



**SARDAR VALLABHBHAI NATIONAL INSTITUTE OF  
TECHNOLOGY SURAT**

**Tel: 0261-2259571 -2259582-584**

**Fax: 0261-2228394**

**SVNIT**

**TENDER NOTICE**

Sealed tenders are invited in duplicate from the supplier/manufacturer/distributor/vendor for the supply of the following items.

| <b>Sr. No.</b> | <b>Item Name</b>                                             | <b>Qty.</b> |
|----------------|--------------------------------------------------------------|-------------|
| 1              | Compressed Air Supply System                                 | 1 set       |
| 2              | Compressed Air Heater                                        | 1 set       |
| 3              | Data Acquisition System with Necessary Software and Hardware | 1 set       |
| 4              | Fuel Supply System                                           | 1 set       |

Tender documents will be available on request during office hours from **05/10/2017** to **15/11/2017** from Mech. Engg. Deptt. of institute on payment of Rs 500/- towards tender fee to be remitted by cash for tender documents delivered in person or Rs 550/- by DD drawn in favor of "**Research & Consulting A/cs**" in case tender documents are to be sent by post. The date of opening of tender is **17/11/2017** at 15:00 hours. The tender documents may also be downloaded from institute website [www.svnit.ac.in](http://www.svnit.ac.in). However, the tender fee must be paid before submission of tenders.

The director reserves the right to reject any or all the tender items without assigning any reasons whatsoever thereof.

**No. MED/SAC/DRDO/17-18**

**DIRECTOR**

# **TENDER DOCUMENT**

## **SUPPLY OF ITEMS FOR SPONSORED PROJECT ON “COMBUSTOR TECHNOLOGY DEVELOPMENT”**



**MECHANICAL ENGINEERING DEPARTMENT  
S. V. NATIONAL INSTITUTE OF TECHNOLOGY,  
SURAT - 395 007**

**SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT**

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**TENDER DOCUMENT**

I. Issued to M/s. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

II. Name of work, Reference No. & EMD to be deposited by cash or D. D. Drawn in favour of **“Research & Consulting A/cs”** are as specified in the following table:

| <b>Sr. No.</b> | <b>Item Name</b>                                             | <b>Ref. No.</b>             | <b>Qty.</b> | <b>E.M.D. (Rs.)</b> |
|----------------|--------------------------------------------------------------|-----------------------------|-------------|---------------------|
| 1.             | Compressed Air Supply System                                 | No. MED/SAC/DRDO/2153/17-18 | 1 set       | 60,000/-            |
| 2.             | Compressed Air Heater                                        | No. MED/SAC/DRDO/2154/17-18 | 1 set       | 10,000/-            |
| 3.             | Data Acquisition System with Necessary Software and Hardware | No. MED/SAC/DRDO/2157/17-18 | 1 set       | 8,500/-             |
| 4.             | Fuel Supply System                                           | No. MED/SAC/DRDO/2158/17-18 | 1 set       | 7,500/-             |

III. The total number of pages in this tender document is thirteen (13) only.

**SCHEDULE OF TENDER**

1. Last Date of Issuing Tender Documents : 15/11/2017
2. Last Date of Receiving Tender Documents : 15/11/2017
3. Date of Opening of Tender : 17/11/2017

**DIRECTOR**

## GENERAL TERMS & CONDITIONS

1. **Tenders received without payment of tender fees will not be considered.**
2. Tender for each item (equipment/instrument) must be submitted separately with the name of equipment/instrument clearly mentioned on the top of the envelope along with the Tender Reference Number. Only first item quoted will be considered in case more than one equipment is quoted in one envelope.
3. The Earnest money for each of the quoted item will have to be paid by Crossed Demand draft drawn in favour of **Research & Consulting A/cs**, and enclosed along with the tender documents. **This amount will be refunded later, only on receipt of written request from supplier. EMD shall not bear any interest and without this EMD, the Tender shall not be considered. No correspondence in this regard shall be entertained.**
4. **The tenders as quoted once shall be considered final. No negotiations for the rate nor any change, alterations and modifications shall be permitted at a later stage.** After opening of the tender regarding specifications of the items in quotations, it will not be possible to accept any changes and no correspondence will be entertained in this connection.
5. The equipment/instrument should be furnished/supplied with a complete set of manuals, catalogues, technical literature, user's manuals and other relevant manuals for each of the items supplied.
6. In case the party has the standard equipment/instrument with marginally different specifications, the same may also be quoted with complete specifications of the equipment/instrument being offered. In case the party has the equipment/instrument with more variations in specifications, equipment may be quoted with complete details.
7. The supplier should have preferably supplied the same equipment/instrument to some of the customers in South/West region, the list of which will have to be furnished along with the quotations.
8. The rate for every individual equipment/instrument should be quoted in Indian Rupees for all indigenous goods. In case of imported equipment/instrument the rates should be offered in foreign currency **as the institute is exempted from, the payment of custom duty.**

