SPECIFICATION FOR FLOW FACILITY FOR SUPERSONIC COMBUSTOR

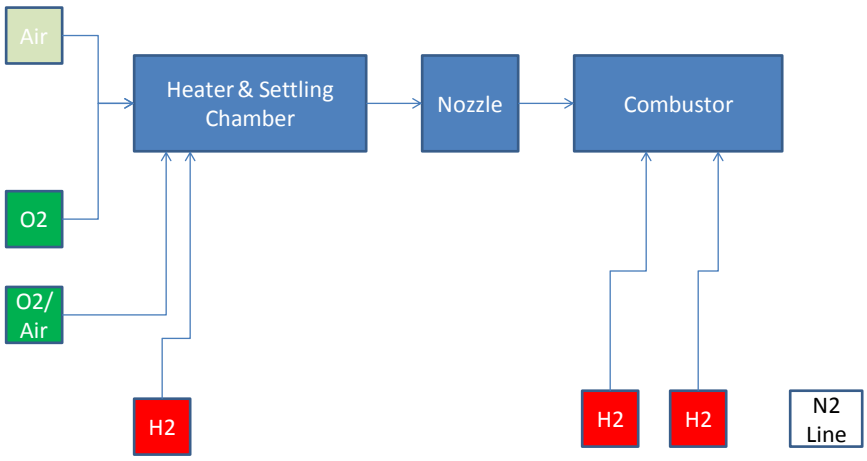
Supply Quantity: One

This tender includes **fully automated flow facility setup** for SCRAMJET combustor. It needs to control following gases (7 individual lines), Refer the **Flow facility required and P&I** which are available in the following pages.

Flow facility Requirement			
Fluid	**To where**	**Number of lines**	**Mass flow rate (Kg/s)**
Air	Main flow	1	1.2
Oxygen	Burner	1	0.0983
	main flow (Makeup)	1	0.122
Hydrogen	Burner	1	0.0197
	Combustor (2 lines)	2	0.042
Nitrogen	Purge	1	

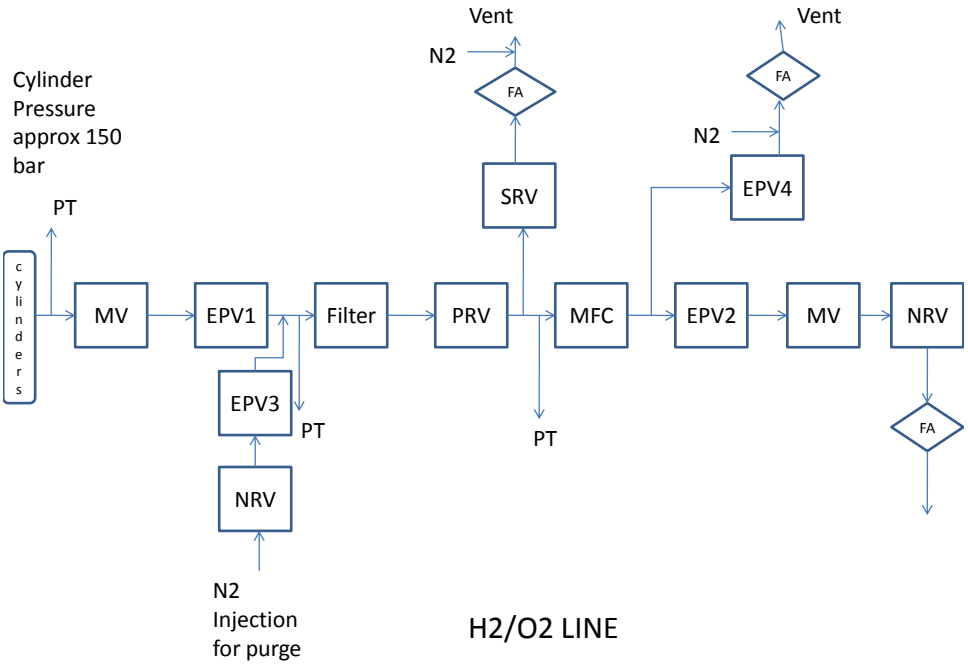
Note : Mass flow rate given is reference value but the system should be flexible over a reasonable range (**Two times approx**)

Flow Facility Required

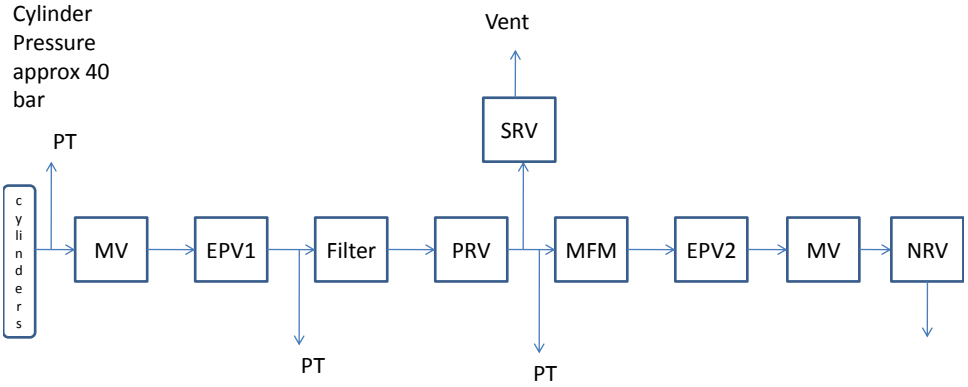


Note :O2/Air follows the O2 flow circuit, MFC in the circuit has to be compatible for both Oxygen and Air.

