



Government of Goa

DIRECTORATE OF SKILL DEVELOPMENT & ENTREPRENEURSHIP

Shramashakti Bhavan, 3rd Floor, Patto, Panaji-Goa, 403001

Tel.: (0832)2437059/60; Fax: (0832)2437060.

Website: www.dsde.goa.gov.in

Email: dir-sdct.goa@nic.in

Ref: . 5/FGD/ITI/STR/Instrument Mechanic/2022-2023

Date 18.09.2024

BRIEF TENDER NOTICE
(e-TENDERING MODE ONLY)

The Director, Directorate of Skill Development and Entrepreneurship, Panaji-Goa, hereby invites bids/tenders on behalf of the Governor of Goa from eligible bidders through e-Tendering mode for procurement Of **Tools, Machinery and Equipments for Instrument Mechanic and Refrigeration & Air Conditioner Technician Trade :-**

Sr. No.	e-Tender No.	Name of Work	Estimated Cost (Rs.)	EMD (Rs.)	Tender Form Fee (Non Refundable) (Rs.)	eTender Processing Fee (Non Refundable) (Rs.)
1	DSDE/Project/e-Tender/ 2024-25/001	"procurement of Tools, Machinery and Equipments for Instrument Mechanic and Refrigeration & Air Conditioner Technician Trade"	1,75,64,176.00	4,39,104.00/-	6,000/-	6,000/-

The Schedule of the e-Tender process and payment details are as below:-

Activity	Time lines
The last date of online submission of Tender	11/10/2024 upto 15:00 hrs.
The date and time of Opening of online Tender	14/10/2024 at 12:00 hrs as mentioned in e-Tender documents
Payment Details	Mode of Payment : ePayment Only
Tender Form Fee (Non Refundable)	<i>Mode of Payment towards Tender Document Fee(TDF), e-Tender Processing Fee(TPF) & Earnest Money Deposit(EMD) to be paid online through e-Payment mode via : (i) National Electronic Fund Transfer (NEFT) / Real-Time Gross Settlement (RTGS).Tenderer requires download pre-printed Challan towards credit of ITG available on e-tender website and make its payment through any of their Bank. (ii) Net Banking: Payment can be made through the Internet Banking of Any Bank.</i>
eTender Processing Fee (Non Refundable)	
Earnest Money Deposit (EMD) <i>As stated above.</i>	
	<i>Any Payments made through NEFT/RTGS will take 24 hours for its reconciliation. Hence the payments through NEFT/RTGS should be made at least TWO BANK WORKING DAYS in advance before any due date and upload the scanned copy of challans in the e-Tender website as a token of payment.</i>

For more details, please visit our website www.dsde.goa.gov.in and for participation in e-Tender please visit our e-Tender website <https://www.eprocure.goa.gov.in>

-Sd-

Director of Skill Development and Entrepreneurship
Panaji-Goa



Government of Goa
DIRECTORATE OF SKILL DEVELOPMENT & ENTREPRENEURSHIP

Shramashakti Bhavan, 3rd Floor, Patto-Plaza, Panaji, Goa 403 001

Ph:(0832)2437059/60 | Fax:2437060

Website: www.dsde.goa.gov.in

Email: procurement-sdct.goa@nic.in

Ref No: 5/FGD/ITI/STR/Instrument Mechanic/2022-2023

Date: 18 /09/2024

Tender Form & Specification of the Tender Item

TENDER NO. : - DSDE/Projects/e-Tender/2024-25/ 001

NAME OF THE WORK – Procurement of Tools,Machinery and Equipment for Instrument Mechanic and Refrigeration & Air Conditioner Technician Trade

ESTIMATED COST- Rs 1,75,64,176/-

EMD - Rs 4,39,104/-

TENDER SHALL REMAIN VALID TILL - 180 days

DELIVERY PERIOD - 45 days from the date of issue of Supply Order

IMPORTANT : 1) Prescribed Tender Form should be submitted **ONLINE** to the Directorate of Skill Development &Entrepreneurship, Shrama Shakti Bhavan, 3rd Floor, Patto Panaji – Goa digitally signed by the tenderer, otherwise offer will be rejected.

2) Detailed Technical specifications are given below:-

Sr. No.	Description/Specification of Items	Qty.	Unit
	Refer Annexure –I and II		

(Signature of Tenderer)

TENDER SCHEDULE & IMPORTANT DATES

Please Note: All bid related activities (Process) like Tender Document Download, Bid Preparation, bid submission and submission of other documents will be governed by the time schedule given under Key Dates below:

Activity	Time Schedule
Online submission of Tender Document	18/09/2024 to 11/10/2024 up to 15:00 hrs
Pre-bid meeting	30.09.2024 at 12:00 hrs
Online opening of Technical bid	14.10.2024 at 12:00 hrs
Online opening of Financial bid	Will be communicated later

INSTRUCTIONS TO BIDDERS

1. GENERAL INSTRUCTIONS:-

- 1.1 To view- Tender Notice, Detailed Time Schedule, Tender Document for this Tender and subsequently purchase the Tender Document and its supporting documents, kindly visit following e-Tendering website of Government of Goa: <https://eprocure.goa.gov.in>
- 1.2 If any assistance is required regarding e-Tendering (registration / upload / download) please contact e-procure help desk on following numbers: 9834889836, 7972854213, 7822039673, 7972871944, e-tender.goa@gov.in
- 1.3 Bidders to quote for items of leading brand with ISO certification, wherever applicable.

2 PURCHASE AND DOWNLOADING OF TENDER FORM:-

- 2.1 The tender document is uploaded / released on Government of Goa, e-tendering website <https://eprocure.goa.gov.in>. Tender document and supporting documents have to be purchased on-line and downloaded from following link of Directorate of Skill Development & Entrepreneurship on e-Tendering website of Government of Goa, <https://eprocure.goa.gov.in> by making online payments for Tender document and tender processing fee.

Mode of Payment towards Tender Document Fee(TDF), e-Tender Processing Fee(TPF) & Earnest Money Deposit(EMD) to be paid online through e-Payment mode via : (i) National Electronic Fund Transfer (NEFT) / Real-Time Gross Settlement (RTGS). Tenderer requires download pre-printed Challan towards credit of ITG available on e-tender website and make its payment through any of their Bank (ii). Net Banking: Payment can be made through the Internet Banking of Any Bank. Any Payments made through NEFT/RTGS will take 24 hours for its reconciliation. Hence the payments through NEFT/RTGS should be made at least TWO BANK WORKING DAYS in advance before any due date and upload the scanned copy of challans in the e-Tender website as a token of payment.

- 2.2 Tender forms will not be sold / issued manually from Directorate of Skill Development & Entrepreneurship, Shram Shakti Bhavan, 3rd Floor, Patto Panaji – Goa.
- 2.3 Only those Tender offers shall be accepted for evaluation for which non-refundable Tender document Fee (non-refundable), Tender processing fee (non-refundable) and EMD (refundable) as mentioned in the tender document is received online on or before scheduled date given in TIME SCHEDULE AND IMPORTANT DATES of the tender.

3. SUBMISSION OF BIDS

- 3.1 Both the Bids (Technical and Financial) shall have to be submitted online **only**. Bids not submitted online will not be entertained.
- 3.2 **Bidder shall strictly quote for all the items with specified brand/ make OR equivalent brand as evaluation shall be done for Total Value of the bid and not item wise for award of contract.**
1. **Manufacturer Authorization:** Wherever Authorised Distributors/service providers are submitting the bid, Authorisation Form /Certificate with OEM/Original Service Provider details such as name, designation, address, e-mail Id and Phone No. required to be furnished along with the bid.
- 3.3 Bidders shall quote for the entire scope of contract on an “overall responsibility” basis such that the total bid price covers Bidder’s all obligations mentioned in the bidding documents in respect of providing the services.
- 3.4 The bidder should quote all the items as part of the BoQ.
- 3.5 The bidder should supply all the items as part of the BoQ and should be as per the specification mentioned in the tender.

3.6 Offer should be inclusive of all taxes, F.O.R. Destination (GST, packing & forwarding, freight upto destination, loading unloading, insurance charges & other charges, if any).