9. The rates should be inclusive of all taxes with F.O.R. destination at S.V. National Institute of Technology, Surat. The rates may be quoted preferably in the following format:

- 9.1 Basic Price of the Unit :
- 9.2 Price of necessary accessories/spares etc. :  
(Prices should be quoted separately for the above items)
- 9.3 Taxes :

**NOTE :** (1) The College cannot issue 'C' or 'D' forms for tax concessions.  
(2) The college is also **exempted from the payment of Custom Duty and Central Excise Duty if applicable.** The college will provide necessary exemption certificate in this regard, **on demand.**

- 9.4 Packing and Forwarding :
- 9.5 Transport (F.O.R. Destination at :  
S. V. National Institute of Technology, Surat.).
- 9.6 Installation and Commissioning :
- 9.7 Insurance :
- 9.8 Any other charges (please specify) :
- 9.9 Rebate/Concession for academic Institution :
- 9.10 **Total** :

10. In case of authorized dealers/sole agents/sole manufacturer in India, appropriate certificate should be submitted along with the tenders.
11. The delivery should be effected within eight weeks from the date of receipt of supply order or a mutually agreed date. The tender should clearly state the delivery period required.
12. In the event of supply being delayed, the party concerned shall apply for suitable extension, stating the grounds/reasons on which the extension is sought.
13. In case the delivery period is delayed beyond the stipulated period inclusive of any extension granted, **a penalty of 5% of the total value of the order will be levied for each week of delay or part thereof.**
14. The goods are required to be duly insured with any nationalized insurance company and the insurance charges will be borne by the institution against the relevant documents of the insurance company.

15. The validity of the tender to be submitted may be kept open at least for 120 days from the last date of the receipt of the tender. However it is desirable to have a longer validity period.
16. The supplier shall be required to undertake the comprehensive guarantee/warranty for all the equipment supplied for a period of **minimum three years** from the date of satisfactory installation of the equipment/instrument.
17. The supplier should provide necessary training for the operation and servicing of the equipment/instrument at free of cost to the concerned personnel, if asked by the purchaser.
18. The supplier shall provide users list and the certificates of satisfactory operation of the equipment/instrument supplied by them to at least three well-known organizations preferably within Gujarat state during the last three years.
19. The supplier shall provide 3 sets of both technical/service manuals and operation/installation manuals along with the proper dust covers for the instrument/equipment at free of cost. Supplier should also provide certificate of calibration traceable to National / International Standards.
20. In case the quoted rates are as per the valid and prevailing contract, with DGS&D, New Delhi/GEM, the supplier shall furnish a certified Xerox copy of the same to the purchaser. It may also be mentioned whether supplier can accept a direct order based on DGS&D rate / GEM contract.
21. Payment is normally made by cheque drawn on the SBI, SVNIT Branch, Surat within a period of 30 days from the date of satisfactory installation of equipment/instrument. **This college is fully financed by Central Governments and the Government auditors have objected for making advance payment against delivery/documents through bank.**
22. Goods may be inspected at the factory before dispatch, if required at supplier's cost and risk. Goods received in the damaged condition will be rejected at the cost and risk of the supplier.
23. In the event of material/equipment/instrument supplied not being as per specifications, the same will have to be replaced at the cost and risk of the supplier. The rejected material will also be sent back at the cost and risk of the supplier including packing and forwarding charges. No payment will be released unless the material/equipment/instrument is as per the specifications specified in the tender.

