

Specification for Hydraulic Pressure Booster

1 Scope of work

Design, realization, supply, installation and commissioning of hydraulic pressure booster setup at HRAG/ASOE/VSSC as per the trailing specification.

2 Detailed description

Hydraulic pressure booster system shall be realized as per the schematic layout shown in fig. 1. This system shall have two modes of operation - manual mode and auto mode. Manual mode of operation shall be provided using regulated drive air pressure supply. In this mode of operation, all valves are switched ON/OFF manually. Auto mode of operation shall be provided through two electro pneumatic regulator / equivalent systems, one each for drive air control and for booster outlet pressure control. In auto mode of operation, booster shall be controlled based on test pressure (DUT pressure). The operation sequence of all the valves, regulator etc. shall be fully automatic based on the DUT pressure. Hydraulic booster shall be controlled through a SCADA/PLC based control system. Features for plotting real time pressure vs time plots shall be provided for both modes of operation. The SCADA system shall permit interchangeability of control pressure transducer (0-100 bar & 0-1000 bar). The overall system shall be integrated in a caster wheel type console for easy movement.

2.1 General specification

Sl.	Parameter	Specification
1	Mode of Operation	The equipment offered shall be fully automated with manual over ride provision.
2	Test pressure	Test pressure shall be settable between 20 - 1000 bar for fully auto mode & 0 -1000 bar (for manual mode).
3	Volume of specimen	25 Litre (Maximum)
4	Hydraulic medium	Distilled water
5	Reservoir capacity	50 Litre
6	Accumulator capacity	2 Litre (minimum)

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7	Minimum settable incremental pressure	5 bar
8	Accuracy of settable pressure	+/-1 bar in the range of 500 bar and +/-3 bar in the range of 500 to 1000 bar

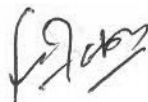
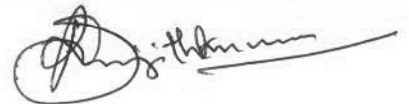
3 Instrumentation and control system

- 3.1 The equipment offered shall work in fully automated mode of operation.
- 3.2 Standard PLC controller having provisions for pressure control and programming shall be used.
- 3.3 Feature for dynamically changing the pressure set point (whenever the booster is in operation in auto mode) shall be provided.
- 3.4 The following shall be controlled by PLC:
- i. Electronic pressure regulator
 - ii. Electro pneumatic valves
 - iii. Pressure transducers
 - iv. Digital pressure gauges (real time plotting of pressure vs time graph)
- 3.5 Party shall mention the make and model number of the proposed pressure transducer used in the booster along with supporting documents.
- 3.6 Software for PC based operation and remote control shall be provided. This software shall be license free to enable adding multiple pressure transducers. Support for the software including future updates etc. shall be provided free of cost. An extra copy of all necessary software (installable) shall be provided preferably in CDR media, so that it can be reinstalled in case of any exigency arising due to corruption of loaded software.

4 Data logging

4.1 Provision for real time monitoring / trend display generation and printing of pressure vs time plot (for all pressure transducers) using external PC interface via LAN shall be provided. The basic configuration of this external PC shall be as follows -

Processor type	:	Intel® Core™ i7-10700 or better
RAM	:	8GB (minimum)
Hard disk	:	SATA 1TB (minimum)
Monitor	:	LED 32 inch

4.2 Ethernet connectivity to PC shall be available with provision for remote operation (minimum 25 meter from Hydraulic booster).

4.3 USB port shall be provided for downloading test data. Feature for saving data in the PC during the test with settable data sample rate and provision for data retrieval at a later stage shall be provided. Internal memory storage shall be sufficient for storing test data for minimum 1000 hours.

5 Trouble shooting / servicing

Real time mimic diagram of full system shall be displayed on the screen so that the fault conditions are visible to the operator. Audible and visual alarm system shall be provided for warning the operator about any malfunction / variation in service conditions.

6 Calibration

Party shall provide valid calibration certificates for all transducers and digital pressure gauges used in the system.

7 Inspection and Acceptance Test Plan at factory and VSSC

Demonstration of all specifications & performance shall be done during factory acceptance test for various test profiles (Sample test profiles will be providing by VSSC during PDI) in manual and auto mode of operations.