3.7 Technical Bid shall contain following documents (in the form of PDF files / Scanned images). These documents need to be digitally signed by individual tenderer's digital signature and uploaded during online bid preparation stage: -

- 1) Submit all GST Returns i.e. 3B/ GST R1 along with Tax Challan for the Last three months.
- 2) No Deviation Certificate in detail in the prescribed proforma should be submitted for each item separately, wherever there is no deviation.
- 3) The Bidder should furnish **document** to support that he has the financial capacity to perform the contract. For this the bidder should have the minimum turnover of **four times** the estimated amount of this e-Tender average last three Financial years(i.e. FY 2020-21, FY 2021-22, FY 2022-23). In case the date of constitution / incorporation of the bidder is less than 3-year-old, the average turnover in respect of the completed financial years after the date of constitution shall be taken into account for this criteria. A certificate issued by the Chartered Accountant (Showing the Annual Turnover of last three years) with their Signature, registration No. & Seal must be submitted along with the bid.
- 4) Annual Turnover (Total of the last 3 years) shall be equal or more than 21 Crores. In case the date of constitution / incorporation of the bidder is less than 3-year-old, the average turnover in respect of the completed financial years after the date of constitution shall be taken into account for this criteria. A certificate issued by the Chartered Accountant (Showing the Annual Turnover of last three years) with their Signature, registration No. & Seal must be submitted along with the bid.
- 5) Manufacturer's Catalogue / Leaflet / Circuit-diagram / Layout-diagram for each equipment should be attached with the offer, wherever applicable.
- 6) Valid registration Certificate of the company / firm.
- 7) PAN CARD copy.
- 8) The product may be quoted with the ISI Certification wherever applicable.
- 9) Partnership deed in case of partnership firm
- 10) In case the bidder is a Proprietorship Firm : - Certified copy of Shop establishment/ Professional Tax Certificate
- 11) Undertaking for service after sales and warranty for minimum 1 year should be given along with tender.

- 12) Undertaking of delivery period within 45 days is to be submitted.
- 13) Undertaking for providing validity of quoted rates for one year from the date of opening of bid.
- 14) Undertaking for delivery at various institutes/Centres, including demonstration, installation, satisfactory trial at free of cost and service during warranty period.
- 15) Undertaking duly signed by the tenderer regarding acceptance of penalty clause, risk purchase clause and fall clause.
- 16) Undertaking to provide AMC/CMC on demand.
- 17) Undertaking that Bidder has not been blacklisted for any default in supply by any Govt. agency. The bidder must have to submit a Declaration on INR 100 Judicial Stamp duly notarized for not having been debarred/blacklisted either by the any Bid Inviting Authority or by any organization functional under Central/ State government. The bid will be rejected without this document. This statement ought to be current as of the date the bid was published
- 18) An affidavit of non – bankruptcy insolvency of bidder, duly attested by the Notary public must be enclosed.
- 19) Undertaking that the bidder is fully conversant with terms and conditions of tender for the supply of machinery / equipments / tools in ITI college Goa.
- 20) Affidavit: The bidder shall furnish an affidavit on stamp paper duly notarized having value of INR 100 to the effect that the correct information has been furnished in the tender and the bidder shall be solely responsible for furnishing wrong/false information in the bid. The bid will be rejected without this document.
- 21) The net worthy of the bidder in last financial year i.e. 2022-23, should be positive (document to support this).
- 22) The Bidder /OEM company shall be an ISO 9001:2015, 14001:2015, 45001:2018 certified company. A copy of valid ISO certification should be enclosed with the bid.
- 23) Bidder may be called for technical presentaion for the offered products and services as per the date and time to be informed by purchaser. This presentation will be part of technical evaluation. If bidder fail to give satisfactory presentation then repective bidder's bid will be treated as non responsive.
- 24) The bidder will have to submit samples of quoted items on demand and give demonstration in the prescribed time limit before opening of financial bid, this will be part of technical evaluation. In case the samples, are not produced

in the prescribed time limit, then bid will be rejected and it shall be open to the Department to forfeit Earnest Money Deposited by the bidder. If the samples sent by the party are approved, the same and may be adjusted in regular supply and in the case of rejection, they will be returned back to the party at their cost.

25) Experience criteria-

Bidder should have regularly supplied same or similar Category Products to any Central / State Govt Organization for last Two Financial years before the bid opening date. Copies of relevant contracts to be submitted along with bid in support of having supplied some quantity during each of the financial year.

For fulfilling the experience criteria any one of the following documents may be considered as valid proof

1. Purchase Order copy along with Invoice(s) with self-certification by the bidder that supplies against the invoices have been executed.
2. Execution / Completion certificate by client with order value

26) Past Performance:

Bidder should have executed a single order amount of Rs. 150 Lacs or above for same or similar Category Products, in at least one of the last two financial years to any Central / State Govt Organization.

For fulfilling the Past Experience criteria any one of the following documents may be considered as valid proof

1. Purchase Order copy along with Invoice(s) with self-certification by the bidder that supplies against the invoices have been executed.
2. Purchase Order copy along with Execution / Completion certificate by client with order value.

Buyer can ask to verify all the orders and received payment details which are submitted in the bid.

27) Bidder should submit the manufacturing documents of OEM- Factory Licence / MSME Certificate, in absence of manufacturing documents the Bid will be rejected.

- 3.8 In case, during the scrutiny of the bids of any bidder, if it is revealed that the documents submitted by the bidder is/ are unauthentic, then such bid/s shall be summarily rejected and further course of action on the said bidder/s shall be initiated as per rules, including forfeiture of the EMD.
- 3.9 The bidders shall submit physical copies of above documents in sealed envelopes for verification, if required, during the bid evaluation process.

3.10 Bidder should have no legal / financial irregularity case pending against them for which charges stand framed and trial commenced in any court of law and affidavit to this effect shall have to be filled by the bidder.

Note: If, during online bid preparation, any need arises to upload additional documents, apart from the above mentioned documents, an option to upload additional documents has been provided in the e-Tendering software which will be available to bidders during online bid preparation stage.

4.0 COMMERCIAL BID :

1. All financial offers must be prepared and submitted online (An online form will be provided, during online bid preparation stage) and signed using individual's digital certificate.
2. The bidder should quote all the items of the Bid. **NQ or Zero** value entered will not be considered and bid will be rejected accordingly.
3. The bidder should not quote his offer anywhere directly or indirectly in Technical bidding failing which the Commercial bid shall not be opened and his tender shall stand rejected.

5.0 OPENING OF BID :-

5.1 TECHNICAL BID: Technical bid will be opened online through e-Tendering procedure, to verify its contents as per requirements, on the date specified in Tender document in presence of tenderer/s or their authorized Representative. Authorized Representative to produce letter of Authorization from the Company/Establishment during his presence.

If the various documents contained in this Technical Bid do not meet the requirements, a note will be recorded accordingly by the tender opening authority and the said tenderer's commercial bid will not be considered for further action but the same will be recorded. Decision of the tender opening authority shall be final in this regard.

5.2 COMMERCIAL BID:

The tenderers qualifying technically are only eligible for opening of commercial bid. The commercial bid will be opened in the presence of tenderer or their authorised representative at a date which will be notified later. **Authorized Representative to produce letter of Authorization from the Company/Establishment during his presence.** This bid shall be opened online through e-Tendering procedure only. The commercial bids shall not be opened till the completion of evaluation of technical bids by the Technical Bid Evaluation Committee. Commercial Bids of only technically qualified Bidders will be opened.

The Commercial bid must be filled online using individual's digital certificate. (An online form will be provided to bidders for Price Schedule during online bid preparation stage).

Offer should be inclusive of all taxes, F.O.R. Destination (excise duty, sales tax, packing & forwarding, freight upto destination, loading unloading, insurance charges & other charges, if any).

6.0 Evaluation of Bid:

Technical Evaluation Committee will evaluate Technical Bid first and only those bids which are Technically Qualified shall be considered for opening of Commercial Bid.

The bid will be evaluated for Total Value of the bid and the lowest bid (i.e. L-1) will be considered for placing supply order.

7.0 EARNEST MONEY DEPOSIT (EMD):

The tenderer shall have to furnish Earnest Money Deposit (E.M.D.) **payable** through online payment Gateway on portal <https://eprocure.goa.gov.in>

Mode of Payment towards Tender Document Fee(TDF), e-Tender Processing Fee(TPF) & Earnest Money Deposit(EMD) to be paid online through e-Payment mode via : (i) National Electronic Fund Transfer (NEFT) / Real-Time Gross Settlement (RTGS). Tenderer requires download pre-printed Challan towards credit of ITG available on e-tender website and make its payment through any of their Bank (ii). Net Banking: Payment can be made through the Internet Banking of Any Bank. Any Payments made through NEFT/RTGS will take 24 hours for its reconciliation. Hence the payments through NEFT/RTGS should be made at least TWO BANK WORKING DAYS in advance before any due date and upload the scanned copy of challans in the e-Tender website as a token of payment.

The tenders without Earnest Money Deposit will summarily be rejected. The Earnest Money Deposit of unsuccessful tenderer shall be refunded. The E.M.D. of the successful tenderer will be refunded or adjusted against Security Deposit, after the tender is accepted and agreement is executed. The Earnest Money shall be forfeited to the Government Treasury in case of breach of any of the conditions governing the supply. If any tenderer withdraws the tender after submission, his / her EMD will be forfeited to Government Treasury.