24. The supplier shall arrange for repair/replacement of the defective/worn out components of the equipment/instrument at our place during the guarantee period at purchaser's first instructions within 15 days. This work will be carried out at the cost of supplier and no charges whatsoever will be paid including TA/DA of the service engineer for the same.
25. The supplier should clearly mention the after sales service facility/capability and provide the same during guarantee/warranty period.
26. Incomplete tenders will be rejected without assigning any reasons and no correspondence will be entertained in this connection.
27. Supplier and/or his representative may remain present on the date and time specified for opening of the tender.
28. The Director reserves the right to increase or decrease the quantity of the tender items or split the items of the tender. Rights are also reserved with the Director to reject any or all the tenders without assigning any reasons thereof.
29. In case of any dispute the matter shall be subject to Surat (Gujarat state) jurisdiction only.
30. In case the equipment is internationally certified for quality and bears the ISO 9000 or TQM certification, a copy of relevant certificate may be enclosed. Such equipment may be given preference.
31. In case of the authorized dealers quoting on behalf of Manufacturers, a copy of certificate is required to be enclosed from the manufacturer, that the equipment being quoted by the party is on behalf of the concerned manufacturer and the manufacturer undertake to provide the after sales maintenance of the equipment.
32. The Tender must be accompanied with a signed declaration from the party that the terms and conditions of the Tender are acceptable and binding to the party.

**DIRECTOR**

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**DECLARATION**

I/We hereby declare that the terms and conditions of the Tender stated herein, and as may be modified/mutually agreed upon are acceptable and binding to me/us.

Name and Address of Supplier/  
Manufacturer

Name and Signature of the  
Tenderer with Official Stamp

Telephone No.     :

Date:

Fax Number        :



## TECHNICAL SPECIFICATIONS

| Sr. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Item Name                                                | Ref. No.                                                  | Qty.  |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
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| 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Compressed Air Supply System                             | No. MED/SAC/DRDO/2153/17-18                               | 1 set |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">No. Equipment Name</th> <th style="text-align: left;">Parameter</th> <th style="text-align: left;">Requirement</th> </tr> </thead> <tbody> <tr> <td rowspan="7"><b>a. Air Compressor</b></td> <td>Fluid</td> <td>Air</td> </tr> <tr> <td>Pressure</td> <td>2 to 5 kg/cm<sup>2</sup></td> </tr> <tr> <td>Type</td> <td>Screw</td> </tr> <tr> <td>Mass Flow Rate</td> <td>1 kg/s (≅ 1800 CFM @ 20 °C, 1 bar)</td> </tr> <tr> <td>Drive</td> <td>VFD Controlled, Energy Efficient AC motor</td> </tr> <tr> <td>Inlet Air Filter</td> <td>1 micron</td> </tr> <tr> <td>Outlet Oil Filter</td> <td>0.01 micron</td> </tr> <tr> <td rowspan="4"><b>b. Air Receiver Tank with Safety Devices</b></td> <td>Capacity</td> <td>5 m<sup>3</sup></td> </tr> <tr> <td>Test Pressure</td> <td>10 kg/cm<sup>2</sup></td> </tr> <tr> <td>Material</td> <td>As per ASME standard</td> </tr> <tr> <td>Application</td> <td>Outdoor</td> </tr> <tr> <td rowspan="5"><b>c. Air Flow Meter</b></td> <td>Type</td> <td>Venturimeter with Differential Pressure Transducer</td> </tr> <tr> <td>Range</td> <td>0.4 to 1 kg/s</td> </tr> <tr> <td>Compensation</td> <td>Pressure and Temperature Both</td> </tr> <tr> <td>Allowable Pressure Drop</td> <td>Minimum and should be specified clearly by the supplier</td> </tr> <tr> <td>Sensors</td> <td>Pressure, Temperature &amp; Humidity at appropriate locations</td> </tr> <tr> <td><b>d. Air Quality Monitoring System</b></td> <td></td> <td></td> </tr> <tr> <td><b>e. Piping System with valves</b></td> <td colspan="2">From compressor to receiver tank exit as per requirement</td> </tr> </tbody> </table> |                                                          |                                                           |       | No. Equipment Name | Parameter | Requirement | <b>a. Air Compressor</b> | Fluid | Air | Pressure | 2 to 5 kg/cm <sup>2</sup> | Type | Screw | Mass Flow Rate | 1 kg/s (≅ 1800 CFM @ 20 °C, 1 bar) | Drive | VFD Controlled, Energy Efficient AC motor | Inlet Air Filter | 1 micron | Outlet Oil Filter | 0.01 micron | <b>b. Air Receiver Tank with Safety Devices</b> | Capacity | 5 m <sup>3</sup> | Test Pressure | 10 kg/cm <sup>2</sup> | Material | As per ASME standard | Application | Outdoor | <b>c. Air Flow Meter</b> | Type | Venturimeter with Differential Pressure Transducer | Range | 0.4 to 1 kg/s | Compensation | Pressure and Temperature Both | Allowable Pressure Drop | Minimum and should be specified clearly by the supplier | Sensors | Pressure, Temperature & Humidity at appropriate locations | <b>d. Air Quality Monitoring System</b> |  |  | <b>e. Piping System with valves</b> | From compressor to receiver tank exit as per requirement |  |
| No. Equipment Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Parameter                                                | Requirement                                               |       |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
| <b>a. Air Compressor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Fluid                                                    | Air                                                       |       |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Drive                                                    | VFD Controlled, Energy Efficient AC motor                 |       |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
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| <b>b. Air Receiver Tank with Safety Devices</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Capacity                                                 | 5 m <sup>3</sup>                                          |       |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
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| <b>c. Air Flow Meter</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Type                                                     | Venturimeter with Differential Pressure Transducer        |       |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
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| <b>d. Air Quality Monitoring System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                                           |       |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |
| <b>e. Piping System with valves</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | From compressor to receiver tank exit as per requirement |                                                           |       |                    |           |             |                          |       |     |          |                           |      |       |                |                                    |       |                                           |                  |          |                   |             |                                                 |          |                  |               |                       |          |                      |             |         |                          |      |                                                    |       |               |              |                               |                         |                                                         |         |                                                           |                                         |  |  |                                     |                                                          |  |

