SAMPLE LINE)
 FIGURE 1 CHAPTER 4 PART 5.