8. JURISDICTION:

The legal jurisdiction is Panaji – Goa.

9. ACCEPTANCE / REJECTION OF BIDS:

The Directorate of Skill Development & Entrepreneurship reserves the right for any changes / cancellation / rejection of any/all offers, without assigning any reason what-so-ever.

10. PRE-DISPATCH INSPECTION:

Pre-dispatch Inspection will be carried out from the representative of this Directorate, if required by the Department. However inspection charges will be borne by the tenderer.

11. SCHEDULE OF REQUIREMENTS :-

Bidder is required to undertake the scope of work for ITI as mentioned below. The scope of work of tender will include the supply of below listed machinery / equipments / tools in ITI.

12. DELIVERY OF GOODS :-

The successful tenderer shall arrange to supply the material at places mentioned in the supply order without any additional charges towards packaging, forwarding, freight,etc. The Tenderer should obtain acknowledgement and issue delivery challan for the material supplied.

13. TIME LIMIT FOR SUPPLY :-

The materials should be delivered within the stipulated period specified in the supply order or within short notice depending upon the situation. Any of the materials received in broken or damaged condition the same will have to be replaced by the successful tenderer without any additional cost & within the stipulated period. Any cost incurred on transportation of damaged goods will have to be borne by the supplier

14. INSTALLATION:

Installation and free working trial is to be given to all consignees at their sites, wherever applicable.

15. WARRANTY:

Warranty should be minimum one year for machines as well as for its accessories from the date of installation and demonstration.

16. PAYMENT TERMS:-

100% of the payment shall be released immediately after acceptance, installation and commissioning of goods the equipments and Machinery.

17. PERFORMANCE GUARANTEE :-

Performance Guarantee / Security Deposit equivalent to 3% of the value of materials/equipment ordered to be submitted within 15 days of the date of supply order by way of Demand Draft/Bank Guarantee infavour of the Directorate of Skill Development &Entrepreneurship, payable at Panaji – Goa valid till a period of 60 days after the date of expiry of defect liability period or the guarantee/ warranty period, as the case may be.

Place : Panaji – Goa

-sd/-
Director,
Directorate of Skill Development &Entrepreneurship
Panaji-Goa

Sr No. 3 (3.7) (2)

No Deviation Certificate

Sr. No.	Specification of Equipment mentioned in Tender Enquiry	Specification of Equipment offered by the tenderer with make and model	Whether there are deviation from the tender specification Yes / No	If yes indicate clear which are the deviation

(Signature of Tenderer)

Sr No. 3(3.2)&(3.6)

PRICE STRUCTURE

Amount in Rs.

Sr No	Description of item offered	Make	Qty	Unit	Rate	GST (if applicable in percent age)	GST Amount	Total Amount without taxes	Total Amount with taxes

ANNEXURE-I

Procurement of Equipements

Sr.no	Description	Total QTY	Unit
1	Potentiometer / Thermocouple Test Set (Specification as per Annexure -II)	1	Nos
2	Calibration test bench for AC and DC voltmeter, AC and DC Ammeter, ohmmeter (Specification as per Annexure -II)	1	Nos
3	“ U” tube manometers, :- Glass tube type with protecting case, safety over wall mounting , scale 120-0120, (Specification as per Annexure -II)	1	Nos
4	Well type manometer, :- Glass tube type 500 mm with protecting case, safety over flow wells, scale adjustment facility, ground balance with spirit leveller. (Specification as per Annexure -II)	1	Nos
5	Inclined limb manometers, :- Glass tube type 500 mm with protecting case, safety over flow wells, scale adjustment facility (Specification as per Annexure -II)	1	Nos
6	Dead weight tester and Compator (Specification as per Annexure -II)	1	No. Each
7	Differential pressure transmitter (Specification as per Annexure -II)	1	Nos
8	HART device communicator and calibrator (Specification as per Annexure -II)	1	Nos
9	P to I converters (Specification as per Annexure -II)	1	Nos
10	Impeller type flow meter (Specification as per Annexure -II)	1	Nos
11	Helical and turbine flow meter (Specification as per Annexure -II)	1	Nos
12	Orifice type flow meter VenturI tube flow meter Rota meter (Specification as per Annexure -II)	1	Nos
13	Magnetic flow meter (Specification as per Annexure -II)	1	Nos
14	Vortex flow meter (Specification as per Annexure -II)	1	Nos

15	Flow control loop set with flow controller, recorder, D.P. transmitter, receiver unit, control Valve and impulse line, computer, Complete experimental set- up for flow measurement (Specification as per Annexure -II)	1	Nos
16	Experimental closed loop set up for solid flow measurement and Control (Specification as per Annexure -II)	1	Nos
17	Flow nozzle Setup (Specification as per Annexure -II)	1	Nos
18	Level control set up with level transmitter (Specification as per Annexure -II)	1	Nos
19	Level measurement equipment for solid (Specification as per Annexure -II)	1	Nos
20	Thermocouple type pyrometer (Specification as per Annexure -II)	1	Nos
21	Radiation Pyrometer (Specification as per Annexure -II)	1	Nos
22	Temperature transmitter, pneumatic (Specification as per Annexure -II)	1	Nos
23	Temperature transmitter electronic (input RTD, TC) (Specification as per Annexure -II)	1	Nos
24	Experimental set up for measuring and controlling of temperature- (Specification as per Annexure -II)	1	Nos
25	Digital temperature calibrator (Specification as per Annexure -II)	1	Nos
26	Strip chart and Pneumatic recorder both single and multi-point (Specification as per Annexure -II)	1	Nos
27	Hydraulic actuators (Specification as per Annexure -II)	1	Nos
28	HART/ field bus/ RS485 final control elements (two different type) (Specification as per Annexure -II)	1	Nos
29	Data acquisition system (DAS) (Specification as per Annexure -II)	1	Nos
30	Digital I/O cards (Specification as per Annexure -II)	2	Nos
31	Conductivity meter & TDS meter (Specification as per Annexure -II)	1	Nos

32	pH meter (Digital) portable (Specification as per Annexure -II)	1	Nos
33	Experimental set up for online conductivity measurement (Specification as per Annexure -II)	1	Nos
34	Experimental set up for online pH measurement (Specification as per Annexure -II)	1	Nos
35	Experimental set up for online dissolved oxygen measurement (Specification as per Annexure -II)	1	Nos
36	HART/Field devices (pressure- flow - level) (Specification as per Annexure -II)	1	Nos
37	Real PID controller training kit Set up (Specification as per Annexure -II)	1	Nos
38	Trainer on RS485 to RS232 Converter (Specification as per Annexure -II)	1	Nos
39	Air-conditioning, indirect system. (Water cooled) complete with all controls including humidity control etc.capacity 15000k.cal/hr` (Specification as per Annexure -II)	1	Nos
40	Package A/C 5 ton capacity, Air cooled type with open type compressor reciprocating type: (Specification as per Annexure -II)	1	Nos
41	CASCADE REFRIGERATION SYSTEM (Specification as per Annexure -II)	1	Nos

ANNEXURE-II

Detail Specifications of Item

1. POTENTIOMETER / THERMOCOUPLE TEST SET

Description:

Precision Potentiometer for resistance feeding For RTD transmitter with digital display. Milli volt source for voltage feeding to thermocouple transmitter. Measurement of milli volt and resistance of sensors. Heating source with temperature change and display like muffle furnace or dry block type up to temperature range 600 deg C or above. Two types (each) of thermocouple and RTD sensors for testing.

Test unit:

A unit with following test facility should be supplied with set.

Measuring Function	: DCV
Range	: 4V, 40V, 400V
ACV Range	: 400mV, 4V, 40V, 400V
DcmV Range	: 40mV, 400mV
OHM	: 400Ohms, 4KOhms, 40KOhms, 400KOhms, 4MOhms, 40Mohms
DC Current Range	: 40mA, 400mA
AC Current	: 40mA, 400mA,
Thermocouple	: R, S, K, E, J, T, N, B
Thermal resistance	: Pt100, CU50

Thermocouple and RTD:

Any two type thermocouple and RTD should be supplied having following details.

Type	: Any two type
Length	: 200 mm
Diameter	: 8 mm
Cable	: minimum 2 mtr.

- The whole set-up will be well designed and arranged on a rigid structure painted with industrial PU Paint.

2. Calibration test bench for AC and DC voltmeter, AC and DC Ammeter, ohmmeter

with built-in 4½ AC/DC Multi-Function Site Calibrator.