## TECHNICAL SPECIFICATIONS

| Sr. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Item Name                | Ref. No.                                                                                                      | Qty.  |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
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| 2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Compressed Air Heater    | No. MED/SAC/DRDO/2154/17-18                                                                                   | 1 set |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
| <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">No. Equipment Name</th> <th style="width: 35%;">Parameter</th> <th style="width: 35%;">Requirement</th> </tr> </thead> <tbody> <tr> <td rowspan="6" style="vertical-align: top;"><b>a. Thermic Fluid Heater</b></td> <td>Capacity</td> <td>@2.5 – 2.8 lac kcal/hr</td> </tr> <tr> <td>Fluid Inlet Temperature</td> <td>@260 – 265 °C</td> </tr> <tr> <td>Fluid Outlet Temperature</td> <td>@275 – 285 °C</td> </tr> <tr> <td>Oil Pump</td> <td>Air Cooled (Reputed Make)</td> </tr> <tr> <td>Oil Burner</td> <td>Diesel/Kerosene based compact, progressive type</td> </tr> <tr> <td>Control Panel</td> <td>Integral with fittings and safety devices</td> </tr> <tr> <td rowspan="10" style="vertical-align: top;"><b>b. Air Heater</b></td> <td>Type</td> <td>Finned Tube</td> </tr> <tr> <td>Rating</td> <td>@2 – 2.2 lac/kcal/hr</td> </tr> <tr> <td>Air Inlet Temperature</td> <td>@40 – 50 °C</td> </tr> <tr> <td>Air Outlet Temperature</td> <td>@240 – 250 °C</td> </tr> <tr> <td>Air Flow Rate</td> <td>@0.4 – 1 kg/s</td> </tr> <tr> <td>Inlet Air Pressure</td> <td>5 kg/cm<sup>2</sup>(g)</td> </tr> <tr> <td>Pressure Drop</td> <td>Minimum and should be specified clearly by the supplier</td> </tr> <tr> <td>Controls</td> <td>With feedback control to achieve set exit air temperature within +/- 5 °C</td> </tr> <tr> <td>Safety</td> <td>Safe upto 10 kg/cm<sup>2</sup> and 300 °C with necessary pressure, temperature indicators and safety devices</td> </tr> <tr> <td>Piping and Valves</td> <td>From Air receiver tank to Setup (Insulated)</td> </tr> <tr> <td>Fuel Tank</td> <td>200 liters</td> </tr> </tbody> </table> |                          |                                                                                                               |       | No. Equipment Name | Parameter | Requirement | <b>a. Thermic Fluid Heater</b> | Capacity | @2.5 – 2.8 lac kcal/hr | Fluid Inlet Temperature | @260 – 265 °C | Fluid Outlet Temperature | @275 – 285 °C | Oil Pump | Air Cooled (Reputed Make) | Oil Burner | Diesel/Kerosene based compact, progressive type | Control Panel | Integral with fittings and safety devices | <b>b. Air Heater</b> | Type | Finned Tube | Rating | @2 – 2.2 lac/kcal/hr | Air Inlet Temperature | @40 – 50 °C | Air Outlet Temperature | @240 – 250 °C | Air Flow Rate | @0.4 – 1 kg/s | Inlet Air Pressure | 5 kg/cm <sup>2</sup> (g) | Pressure Drop | Minimum and should be specified clearly by the supplier | Controls | With feedback control to achieve set exit air temperature within +/- 5 °C | Safety | Safe upto 10 kg/cm <sup>2</sup> and 300 °C with necessary pressure, temperature indicators and safety devices | Piping and Valves | From Air receiver tank to Setup (Insulated) | Fuel Tank | 200 liters |
| No. Equipment Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Parameter                | Requirement                                                                                                   |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
| <b>a. Thermic Fluid Heater</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Capacity                 | @2.5 – 2.8 lac kcal/hr                                                                                        |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Fluid Inlet Temperature  | @260 – 265 °C                                                                                                 |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Fluid Outlet Temperature | @275 – 285 °C                                                                                                 |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Oil Pump                 | Air Cooled (Reputed Make)                                                                                     |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Oil Burner               | Diesel/Kerosene based compact, progressive type                                                               |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Control Panel            | Integral with fittings and safety devices                                                                     |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
| <b>b. Air Heater</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Type                     | Finned Tube                                                                                                   |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Rating                   | @2 – 2.2 lac/kcal/hr                                                                                          |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Air Inlet Temperature    | @40 – 50 °C                                                                                                   |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Air Outlet Temperature   | @240 – 250 °C                                                                                                 |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Air Flow Rate            | @0.4 – 1 kg/s                                                                                                 |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Inlet Air Pressure       | 5 kg/cm <sup>2</sup> (g)                                                                                      |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Pressure Drop            | Minimum and should be specified clearly by the supplier                                                       |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Controls                 | With feedback control to achieve set exit air temperature within +/- 5 °C                                     |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Safety                   | Safe upto 10 kg/cm <sup>2</sup> and 300 °C with necessary pressure, temperature indicators and safety devices |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Piping and Valves        | From Air receiver tank to Setup (Insulated)                                                                   |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |
| Fuel Tank                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 200 liters               |                                                                                                               |       |                    |           |             |                                |          |                        |                         |               |                          |               |          |                           |            |                                                 |               |                                           |                      |      |             |        |                      |                       |             |                        |               |               |               |                    |                          |               |                                                         |          |                                                                           |        |                                                                                                               |                   |                                             |           |            |