8 Safety

8.1 Functioning of all interlocks shall be demonstrated.

8.2 Safe shut down & revival in the event of electrical power failure shall be demonstrated.

8.3 All Safety alarms & it's acknowledgment shall be demonstrated

8.4 Emergency push stop button shall be provided.

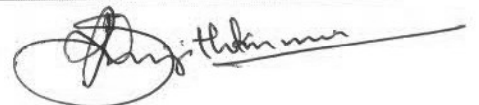
8.5 Operating procedure: A detailed operating procedure for manual and auto mode operation of the system shall be provided along with the system.

9 Detailed specifications of various sub systems

9.1 Hydraulic systems

This system shall consist of following elements:

- a. Drive air filter regulator with pressure gauge and ball valve



- b. Reservoir (water storage tank)
- c. High pressure pump (Liquid booster)
- d. Accumulator(Pulsation Dampener)
- e. Pressure Gauges
- f. Ball Valves
- g. Electro-Pneumatic valves
- h. Pressure Transducers
- i. Safety Relief Valve
- j. Electronic Pressure Regulator/ Equivalent system also acceptable for meeting the specification
- k. Digital Pressure Gauge
- l. Pre fill pump
- m. Bleed valve

9.2 Drive air filter regulator with pressure gauge (PR)

Pressure Regulation : 8-175 psig
 Quantity : As per the system requirement

9.3 Drive Air Ball Valves

Working Pressure : 200 psig (approx.)
 Quantity : As per the system requirement

9.4 Reservoir (Water storage tank)

Volume : 30 Litres
 MOC : SS 304 /SS304L with Liquid Level Digital Indicator, Drain Valve, Strainer and Isolation Valve
 Quantity : 1 No.

9.5 High pressure pumps (Liquid booster)

Minimum Suction Pressure : Atmospheric
 Maximum Gas Outlet Pressure : 1380 bar
 Flow rate : As per system requirement
 Quantity : 1 No.

9.6 Accumulator (Pulsation Dampener)

Working Pressure : 1380 bar
Volume : 2-3 Litres
Design code : ASME
MOC : SS 316
Quantity : 1 No.

9.7 Outlet Pressure Gauges(PG-1 to PG-3)

Range : 1380 bar
Accuracy : 0.5% FS
Quantity : As per system requirement

9.8 Outlet Ball Valves (BV-1 to BV-5)

Working Pressure : 1380 bar
MOC : SS 316
Quantity : As per system requirement

9.9 Electro-Pneumatic valves (EPV-1 to EPV-4)

Working Pressure : 1380 bar
Quantity : As per system requirement

9.10 Outlet Pr. Transducer (PT-3 & PT-4)

Pressure Range : 1380 bar (approx.)
Accuracy : As per system requirement

Party shall select appropriate transducer for meeting the pressure control of +/-1 bar in the range of 500 bar and +/-3 bar in the range of 500 to 1000 bar.

9.11 Safety Relief Valve (SRV)

Adequate number of safety relief valves shall be provided in the system.

9.12 Gas Outlet Electronic Pr. Regulator (EPR)

Control Range : 1380 bar
Accuracy : +/-1 bar in the range of 500 bar and +/-3 bar in
The range of 500 to 1000 bar.

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Quantity : As per system requirement

9.13 Digital Pressure Gauge (DPG)

Working Range : 1000bar

Accuracy : 0.1% FS,

10 General Terms and Conditions

- 10.1 **Safety:** All statutory safety requirements for the equipment shall be compiled. Details of safety features incorporated in the equipment like relief valve, shutoff valve, etc. and safety procedures to be followed during the operation shall be explained. Safety interlocks shall be provided wherever feasible
- 10.2 **Ergonomic design:** Machine and the control panel are to be ergonomically designed.
- 10.3 **Delivery schedule:** Time schedule for the completion of work shall be clearly mentioned in the offer.
- 10.4 **Pre delivery inspection:** VSSC engineers will inspect the machine at party's site for its performance before dispatching. Clearance will be based on the successful demonstration of the system at factory. Party shall give training to VSSC Engineers for the operation and maintenance of the equipment.
- 10.5 **Packing and forwarding:** After the initial acceptance, party shall properly pack and forward the equipment to our site at VSSC, Trivandrum for final installation and commissioning.
- 10.6 **Installation and commissioning:** Party shall be responsible for the installation and commissioning of the equipment at VSSC.
- 10.7 **Warranty:** Total equipment shall have comprehensive warranty for a period of 12 months from the date of final acceptance at VSSC.
- 10.8 Any other items those are essential for realisation of the equipment conforming to all specification requirements, installation and for the regular operation but are not referred herein, may also be included in the offer.
- 10.9 Supplier shall provide the details of similar system supplied to Government/PSU/Private industries highlighting/indicating the date of supply and contact details including telephone number and email address.