Technical specification:

Calibrator for calibration and testing of A.C. Mill ammeters, ammeters, voltmeters and D.C. Mill ammeters, ammeters, millivolt meters, voltmeters and ohmmeters (resistance) having following

Input : 230/240 volts, Single phase a.c. 50 hz.

A. C. Circuit

Output voltage: 0 -1000 volts.

Voltage range : 0 -250 v, 0 - 500 v & 0 - 1000 v each range is selectable by selector switch and continuously variable. Indication by digital voltmeter class better than 0.5%

Output current (1) : 0 -1000 milliamps.

Current ranges : 0 -500 mA and 0- 1000 milliamps each range is selectable by selector switch and continuously variable. Indication by digital milli ammeter class better than 0.5%. Output current (2) : 0 - 50 amps.

Current ranges : 0-1 A, 0-5 A, 0-10 A, 0-25 A & 0-50 A, each range is selectable and continuously variable. Indication by digital ammeter class better than 0.5%.

D.C. Circuit

Output voltage (1) : 0 -1000 millivolts.

Voltage ranges : 0- 250 mv, 0- 500 mv & 0- 1000 mv, each range is selectable and continuously variable. Indication by digital millivolt meter class better than 0.5%

Output voltage (2) : 0- 1000 volts.

Voltage range : 0- 250 v, 0 - 500 v & 0-1000 volts, each range is selectable and continuously variable. Indication by digital voltmeter class better than 0.5%

Output current (1) : 0- 1000 milliamps.

Current ranges : 0- 250 ma, 0- 500 ma & 0 -1000 ma, each range is selectable and continuously variable. Indication by digital milli ammeter class better than 0.5%.

Output current (2) : 0 - 50 amps.

Current ranges : 0-1 a, 0-5a, 0-10a, 0-25a & 0-50 amps, each range is selectable and continuously variable. Separate terminals for high current will be provided. Indication by digital ammeter, class better than 0.5%

Resistance measuring circuit range: 0-2000 $\mu\Omega$, 0-20 m Ω , 0-2000 m Ω , 0-20 Ω , 0-200 Ω , 0-2000 Ω & 0-20 k Ω . (I.e. Suitable for measuring microohms / mili ohms and ohms.) Indication by 3 ½ digit digital meter. Fixed Resistance: 1 Ω , 10 Ω , 100 Ω , 1k Ω , 10k Ω , 100k Ω , 1M Ω , 10 M Ω , 100 M Ω . For measuring winding resistance, conductor resistance and contact resistance of any products.

Components:

- Multi ratio precision current transformers of class 0.2 with suitable tapings.
- Loading transformer with sufficient capacity and tapings.
- Multi range potential/voltage transformer with sufficient capacity.
- Auto Transformer of Sufficient Capacity
- Rectifier circuit for D.C Output with suitable chokes and filtering unit to reduce the

Ripple contents.

- Indicating lamps for input side, output A.C., output D.C. And resistance measuring

Circuit.

- Circuit breaker on input side to avoid any short circuit.

The entire system will be housed in sheet steel desk type panel duly powder coated, assembled, wired and tested. All controlling knobs will be brought out and mounted on the front panel for easy operation.

3. " U" Tube Manometers:-

Technical Specification:

- Range :-0-1200mm
- Fluid :- Monomeric Fluid
- End Connection :- Grooved for easy attachments Single glass tube should be housed in a MS powder coated cabinet
- With draining charging and Zero adjustment. One side of cabinet Should be Perspex and scale should be provided inside the cabinet.
- Ground Balance with spirit Leveler.

4. Well Type Mano meter:-

Technical Specification:

- Range : 0-500mm
- Fluid :- Mercury filled
- End Connection :- Grooved for easy attachment
- Single glass tube should be housed in a MS powder coated cabinet with draining charging and zero adjustment. One side of cabinet Should be Perspex inside the cabinet. ground Balance With Spirit Leveler.

5. Inclined Limb Manometer:-

Technical Specification:

- Range - 500mm scale
- Fluid - Mercury filled
- Resolution - 1mm
- Connection - ¼" SS/PVC Hose nozzle
- Pressure - Normal
- Measuring Tube - Acrylic Tube
- Knob - Zero Adjustment Knob
- Scale - White Acrylic clear with Printed Scale
- Body - Transparent Acrylic body
- Mounting - Wall mounting
- Accuracy - 1% of Full Scale ground Balance With Spirit Leveler.

6. Dead weight tester & comparator Technical

Specification:

It will consist of frictionless piston (ram) mounted on a rugged base. Effortless screw type operating system. Rotation of the screw will produce the pressure which is to be balanced by precision weights.

Range : 0.5 – 30 kg/cm

Step Size : 0.1 kg/cm

Accuracy : 0.2 to 0.1 %

Accurately Calibrated Weights to cover the entire range with a carrying case

Gauge connection adapters for 1/8", ¼", 3/8", ½" BSPF; ½" NPTF, 20 * 1.5mm on ½" BSPF Fitment,

Pointer Puller and Pointer Punch, Gauge Opener, Spirit Level, A set of spanners in a tool box, 500 ml SAE 30/ 40 Oil in bottle One set of spare seals and O ring.

Dust Cover:

To be supplied with necessary calibration & pointer pulling tool for two set of instruction manuals of calibrating/servicing and operating/installation.

Comparator having standard gauge.

7. DIFFERENTIAL PRESSURE TRANSMITTER (PNEUMATIC)

Differential pressure transmitter Max. Air Supply:30 psi, Output: 0.2 1.0Kg/cm², S.S. Orifice plate assembly, PID controller, control valve, actuator, valve positioner, rotameter, air regulator.

Pneumatic Flow Transmitter:

Measuring Principle	: Pneumatic
Air Supply	: 1.4 Kg/cm ²
Output	: 0.2 – 1.0 Kg/cm ²
Diaphragm Material	: Stainless Steel
Operating	: As per System

Orifice Plate Assembly:

Service	: water
Max. Temp.	: 45 deg. C
Orifice Plate Material	: SS 304
Orifice Plate Body	: Stainless Steel
Orifice Plate Type	: Flange Type

Pneumatic PID Controller:

Input	: 0.2 – 1.0 Kg/cm ²
Output	: 0.2 – 1.0 Kg/cm ²
Range	: 0 – 100 %
Scale	: For Set Point & Process
Control Mode	: P + I + D
Control Action	: Direct / Reverse (Field Selectable)
Accuracy	: Better than 3%
Repeatability	: Better than 0.6%
Max Air Supply	: 30 PSi
Process Connection	: ¼” NPT
Air Connection	: ¼” NPT

Control Valve:

Body Type	: Globe Valve
Nominal Size	: 15 mm
Stem Diameter	: 10 mm
Characteristics	: Equal Percentage

Actuator:

Fail Safe Action	: extends
Bench Range	: 0.2-1.0 bar

Valve positioner:

Positioner : Pneumatic type

Air Regulator:

Service : Air
Max. Input Pressure : 10 kg/ cm²
Hose Connection : ¼"

Sump Tank:

Service : Water
Capacity : 50 liters
MOC : SS-304

Pump:

Voltage : 220 V AC
Power : ½ HP
MOC : SS 304 Body

Manifold valve:

Connection : 3 way

- M.S. Stand and Structure
- Whole assembly should be mounted on MS structure.
- All Valves Should Be made up of SS or Brass.

It Should Mounted on Robust Caster Wheel.

To study the working principal of pneumatic DP Transmitter and functioning of it with working.

Controller for controlling valves.

8. HART DEVICE COMMUNICATOR AND CALIBRATOR

Microprocessor base HART Communicator calibrator with Full multi-bus communicator for HART, LCD display, for calibration of various HART transmitters.