## TECHNICAL SPECIFICATIONS

| Sr. No.    | Item Name                                                    | Ref. No.                            | Qty.                                                                                                                      |
|------------|--------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 3.         | Data Acquisition System with Necessary Software and Hardware | No. MED/SAC/DRDO/2157/17-18         | 1 set                                                                                                                     |
| <b>No.</b> | <b>Equipment Name</b>                                        | <b>Parameter</b>                    | <b>Requirement</b>                                                                                                        |
| <b>1.</b>  | <b>High Speed DAQ</b>                                        | <b>Data Acquisition System</b>      |                                                                                                                           |
|            |                                                              | Operating System                    | Windows 7 or higher                                                                                                       |
|            |                                                              | Lab VIEW Support                    | Yes                                                                                                                       |
|            |                                                              | Sample Rate                         | 1 kS/s per channel or as per system                                                                                       |
|            |                                                              | Sampling Mode                       | Multiplexed                                                                                                               |
|            |                                                              | Resolution                          | 16 bits or better as per vendors design                                                                                   |
|            |                                                              | Range Accuracy                      | +/- 0.05% accuracy                                                                                                        |
|            |                                                              | Minimum Voltage Range               | ± 0.1 V                                                                                                                   |
|            |                                                              | Over Voltage Protection             | +/- 40 V.                                                                                                                 |
|            |                                                              | PC interface                        | USB / Ethernet                                                                                                            |
|            |                                                              | Digital Trigger Source              | Module terminal / Software-selectable                                                                                     |
|            |                                                              | Network Interface                   | Network protocols TCP/IP, UDP                                                                                             |
|            |                                                              | <b>Pressure/Voltage Measurement</b> |                                                                                                                           |
|            |                                                              | Number of channels                  | 32 single-ended channels/16 differential                                                                                  |
|            |                                                              | ADC resolution                      | 16 bits                                                                                                                   |
|            |                                                              | Input coupling                      | DC                                                                                                                        |
|            |                                                              | Nominal input ranges                | ±10 V, ±5 V, ±1 V, ±0.2 V, 4-20mA                                                                                         |
|            |                                                              | CMRR, DC to 60 Hz                   | 100 dB                                                                                                                    |
|            |                                                              | Input impedance (AI-to-COM)         | >10 GΩ in parallel with 100 pF                                                                                            |
|            |                                                              | Powered on                          | 4.7 kΩ minimum                                                                                                            |
|            |                                                              | Powered off/overload                |                                                                                                                           |
|            |                                                              | Signal Connectivity                 | as required                                                                                                               |
|            |                                                              | Form Factor                         | as required                                                                                                               |
|            |                                                              | Measurement Accuracy                | Accuracy : ± 0.05% FS                                                                                                     |
|            |                                                              | <b>Temperature Measurement</b>      |                                                                                                                           |
|            |                                                              | Number of channels                  | 32 thermocouple channels                                                                                                  |
|            |                                                              | Type of ADC                         | Delta-sigma                                                                                                               |
|            |                                                              | Cold Junction compensation          | 4 internal cold-junction compensation channels                                                                            |
|            |                                                              | Temperature measurement ranges      | Works over temperature ranges defined by NIST (J, K, T, E, N, B, R, S thermocouple types)                                 |
|            |                                                              | Common-mode voltage range           | ±1.2 V minimum                                                                                                            |
|            |                                                              | Channel-to-COM                      | ±250 V                                                                                                                    |
|            |                                                              | COM-to-earth ground connectivity    | Isothermal terminal Block                                                                                                 |
|            |                                                              | Engineering Unit output             | degC, K                                                                                                                   |
|            |                                                              | Measurement Accuracy                | K-type thermocouple ( Working Range : Room temperature to 800 °C )<br>±1.0°C upto 200°C<br>±3.0°C between 200 °C & 800 °C |