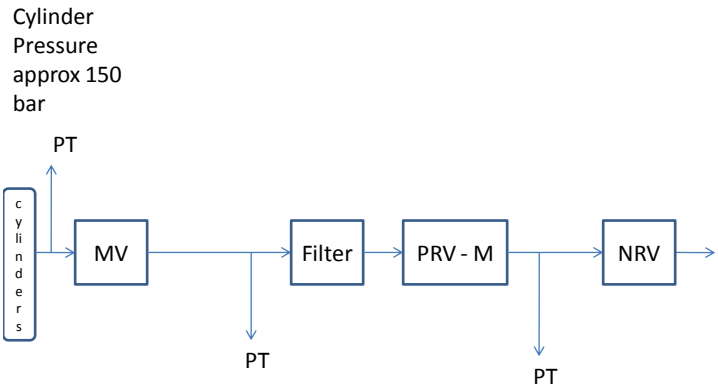
Note: Scope of this tender is only flow facility and control systems (Air, O2, H2, and, N2 Lines), This tender does not include Heater & Settling chamber, nozzle and combustor.



H2/O2 LINE



Air LINE



N2 LINE

Descriptions

MV	Manual Valve
EPV	Electro Pneumatic Valve
PRV	Pressure Regulating Valve
PRV-M	Pressure Regulating Valve -Manual
SRV	Safety Release Valve
MFM	Mass Flow Meter
MFC	Mass Flow Controller
FA	Flame Arrestor
NRV	Non Return Valve
PT	Pressure Transducer
N2	Nitrogen Line
H2	Hydrogen
O2	Oxygen
Filter	40 micron filters are preferred

Point to be taken into account

- Response time for MFC should be around 500 milliseconds.
- Vendor has to design and fabricate manifold (with pigtails and bull nose) assembly to connect six cylinders(For all three gases, H2, O2, and N2, One manifold for each gas)
- Manifold should have pressure gauge and isolation valve.
- All H2, O2, and N2 supply lines should terminate with flexible hoses of 2m length.
- The flexible hoses both the ends (Supple line interface and test rig interface) connections can be of ferrule nut type.
- Flexible hoses material has to be compatible for these gases.
- Air supply line, two flexible hoses of 4 inch diameter x 1 meter length, with flanged type end connection should be supplied (these hoses are used to connect inlet and outlet of flow facility)
- Air line has to be rated for 40 bar pressure.
- H2 and O2 line pressure up to PRV will be 150 bar approx.
- PRV in the H2 and O2 line can be eliminated; if MFC can handle high input pressure (150 bar approx).
- H2 line components have to satisfy all **safety class certification** for hydrogen handling.
- 02 line components have to satisfy all **safety class certification** for oxygen handling.
- Two H2 leak sensor has to be provided and they have to be integrated with the system for emergency stop if hydrogen leaks.
- Emergency stop switch has to be provided (For manual stopping)
- Prepare your quotation such that it includes complete hardware and software package.
  - Valves, pipe connectors, sensors, Filter, PRV, SRV, FA, MFC MFM, computer, interfaces, and etc
  - LabVIEW/Equivalent integration and etc
- Please make a detailed quotation.

Control Sequence

1. Air line ON
2. O2 line ON
3. O2/Air and H2 lines to Heater and settling chamber is ON
4. H2 for combustor is ON (One or Two independently)
5. All H2 lines and O2 lines OFF and Purging Initiated (O2/H2 line sequence will have detail for the purging sequence)
6. Air line OFF

- Sequence flexibility should be there, Duration of line being ON has to be adjustable.
- When emergency command from Hydrogen sensor or from manual button is received then all O2 and H2 has to shut down immediately and purging line (N2) has to be ON

O2/H2 line sequence

1. All EPVs are in closed position but MVs are in open position
2. EPV1 and EPV2 set to open
3. PRV and MFC set to the required value (goes from zero)
4. Experiment time
5. EPV1 set to close
6. EPV3 and EPV4 set to open – line will be purged with nitrogen
7. EPV2, EPV3 and EPV4 set to close
8. MV will be closed

Air line sequence

1. All valves are in closed position
2. MV set to open
3. EPV1 and EPV2 set to open
4. PRV set to desired value (Goes from zero)
5. Experiment time
6. EPV1 set to close
7. PRV set to zero
8. EPV2 set to close
9. MV will be closed

N2 line

1. PRV-M will be set desired value and this N2 outlet will be multiplexed and given as input in all the N2 required places in O2 and H2 lines

Price should include Materials, Manufacturing, Assembly, Testing, and transporting the same to IIT Madras.

Note: Competitive Vendors having doubt in our Tender Drawing and Specification may personally visit on 20-5-2014 at 3 PM in Aerospace Engineering Department conference room, to understand and to get clarify. Interested vendors may confirm about their visit, though E-mail.

For any technical clarification please contact

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