Measurement Specifications:

Voltage Measurement Range	: -1 to 60 VDC
Resolution	: 0.00001 - 0.001V
Uncertainty	: 0.02% RDG + 0.25 mV
Current Measurement Range	: +/- 100 mA
Resolution	: 0.0001 – 0.001 mA
Uncertainty	: 0.02% RDG + 1.5 μA
Resistance Measurement Range	: 0 to 4000 Ω
Resolution	: 0.001- 0.1Ω

Uncertainty	: 0.02% RDG+ 13.5mΩ
Frequency Measurement Range	: 0.0027 to 50,000
Hz Resolution	: 0.000001 - 0.1 Hz
Uncertainty	: 0.01% RDG
Pulse Counting Range	: 1 to 9 999 999 pulse
RTD Measurement Range	: -200 to 850 °C
Resolution	: 0.01 °C
Thermocouple Measurement Range	: -270 to 2315 °
CResolution	: 0.01 °C

Generation / Simulation Specifications:

Voltage Generation Range	: -3 to 12 VDC
Resolution	: 0.0001 - 0.01V
Uncertainty	: 0.02% RDG + 0.1 mV
Current Generation Range	: 0 to 25 mA
Resolution	: 0.0001 mA
Uncertainty	: 0.02% RDG + 1.5 μA
Resistance Simulation Range	: 0 to 4000 Ω
Resolution	: 0.01- 0.1Ω
Uncertainty	: 0.04% RDG OR 30mΩ
Frequency Generation Range	: 0.0005 to 10,000
Hz Resolution	: 0.000001 - 0.1 Hz
Uncertainty	: 0.01% RDG
Pulse Generation Range	: 1 to 9 999 999 pulse
RTD Simulation Range	: -200 to 850 °C
Resolution	: 0.01 °C
Thermocouple Simulation Range	: -270 to 2315 °C
Resolution	: 0.01 °C

Pressure Measurement Module (internal)

Range	: -1 to +20 bar
Resolution	: 0.001 bar
Uncertainty	: +/- 0.05% FS
Accuracy	: +/-0.025% FS
Loop Supply	: 24 VDC

- Internal Loop supply for transmitter calibration HART Compatible: Output impedance in HART® compatible mode 300 Ohm

HART Communication: Smart Device Communication Software with HART Modem and Tablet shall be provided

Operating Step / Ramp Output Incremental Adjustment Percentage reading Leak Testing Bar Graph Programmable Alarms Minimum / Maximum readings Deviation / Damping Pressure Units: Measurement in Vacuum, Gauge pressure Minimum unit required Pa, hPa, kPa, MPa, mbar, bar, psi, kgf/cm², kgf/m², atm, inHg, inH₂O mmH₂O, mmHg, torr External Pressure Measurement Modules: The Instrument should be capable of Pressure measurement by means of External Pressure Measurement Modules.

General Specification:

Operating Temperature	: -10 to 50 deg C
Storage Temperature	: -20 to 60 deg C
Humidity	: 0 to 80 % R.H. non-condensing
Safety	: Directive 73/23/EEC, EN 61010-1 EMC 89/336/EEC, EN 61326
Display	: Back Light LCD, 7-1/2 Digit, 60 mmx60 mm (2.36" x2.36"), 160 x 160 pixels LCD with user programmable Bar graph display.
Protection Type	: Weatherproof with impact protector and Membrane Protected individual keys.
Battery Type	: Rechargeable NiMH, 4000 mAh, 3.6V DC (one for each).
Charger Supply	: 100 - 240 V AC, 50-60 Hz

Internal memory for storage and calibration / testing results to be stored and need to be connected to PC / Laptop using RS-232 / USB cable for generation of reports. Also, the instrument should be operated / monitored on PC / Laptop by connecting the instrument using RS-232 / USB Cable.

- Soft Carrying Case.
- Charger for Rechargeable batteries operated on. 230VAC
- Test Leads & Test clips
- Pressure T-Hose 1/4" NPTM connections with 2 Nos. of 1/4". NPTM to 1/4" NPTF adaptors.
- Pressure Generation hand pumps combined in one for Vacuum Range: -0.95 bar to 0 bar
- Pneumatic Range: 0 to 35 bar with Pressure T-hose set, connector kit and carrying case. etc.
- Instruction & User Manuals International / National Accredited Calibration Certificate

MS Structure and fittings:

The calibrator setup should be supplied with pressure transducers/transmitter and DC power supply for transmitter. The calibrator setup also should be supplied with necessary air regulator and pressure gauge and pressure vessel. The calibrator setup should be supplied with necessary hardware fittings and piping of suitable size to perform calibration. The operating and instruction manual should be supplied.

9. P to I and I to P converters Training**Platform****Technical Specifications:**

Principle	: Piezo Resistive Measurement
Range	: 0 – 15 psig / 0 – 1 kg/cm ² Zero and span adjustments
Connection	: ¼” BSP (M) thread
Output	: 4 – 20 mA, 2 wire operation
Power Supply	: 0 – 36 V DC

Current Meter:

Type	: Digital
Range	: 0 – 25 mA
Use	: To measure outlet current of P/I Transducer

Air Filter Regulator:

Service	: Air
Indicator	: Pressure
GaugeMax. Input Pressure	: 10
kg/cm ² Hose Connection	: 1/4”
Drain Type	: Auto Type

Pressure Gauge:

Pressure Range	: 0 – 2 kg/cm ²
Use	: To measure inlet pressure of Transducer

I to P converter:

Principal	: Force Balancing
Input	: 4 – 20 mA
Output	: 3 – 15
psiZero and span adjustments	
Air supply	: 25 psig
Connection	: ¼” NPT (Pneumatic), ½” NPT (Electric)

Current Source:

Type : Digital
Range : 0 – 25 mA

Current Meter:

Type : Digital
Range : 0 – 25 mA

Air Filter Regulator:

Service : Air
Indicator : Pressure Gauge

Max. Input Pressure : 10

kg/cm²Hose Connection :
1/4"

Drain Type : Auto Type

Pressure Gauge:

Pressure Range : 0 – 2 kg/cm²

Use : To measure outlet pressure of Transducer

Having dial 150 mm dia. Or above

10. IMPELLER TYPE FLOW METER

Impeller type flow meter:

Impeller Flow meter type of Suitable range for Water or Viscous fluid With Pulse or 4- 20 mA DC or DC Voltage Output with S.S. measuring and sump tank, SS pump fitted on stand for working of flow meter. with 10 bit controller device with analog & digital IOs, USB, PC software for data monitoring, logging and control with current and historical data.

Technical Specifications:**Flow meter:**

Impeller Flow meter type of Suitable range for Water or Viscous fluid with Pulse or 4-20 mA DC or DC Voltage Output

Sump Tank:

Capacity : 60 liter

MOC : SS – 304

- With ½" drain valve

Collection Tank:

Capacity : 40 liter

MOC : SS - 304

- With level indicator & 1" drain valve

Pump:

Type : Monoblock
Power : FHP Single Phase

Delivery Size : 1/2"/1"

- Necessary piping and valves will be provided to water circulation in setup.
- The total assembly will be mounted on MS square framework painted with good quality paint.

11. HELICAL AND TURBINE FLOW METER

With Suitable range for Water or Viscous fluid with Pulse or 4- 20mA DC or DC Voltage Output with SS measuring and sump tank, SS body pump fitted on stand for working of flow meter, mounted on Suitable frame structure with 10 bit controller device with analog & digital IOs, USB, PC software for data monitoring, logging and control with current and historical data.

Technical Specifications**Helical & Turbine type flow meter: 1 Each**

Flow meter type : Helical & Turbine
Flow range : Suitable
Application : Water/Viscous fluid
Output : Pulse/ 4-20 mA DC/ DC Voltage
Power supply : 12 to 28 V DC or 230 V AC

Storage Tank:

Capacity : 80 litter
MOC : SS-304

- With 1/2" drain valve.

Collection Tank:

Capacity : 50 litter
MOC : SS-304 with glass tube level indicator with 1" drain valve and piping leading the liquid to the sump tank.

Pump:

Type : Monoblock
MOC : SS body
Power : 0.5 HP, Single Phase

12. ORIFICE TYPE FLOW METER, VENTURI TUBE FLOW METER, ROTAMETER

Rotameter, Orifice plate assembly of SS & brass venturi all suitable for 1" pipe line, SS sump tank, SS measuring tank, SS body pump, mercury manometer with scale with required all fittings accessories and mounted on stand to understand working of all three flow meters.

Technical Specification:

Rotameter:

Size : Suitable for 1" pipeline

Range : 3 – 30 LPM

Metering tube : Borosilicate Glass

Valve : Needle Valve provided integral

Orifice meter:

Size : Suitable for 1" pipeline

Dia. Ratio : 0.6-0.64

MOC : SS 304

- With suitable Pressure tapings

Venturi meter:

Size : Suitable for 1" pipeline

Dia. Ratio : 0.6-0.64

MOC : Brass

- With suitable Pressure tapings Arrangement

Sump Tank:

Capacity : 60 liter

MOC : SS – 304

- With ½" drain valve

Collection Tank:

Capacity : 40 liter

MOC : SS - 304

- With level indicator & 1" drain valve

Pump:

Type : Monoblock

MOC : SS - 304

Power : FHP, Single Phase

Manometer:

MOC : Borosilicate glass tube
Size : 500 mm
Fluid : Mercury filled each limb up to measurable height

- Necessary piping and valves will be provided to supply water to various flow meters.
- The total assembly will be mounted on MS square framework painted with good quality paint.

13. MAGNETIC FLOW METER

Magnetic flow meter with HART/RS-485 communication facility & 4-20 mA output along with SS sump tank, SS measuring tank, SS body pump and with required all fittings accessories and mounted on stand.