**TECHNICAL SPECIFICATIONS (CONT.)**

| Sr. No.                                                                  | Item Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Ref. No.                    | Qty.  |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
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| 3.                                                                       | Data Acquisition System with Necessary Software and Hardware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No. MED/SAC/DRDO/2157/17-18 | 1 set |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| <b>No. Equipment Name</b><br><b>1. High Speed DAQ</b>                    | <table border="0"> <tr> <td colspan="2"><b>Parameter</b></td> </tr> <tr> <td colspan="2"><b>Digital Input</b></td> </tr> <tr> <td>Digital logic levels</td> <td>Digital logic levels</td> </tr> <tr> <td></td> <td>Input high, VIH</td> </tr> <tr> <td></td> <td>Minimum 2.0 V</td> </tr> <tr> <td></td> <td>Maximum 3.3 V</td> </tr> <tr> <td></td> <td>Input low, VIL</td> </tr> <tr> <td></td> <td>Minimum 0 V</td> </tr> <tr> <td></td> <td>Maximum 0.34 V</td> </tr> <tr> <td></td> <td>Output high, VOH, sourcing 75 <math>\mu</math> A</td> </tr> <tr> <td></td> <td>Minimum 2.1 V</td> </tr> <tr> <td></td> <td>Maximum 3.3 V</td> </tr> <tr> <td></td> <td>Output low, VOH, sinking 250 <math>\mu</math> A</td> </tr> <tr> <td></td> <td>Minimum 0 V</td> </tr> <tr> <td></td> <td>Maximum 0.4 V</td> </tr> <tr> <td colspan="2"><b>Counters/Timers</b></td> </tr> <tr> <td>Counters</td> <td>8</td> </tr> <tr> <td>Buffered Operations</td> <td>Yes</td> </tr> <tr> <td>Debouncing / Glitch Removal</td> <td>Yes</td> </tr> <tr> <td>Max Source Frequency</td> <td>1 MHz</td> </tr> <tr> <td>Size</td> <td>32 bits</td> </tr> <tr> <td>Logic Levels</td> <td>24 V</td> </tr> <tr> <td>Programmable</td> <td>TTL</td> </tr> <tr> <td>Overvoltage protection</td> <td><math>\pm 30</math> V</td> </tr> <tr> <td colspan="2"><b>Frequency Measurement</b></td> </tr> <tr> <td colspan="2">No of Channels – 4</td> </tr> <tr> <td colspan="2">Measurement Method : Counter measurement/ Frequency to Voltage converter</td> </tr> <tr> <td colspan="2"><u>Signal Specifications:</u></td> </tr> <tr> <td colspan="2">Input :</td> </tr> <tr> <td></td> <td>Selectable Input Voltage Range : <math>\pm 1</math>V, <math>\pm 5</math>V , <math>\pm 10</math>V</td> </tr> <tr> <td></td> <td>Current input - <math>\pm 20</math>mA, 0-20mA</td> </tr> <tr> <td></td> <td>Input Frequency Range: 0 to 6kHz</td> </tr> <tr> <td></td> <td>Low Pass Filter cutoff frequency – 6Khz</td> </tr> <tr> <td></td> <td>Impedance of Pulse probe: 20<math>\Omega</math></td> </tr> <tr> <td></td> <td>Impedance of Flow meter: 2k<math>\Omega</math></td> </tr> <tr> <td colspan="2">Output :</td> </tr> <tr> <td></td> <td>Output Voltage: 5VDC , Open collector Square wave</td> </tr> <tr> <td colspan="2">Isolation (three way): 1000VDC</td> </tr> <tr> <td colspan="2">The accuracy of the measurement: <math>\pm 0.07</math> % FS</td> </tr> </table> | <b>Parameter</b>            |       | <b>Digital Input</b> |  | Digital logic levels | Digital logic levels |  | Input high, VIH |  | Minimum 2.0 V |  | Maximum 3.3 V |  | Input low, VIL |  | Minimum 0 V |  | Maximum 0.34 V |  | Output high, VOH, sourcing 75 $\mu$ A |  | Minimum 2.1 V |  | Maximum 3.3 V |  | Output low, VOH, sinking 250 $\mu$ A |  | Minimum 0 V |  | Maximum 0.4 V | <b>Counters/Timers</b> |  | Counters | 8 | Buffered Operations | Yes | Debouncing / Glitch Removal | Yes | Max Source Frequency | 1 MHz | Size | 32 bits | Logic Levels | 24 V | Programmable | TTL | Overvoltage protection | $\pm 30$ V | <b>Frequency Measurement</b> |  | No of Channels – 4 |  | Measurement Method : Counter measurement/ Frequency to Voltage converter |  | <u>Signal Specifications:</u> |  | Input : |  |  | Selectable Input Voltage Range : $\pm 1$ V, $\pm 5$ V , $\pm 10$ V |  | Current input - $\pm 20$ mA, 0-20mA |  | Input Frequency Range: 0 to 6kHz |  | Low Pass Filter cutoff frequency – 6Khz |  | Impedance of Pulse probe: 20 $\Omega$ |  | Impedance of Flow meter: 2k $\Omega$ | Output : |  |  | Output Voltage: 5VDC , Open collector Square wave | Isolation (three way): 1000VDC |  | The accuracy of the measurement: $\pm 0.07$ % FS |  |  |  |