Note:

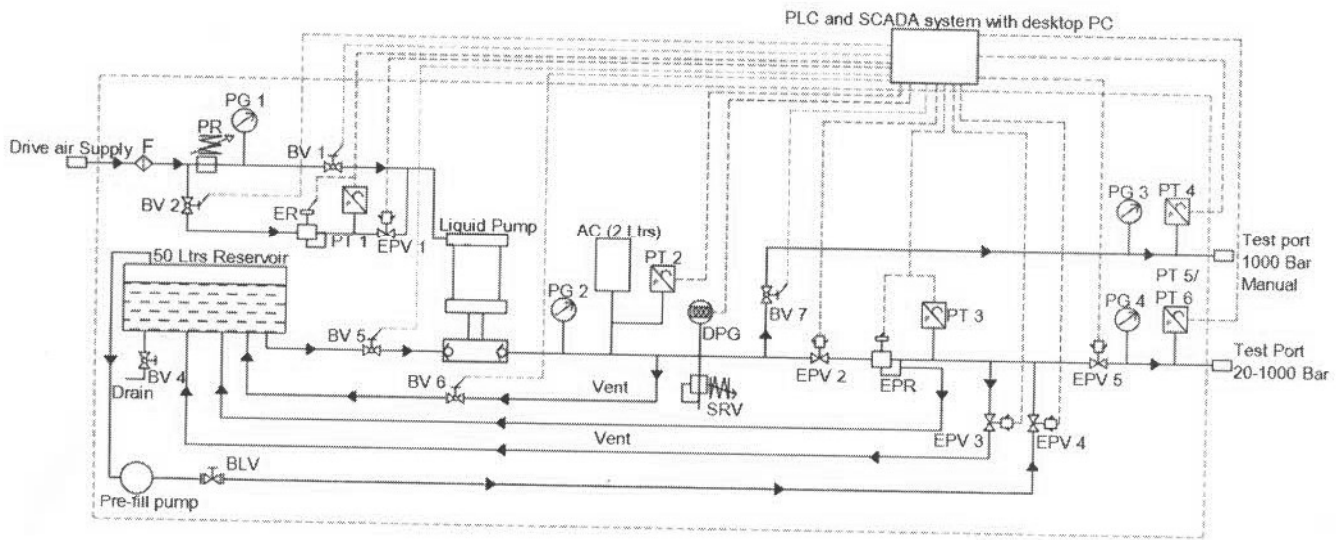
Conceptual drawing is provided in Fig.-I for reference. Party is free to suggest modification where ever it is essential to achieve the test pressure settable between low



pressure range (0 to 100 bar) & high pressure range (0 to 1000 bar) with an accuracy of ± 1 bar in the range of 500 bar and ± 3 bar in the range of 500 to 1000 bar to the maximum and minimum test volumes. However, the party has to submit the detailed drawing for verification by VSSC prior to fabrication.

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(Fig No.1: Schematic layout)

Description	Key Words & Qty(Nos)	Pressure range	Remark	SL No	Description	Key Words & Qty(Nos)	Pressure range	Remark
1 Electro pneumatic valve	EPV (5)	EPV 1 (0-10 Bar)		9	Safety relief valve	SRV (1)	As per system requirement	
		EPV 2 to 5 (0-1000 Bar)						
2 Ball valve	BV (7)	BV 1 & 2 (0-100 Bar)		10	Electro pneumatic regulator	EPR (1)	(20-1000 Bar)	
		BV 3 to 7 (0-1500 Bar)						
3 Bleed valve	BLV (1)	As per system requirement		11	High Pressure Pump	(1)		
5 Pressure Transducer	PT (5)	PT 1 (0-10 Bar)	PT 5/PT 6 as interchangeable based on test pressure range.	12	Digital pressure gauge	DPG (1)	(0-1000 Bar)	
		PT 2 to 5 (0- 1000 Bar)						
		PT 6 (0-100 Bar)						
6 Accumulator (2 Ltrs)	AC (1)	0 to 20,000PSI (minimum)		13	Water reservoir (50 Ltrs)	50 Ltrs (1)		
7 Pre-fill pump	(1)	As per system requirement		14	Pressure regulator	PR (1)	(0-10 Bar)	
8 Pressure Gauge (Bourdon tube)	PG (4)	PG 1 (0-10 Bar)		15	Electro pressure regulator	ER (1)	(0-10 Bar)	
		PG 2 to 4 (0-1400 Bar)						

(Table No.1: Major component list)

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