Technical Specifications:

Measuring range : 5 - 30 LPM
Output : 4-20 mA/ Relay
Measuring Pipe Material : M.S. / SS
Process Connection : CS
Type : Compact
Mains supply : 85 to 240 V AC/24 VDC;

- HART/RS485 Communication & 4-20 mA output

Sump Tank:

Capacity : 80 liter
MOC : SS-304 With ½” drain valve.

Measuring Tank:

Capacity : 60 liter
MOC : SS-304 with 1” drain valve

Pump:

Type : Monoblock
Power : 0.50 HP, Single Phase

- Necessary piping and valves will be provided.
- The total assembly will be mounted in suitable MS framework painted with good quality paint.

14.VORTEX FLOW METER

SS sump tank, SS measuring tank, SS body pump, flow Meter with HART/RS485 Communication & 4-20 mA output and with required all fittings accessories and mounted on stand.

Technical Specification:

Flow meter:

Vortex flow meter with HART/RS485 Communication & 4-20 mA output

Measurable Medium	: Liquid
Connection	: ½” or 1”
Display	: LCD/LED
Power Supply	: 12-24VDC / 230 V AC

Sump Tank:

Capacity	: 60 liter
MOC	: SS-304with ½” drain valve.

Measuring Tank:

Capacity	: 40 liter
MOC	: SS-304 with level Indicator With 1” drain valve and piping leading the water to the sump tank.

Pump:

Type	: Mono block
MOC	: SS body
Power	: 0.5 HP, Single Phase with Bypass, supply valve.

- Necessary piping and valves will be provided to supply water to flow meter.
- The total assembly will be mounted in suitable MS framework painted with good quality paint.

15.FLOW CONTROL LOOP SET WITH FLOW CONTROLLER RECORDER, D.P. TRANSMITTER, RECEIVER, UNIT CONTROL VALVE AND IMPULSE LINE, COMPUTER COMPLETE EXPERIMENTAL SET- UP FOR FLOW MEASUREMENT

DP transmitter with HART/RS485, Auto- Manual PID controller (with three term facility), communication facility, control valve, I/P converter, S.S. sump tank, rotameter, circular chart recorder. Auto control software.

Technical Specification

DP Transmitter with HART/RS485:

Range : 0 - 1000 mm WC,
Ambient Temperature: Up to 70° C,
Power Supply : 24 V DC,
Output : 4-20 mA DC,
Diaphragm Material : Stainless Steel,

Orifice Plate Assembly:

Fluid : Water,
Max. Temp. : 45° C,
Orifice Plate Material : SS 304,
Orifice Plate Body : Stainless Steel,
Orifice Plate Type : Flange Type

PID Controller:

Type : Digital
Display : LCD/LED
Bar graph : for output
Input type : PT100, J, K, 0 - 10V DC, 0 - 20mA DC, 4 - 20mA DC
Range : Settable as per input type
Resolution : 1 to 0.001 as per input type
Accuracy : $\pm 1\%$ of FSD $\pm 1^\circ\text{C}$ FSD
Output : 2 nos. Relay
Analog Output : 4 to 20 mA DC
Operating Temp. : 0°C to 55°C
Relative Humidity : UP to 95% RH
Protection Level : IP-65
Communication : RS - 485 MODBUS

Control Valve:

Body Type : Globe Valve
Nominal Size : 15 mm
Stem Diameter : 10 mm

Actuator:

Fail Safe Action : extends
Bench Range : 0.2-1.0 bar

I/P Converter:

Input : 4 - 20 mA
Output : 3 - 15 psig
Air Supply : 1.4 bar

Rotameter:

Service : Water
Range : Suitable
Connection : ½"

Metering Tube: Borosilicate Glass

Float : SS
Valve : Needle type, integrated

Sump Tank:

Service : Water
Capacity : 60 liters
MOC : SS-304

Pump:

Type : Mono block
Power : FHP, Single Phase

Air Regulator:

Service : Air
Max. Input Pressure : 10 kg/ cm²,
Hose Connection : ¼"
Pressure Gauge : To indicate & measure supply air pressure to I/P Converter

Circular Chart Recorder:

Single Pen Circular Chart Recorder With Display

Power Supply : 85-264 VAC
Range : Programmable
Chart Speed : Programmable (24Hrs)
Input : Universal
Recording : Stepper motor controlled
Pen : Red or Blue color
Power supply : 180/ 260 V AC 50 Hz
Display : LED/LCD

Converter:

- Suitable Converter will be provided to connect instrument with computer

Software:

- Necessary software will be provided to interface to a personal computer.

The unit will also consist of necessary piping, fittings. Standard pneumatic lines, And Connections wherever necessary will be provided 3 meter long braided type, Flexible pipe will be provided to connect air compressor with the control trainer. A 3 meter long insulated cable will be provided with necessary plug ready to connect control panel to the power supply board.,

Control trainer software: -

The software package offered contains necessary hardware and software required to interface the setup to a personal computer thus creating full software controlled experimental and instructional environment. The package will enable students to investigate and understand the principles of process control in a laboratory environment with the minimum technical support. Windows compatible software package has been developed using SCADA software. This provides direct control of the processes (control trainer) used, including open and closed loop control, plus multi loop configurations associated with remote set point control (as appropriate). Comprehensive laboratory sheets for all the experiments are included in the manual with setting up information, background theory, operational procedures and all other relevant information.

Industrial SCADA software.

User friendly Windows interface. Two-way communication for control and data acquisition. Auto-configuration with multi-port selection option. Manual (Open Loop) and automatic control (Closed Loop). Selectable P, P+I, P+D and P+I+D mode. Bump less transfer between open and closed loop operation. Live mimic diagrams of the process including set point, process variable and output. Dynamic multi-color data display capability (tabular, chart or graphical form). Powerful graphics and trend chart capabilities with customization.

Simulation Studies of Flow Control Trainer:

This simulation provides a comprehensive experimental introduction to the fundamentals of process control using an example of Flow Control Trainer. The Simulation Package of Flow Control Trainer is menu-driven. The screens display the corresponding Flow Control Trainer Process Diagram including online display of all relevant data. Simulated data can be saved. The graphical display of the step response and the alarm triggering complete the capabilities of the process control simulation.

Desktop Computer

- Intel Core i3 or higher or Latest VERSION
- MINIMUM 4 GB RAM
- MINIMUM 17” LED MONITOR
- MINIMUM 500GB HARD DISK
- KEYBOARD AND MOUSE SET(Optical)
- SPEAKER SET
- With pre-installed Windows 10 or Compatible O.S

16. Experimental closed loop set up for solid flow measurement and Control with storage vessel, hopper, solid flow sensor, controller, Recorder and final control element

Technical Specification:

Description:

The setup will consist solid supply conical vessel to supply dry solid material like powder or cement or sand etc..., control valve to control flow of solid through the pipe, sensor to measure flow of solid through the pipe, PID controller, recorder to record data on chart paper.

The Material used to measurement will be fine dry powder form or dry sand. The flow of dry solid material flow from conical vessel will measure with help of sensor and PID controller will control thisflow using control valve.

Sensor/Sensor accommodation:

Housing	: Stainless Steel
Protection category	: IP65
Operating temp. Front end of sensor	: -20 to + 80 °C
Sensor electronic	: 0+ 60 °C [32...140 °F]
Max. Working pressure	: 1 bar
Working frequency	: K-Band 24.125 GHz, ±100 MHz, Transmitting
Power	: Max. 5 mW
Accuracy	: +/- 3% in calibrated range,
Sensor Size	: Dia. 20 mm x Length 270 mm Approx.