| <b>Parameter</b>                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| <b>Digital Input</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Digital logic levels                                                     | Digital logic levels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Input high, VIH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Minimum 2.0 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Maximum 3.3 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Input low, VIL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Minimum 0 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Maximum 0.34 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Output high, VOH, sourcing 75 $\mu$ A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Minimum 2.1 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Maximum 3.3 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Output low, VOH, sinking 250 $\mu$ A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Minimum 0 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Maximum 0.4 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| <b>Counters/Timers</b>                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Counters                                                                 | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Buffered Operations                                                      | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Debouncing / Glitch Removal                                              | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Max Source Frequency                                                     | 1 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Size                                                                     | 32 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Logic Levels                                                             | 24 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Programmable                                                             | TTL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Overvoltage protection                                                   | $\pm 30$ V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| <b>Frequency Measurement</b>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| No of Channels – 4                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Measurement Method : Counter measurement/ Frequency to Voltage converter |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| <u>Signal Specifications:</u>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Input :                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Selectable Input Voltage Range : $\pm 1$ V, $\pm 5$ V , $\pm 10$ V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Current input - $\pm 20$ mA, 0-20mA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Input Frequency Range: 0 to 6kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Low Pass Filter cutoff frequency – 6Khz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Impedance of Pulse probe: 20 $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Impedance of Flow meter: 2k $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Output :                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
|                                                                          | Output Voltage: 5VDC , Open collector Square wave                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| Isolation (three way): 1000VDC                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |
| The accuracy of the measurement: $\pm 0.07$ % FS                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |       |                      |  |                      |                      |  |                 |  |               |  |               |  |                |  |             |  |                |  |                                       |  |               |  |               |  |                                      |  |             |  |               |                        |  |          |   |                     |     |                             |     |                      |       |      |         |              |      |              |     |                        |            |                              |  |                    |  |                                                                          |  |                               |  |         |  |  |                                                                    |  |                                     |  |                                  |  |                                         |  |                                       |  |                                      |          |  |  |                                                   |                                |  |                                                  |  |  |  |

### TECHNICAL SPECIFICATIONS (CONT.)

| Sr. No.    | Item Name                                                    | Ref. No.                    | Qty.                                                                                                         |
|------------|--------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------|
| 3.         | Data Acquisition System with Necessary Software and Hardware | No. MED/SAC/DRDO/2157/17-18 | 1 set                                                                                                        |
| <b>No.</b> | <b>Equipment Name</b>                                        | <b>Parameter</b>            |                                                                                                              |
| 1.         | High Speed DAQ                                               | Data Logging Hardware       |                                                                                                              |
|            |                                                              | System Manufacturer:        | Hewlett-Packard / DELL / LENOVO                                                                              |
|            |                                                              | System Type:                | x64-based PC                                                                                                 |
|            |                                                              | Processor(s):               | Intel (R) Core(TM) i7-6500U CPU@ 2.50GHz 2.59GHz or latest                                                   |
|            |                                                              | RAM                         | 4GB                                                                                                          |
|            |                                                              | Hard Disk                   | 1TB                                                                                                          |
|            |                                                              | Operating System            | Preloaded with Microsoft Windows latest Version along with MS-Office tools                                   |
|            |                                                              | Network Card                | Broadcom BCM943228Z 802.11abgn 2x2 M.2 Wi-Fi Adapter<br>RealtekPCIeGBE Family Controller<br>Bluetooth Device |
|            |                                                              | Features                    | USB ports<br>RS 232 Serial Port                                                                              |
|            |                                                              | Display                     | 24" High- Definition+LED Touchscreen Display                                                                 |
|            |                                                              | High Speed Data Port        | 4 port RS 232/422/485 Serial Device                                                                          |

## TECHNICAL SPECIFICATIONS

| Sr. No.                      | Item Name                    | Ref. No.                    | Qty.  |
|------------------------------|------------------------------|-----------------------------|-------|
| 4.                           | Fuel Supply System           | No. MED/SAC/DRDO/2158/17-18 | 1 set |
| <b>No. Equipment Name</b>    | <b>Parameter</b>             | <b>Requirement</b>          |       |
| <b>1. Fuel Supply System</b> | Fuel Pump with VFD           |                             |       |
|                              | Discharge Pressure           | upto 21 kg/cm <sup>2</sup>  |       |
|                              | Mass Flow                    | 0.0076 kg/s                 |       |
|                              | Fuel type                    | Kerosene                    |       |
|                              | Fuel Mass Flow Controller    | 0 - 100 kg/hr               |       |
|                              | Accuracy for Control         | Better than 0.5%            |       |
|                              | Buffer Fuel Tank with Filter | 100 litres                  |       |
|                              | Main Fuel Tank with Filter   | 250 litres                  |       |
|                              | Atomizer                     | Simplex - 7 GPH             |       |
|                              | Fuels                        | Kerosene                    |       |