Evaluation-Unit:

Supply voltage	: 230 V 50 Hz,
Power consumption	: 20 W, 24 VA,
Current consumption	: Max. 1 A @ 24 V,
Protection category	: IP40 to EN 60 529
Operating temperature	: -10 to +45 °C [14...113 °F],
Additional data	: Cable glands 3 x M16 (4.5 – 10 mm Ø), Screw terminals 0.2 – 2.5 mm ² [AWG 24-14],
Current output signal	: 4...20 mA (0...20mA),
Interface	: ModBus RTU (RS 485) / USB
Pulse output	: Open Collector - max. 30 V, 20 mA
Output	: Relay with switching contact Max. 250V AC, 1A,
Data storage	: Flash Memory
Output	: Open collector Max. 30V, 20mA,

PID Controller:

Type	: Digital
Display	: LCD/LED
Bar graph	: for output
Input type	: PT100, J, K, 0 - 10V DC, 0 - 20mA DC, 4 - 20mA DC
Range	: Settable as per input type
Resolution	: 1 to 0.001 as per input type
Accuracy	: ±1% of FSD ± 1°C FSD
Output	: 2 nos. Relay
Analog Output	: 4 to 20 mA DC
Operating Temp.	: 0°C to 55°C
Relative Humidity	: UP to 95% RH
Protection Level	: IP-65
Communication	: RS - 485 MODBUS

Current Meter:

1. To indicate & measure PID input (4 - 20 mA),
2. To indicate & measure PID output (4 - 20 mA),

Circular Chart Recorder:

Single Pen Circular Chart Recorder With Display

Power Supply	: 85-264
VAC	
Chart Size	: 6"
Range	: Programmable
Chart Speed	: Programmable (24Hrs)
Input	: Universal
Recording	: Stepper motor controlled
Pen	: Red or Blue color
Power supply	: 180/ 260 V AC 50
HzDisplay	: LED/LCD

MS Structure and Fittings:

The above unit will have solid supply conical vessel of M.S. powder coated 400(Dia.) mm* 600(Height) mm including conical drainage with conical bottom and feeding of solid material container with respective piping and valve arrangement. also, it will have two nos. of collection M.S. tray. The control panel will consist of necessary switches and indications for all above instruments. The unit will also consist of necessary piping, fittings. A 3-meter-long insulated cable will be provided with necessary plug ready to connect control panel to the power supply board, the set-up will be mounted on Robust Caster wheel-based M.S. structure with Good Quality Paint.

With 10 bit controller device with analog & digital IOs, USB, PC software for data monitoring, logging and control with current and historical data.

17. FLOW NOZZLE

SS Flow nozzle flange Type mounting with manifold assembly, sump tank, measuring tank, pump, water manometer, mounted on suitable frame structure.

Technical Specification:**Flow nozzle:**

Type : flange Type mounting
MOC : SS

- With manifold assembly with suitable Pressure tapings

Sump Tank:

Capacity : 60 liters

MOC : SS – 304

- With ½” drain valve

Collection Tank:

Capacity : 40 liters

MOC : SS - 304,

- With level indicator & 1” drain valve

Pump:

Type : Mono block

Power : FHP, Single Phase

Manometer:

MOC : Glass tube

Size : 500 mm

Fluid : Mercury filled each limb up to measurable height

- Necessary piping and valves will be provided to supply water to various flow meters.
- The total assembly will be mounted on MS square framework painted with good quality paint.

18. LEVEL CONTROL SET UP WITH LEVEL TRANSMITTERS LEVEL RECORDER CONTROLLER & CONTROL VALVE COMPLETE EXPERIMENTAL SET UP OR LEVEL SIMULATOR

Level transmitter, AutoManual PID controller(with three term facility), communication facility, control valve with I/P converter, S.S. sump tank, measuring tank of suitable height with sight glass, pump, PC software with necessary fitting to run the setup, mounted on suitable frame structure.

Technical Specifications:**Electronic Level Transmitter:**

Service : Water

Measuring Principle : Capacitance type

Range : 0 – 500 mm WC

Accuracy : 3%

Output : 4-20 mA DC

PID CONTROLLER:

Type : Digital

Display : LCD/LED

Bar graph	:	for output
Input type	:	PT100, J, K, 0 - 10V DC, 0 - 20mA DC, 4 - 20mA DC
Range	:	Settable as per input type
Resolution	:	1 to 0.001 as per input type
Accuracy	:	±1% of FSD ± 1°C FSD
Output	:	2 nos. Relay
Analog Output	:	4 to 20 mA DC
Operating Temp.	:	0°C to 55°C
Relative Humidity	:	UP to 95% RH
Protection Level	:	IP-65
Communication	:	RS - 485 MODBUS

Control Valve:

Body Type	:	Globe Valve
Nominal Size	:	15 mm
Stem Diameter	:	10 mm
Bonnet	:	Standard
Characteristics	:	Equal percentage

Actuator:

Fail Safe Action	:	extends
Bench Range	:	0.2-1.0 bar

I/P Converter:

Input	:	4 – 20 mA
Output	:	3 – 15 psig
Air Supply	:	1.4 bar
Connection	:	¼” NPT (F)

Rotameter:

Service	:	Water
Range	:	suitable
Connection	:	½”
Metering Tube	:	Borosilicate Glass
Float	:	SS
Valve	:	Needle type, integrated

Sump Tank:

Service	:	Water
Capacity	:	80 liters
MOC	:	SS-304

Pump:

Type : Mono block,
MOC : SS body
Power : ½ h.p

Measuring Tank:

Service : Water
Capacity : 30 liters
MOC : Transparent Acrylic
Range : 0 – 500 mm WC

Air Regulator:

Service : Air
Max. Input Pressure : 10 kg/ sq.cm,
Hose Connection : ¼”

Current Meter:

1. To indicate & measure Level Transmitter Output (0 – 20 mA)
2. To indicate & measure I/P Converter Input (0 – 20 mA)

Pressure Gauge:

To indicate & measure supply air pressure to I/P Converter

Circular Chart Recorder:

Single Pen Circular Chart Recorder With Display

Power Supply : 85-264 VAC
Range : Programmable
Chart Speed : Programmable (24Hrs)
Input : Universal
Recording : Stepper motor controlled
Pen : Red or Blue color
Power supply : 180/ 260 V AC 50 Hz
Display : LED/LCD

Converter:

- Suitable Converter will be provided to connect instrument with computer

Software:

Necessary software will be provided to interface to a personal computer. The unit will also consist of necessary piping, fitting; standard pneumatic lines and connections wherever necessary will be provided 3 meter long braided type, Flexible pipe will be provided to connect air compressor with the control trainer. A, 3 meter long insulated cable will be provided with necessary plug ready to connect control panel to the power supply board. The set up will be mounted on robust caster wheel-based stand.

Control trainer software: -

The software package offered contains necessary hardware and software required to interface the setup to a personal computer thus creating full software controlled experimental and instructional environment. The package will enable students to investigate and understand the principles of process control in a laboratory environment with the minimum technical support. Windows compatible software package has been developed using SCADA software. This provides direct control of the processes (control trainer) used, including open and closed loop control, plus multi loop configurations associated with remote set point control (as appropriate). Comprehensive laboratory sheets for all the experiments are included in the manual with setting up information, background theory, operational procedures and all other relevant information.

Industrial SCADA software.

User friendly Windows interface. Two way communication for control and data acquisition. Auto-configuration with multi-port selection option. Manual (Open Loop) and automatic control (Closed Loop). Selectable P, P+I, P+D and P+I+D mode. Bump less transfer between open and closed loop operation. Live mimic diagrams of the process including set point, process variable and output. Dynamic multi-color data display capability (tabular, chart or graphical form). Powerful graphics and trend chart capabilities with customization.

Simulation Studies of Level Control Trainer:

This simulation provides a comprehensive experimental introduction to the fundamentals of process control using an example of Level Control Trainer. The Simulation Package of Level Control Trainer is menu-driven. The screens display the corresponding Level Control Trainer Process Diagram including online display of all relevant data. Simulated data can be saved. The graphical display of the step response and the alarm triggering complete the capabilities of the process control simulation.

19. LEVEL MEASUREMENT EQUIPMENT FOR SOLID, SONIC SOLID LEVEL, MICROWAVE, CAPACITANCE PROBES, POINT LEVEL DETECTOR, VIBRATING FORK TYPE

Ultrasonic level detector, Microwave level detector, Vibrating fork type level switch, capacitance probe level detector, Point type level Detector, All transmitters and sensors with individual Container as measuring tank suitable to transmitters and mounted common stand such as experimental kit, with switches and indicators.

SONIC SOLID LEVEL DETECTOR:

Application	: Solid (Fine sand Powder)
Temperature Range	: 0 to 70 deg C,
Sensor Metal	: PVDF / PP
Frequency	: 30- 50 KHz,
Housing	: Nylon/ Plastic
Range	: 3 m, Temperature measurement with IR Sensor
Process Pressure	: up to 2 bar,
Blocking Distance	: 0.3 m onwards,
Accuracy	: +/- 0.2% of the Measuring Distance,
Display	: 4-digit LCD display single line
Response time	: > 1 sec
Protection	: IP65 / IP67
Process Connection	: Threaded

MICROWAVE (NON-CONTACT RADAR) LEVEL DETECTOR:

Range	: 2 m
Type	: Horn/Air Purge
Seal	: Viton/Kalrez,
Operating Frequency	: 6 to 26 Ghz
Temperature	: - 40 to 60 deg. C
Housing	: Al-1/2 chamber / Plastic,
Response	: 1 sec,
Process Pressure	: up to 3 bar,

VIBRATING FORK LEVEL SWITCH:

Mains Supply	: 85 Vac to 265 Vac, 50/60 Hz, / 18 Vdc to 30 Vdc
Outputs	: LED, Relay
Time Delay	: 2 to 30 seconds adjustable
Fork Vibrating Frequency	: 80 Hz \pm 5 Hz
Ambient Temperature	: -20 deg. C to +60 deg. C
Process Temperature	: 80 deg. C max.

Max. Process Pressure : 10 bar max.
 Housing : Cast Aluminum
 Fork Material : SS 316
 Max. Insertion Length : 225 mm
 Protection : IP67

CAPACITANCE TYPE LEVEL INDICATOR:

Application : Solid (Fine sand Powder) Container
 Type : Radio frequency,
 Probe : Fully insulated rod probe
 Measuring Range : 10 to 300 mm,
 Output : 4-20 mA current in Corresponding to level.
 Supply voltage : 230 V AC (±10%), 50 Hz
 Housing : Cast Alu.

POINT LEVEL DETECTORS:

Application : solid (fine sand powder), Container
 Principle : capacitance point level switch.,
 Probe length : 100 mm,
 Output : Relay Output

CURRENT METER:

- To indicate & measure Level (4 – 20 mA)-2 No for (Sonic Level Detector & Micro level Detector)

MS Structure and Fittings.

- The setup will have overhead solids supply feed tank with conical bottom and feeding of fine sand to the Container with respective piping and valve arrangement. Also, it will have one combine solid collection tank with drainage valve

CONTROL PANEL:

- The control panel will consist of indicator and indicating lamp/buzzer/hooter.
- All level measurement kit will be mounted on 1” * 1” MS pipe stand.

20. THERMOCOUPLE TYPE PYROMETER WITH MILLI VOLTMETER (WITH DIFFERENT TYPES OF THERMOCOUPLES)

Pyrometer (Digital Indicator) Range: as available Sensor type: thermocouple with display and milli voltmeter. Temperature source (Water bath, heater, PID, temperature indicator, thyristor drive, agitator, different thermocouples like J, K, E, N pyrometer.) for measurement.

Technical Specification:

It will consist of a 5-liter SS 304 water bath with 1kw Heater and full three term Digital PID Controller to control the temperature of the bath with necessary thyristor drive. A 1/10 HP gear motor with agitator also mounted on the same unit for the stirring of the water inside bath for uniform temperature distribution. Different thermocouple type J, K with its construction drawing, mV Vs Temperature Table and its calibration procedure are also included in scope of supply. It will also consist of Programmable Digital Indicator (Pyrometer). It will have facility to select mV range & thermocouple type (J, K) ranges, C/ F Unit, with in – built automatic reference junction compensation (for thermocouple inputs).

The unit will supplied with instruction manual for Digital Indicator and calibration of different types of thermocouples using Digital Indicator (Pyrometer)

21. Radiation Pyrometer with all accessories

Technical Specification:

Temperature range	: 300 to 1300 °C
Accuracy	: $\pm 0.5\%$ of reading
Response Time	: 10 mS (90%)
Ambient Operating Range	: -10 – 120 °C
Sensing Head	: SS
Relative Humidity	: 10 – 95 %, non-condensing @ upto 30 °C
Power Supply	: 08 – 32 V DC
Optical Resolution	: 100:1
Adjustable Emissivity	: 0.100 to 1.100 in 0.001 increments
Output	: scalable 4 – 20 mA
Electronic Housing	: zinc-die cast
Cable length	: 1000 mm
Digital Indicator	: For temperature indication
Signal Processing	: Peak hold, valley hold, variable averaging filter, adjustable up to 998 seconds
Furnace	: With 1300 °C temperature range.

22. Temperature transmitter, pneumatic

Scale for Set Point & Process, output 0.2 to 1.0Kg/cm² and Input 0 to 100 Deg. C, Selectable Control Mode & Control Action, control valve works on 3 to 15psi, steam generator, rotameter, S.S. sump tank & S.S. jacketed measuring tank, pump, stand with hardware Fittings & electrical accessories, mounted on suitable frame structure.

Technical Specification:

Machine Description

The setup should consist of insulated jacketed tank (5 liter, SS 304) heated with the help of steam and the flow rate of the water can be measured with the help of a Rota meter. The temperature of the heated water should be sensed by temperature bulb and steam should be controlled using pneumatic control valve to maintain the temperature in the tank. The pneumatic temperature controller should act to vary the flow of steam for controlling purpose. The heating tank should also consists of stirrer and motor for uniform distribution of temperature in the tank.

Pneumatic PID Controller

Range	: 0 - 100 deg.C,
Output	: 0.2 -1.0 Kg/cm ² ,
Type of thermal systems	: Mercury Filled
Compensation	: Required
Max. Air Supply	: 30 psi,
Action	: Direct / Reverse (Field Selectable),
Process Connection	: 3/4" NPT,
Thermo well	: Required,
Air Connection	: 1/4" NPT
Scale	: for Set Point & Process

Control Valve:

Valve Type	: Globe Valve 2 way
Nominal Size	: 15 mm
Stem Diameter	: 10 mm
Characteristics	: Equal Percentage / Linear
Pressure Rating	: ANSI class 150#
Body MOC	: A 216 Gr. WCC

Packing Type : PTFE
Connection Type : Flanged R/F

Actuator:

Type : Pneumatic Diaphragm Spring Actuator
Fail Safe Action : Close
Bench Range : 0.2-1.0 bar
Action : Air to Open

Rotameter:

Service : Water,
Range : Suitable,
Connection : ½",
Metering Tube : Borosilicate Glass,
Float : SS,
Valve : Needle type, integrated

Air Regulator:

Service : Air,
Max. Input Pressure : 10 kg/ cm²,
Hose Connection : ¼",

Sump Tank:

Service : Water,
Capacity : 50 liters,
MOC : SS-316

Pump:

Voltage : 220 V AC,
Power : ½ HP,
MOC : SS Body,

Steam Generator:

Capacity : 20 litre (Approx.),
Heater : 2 Nos. ,
M.O.C : SS 316 (Inner),
: SS 316 (Outer)

Steam Generator should consist of safety valve, pressure gauge, pressure relief valve, feed valve, and drain valve, water level indicator.

MS Structure and Fittings:

- The unit should also consist of necessary piping, fittings and pneumatic connections wherever necessary should be provided. The setup should be mounted on stand.
- All Valves Should be provided with Brass or SS Material

23. TEMPERATURE TRANSMITTER ELECTRONIC (INPUT RTD, TC)

Pt 100 is the common abbreviation for the most common type of resistance temperature sensor used in industry. It has a specified resistance of 100.00 ohms at 0° C and is made of platinum which has an accurately defined.

Type	: RTD pt. 100, Any Two Type of TC
Range	: 0-200 °C (As suitable)
Stem diameter	: 8 mm
Length	: 200 mm with head mounted transmitter.
Input	: RTD Transmitter, And TC
Output	: 4-20 mA panels mounted

24. Experimental set up for measuring and controlling of temperature- Consisting of measuring, controlling, indicating, recording and finalcontrolling elements, complete closed loop system with simulator

Machine Details:

The setup should consist of 1-1 Shell and Tube Heat Exchanger with a cold-water tank fitted with Pump, Rota meter and a hot water tank with thyristorized heater to heat the water. The temperature of the heated water should be sensed by the RTD Pt-100/Pt-1000. The leaving temperature of hot water and entry and exit temperatures of Cold water should also measure with the help of Thermocouple.

Temperature Transmitter:

Type	:	RTD
Power Supply	:	24 VDC
Output	:	4 to 20 mA
Mounting	:	Head Mounting

PID CONTROLLER:

Type	:	Digital
Display	:	LCD/LED

Bar graph : for output
Input type : PT100, J, K, 0 - 10V DC, 0 - 20mA DC, 4 - 20mA DC

Range : Settable as per input type
Resolution : 1 to 0.001 as per input type
Accuracy : $\pm 1\%$ of FSD $\pm 1^\circ\text{C}$ FSD
Output : 2 nos. Relay
Analog Output : 4 to 20 mA DC
Operating Temp. : 0°C to 55°C
Relative Humidity : UP to 95% RH
Protection Level : IP-65
Communication : RS - 485 MODBUS

Control Valve:

Valve Type : Globe Valve 2 way
Nominal Size : 15 mm
Stem Diameter : 10 mm
Characteristics : Equal Percentage / Linear
Pressure Rating : ANSI class 150#
Body MOC : A 216 Gr. WCC
Packing Type : PTFE
Connection Type : Flanged R/F

Actuator:

Type : Pneumatic Diaphragm Spring Actuator
Fail Safe Action : Close
Bench Range : 0.2-1.0 bar
Action : Air to Open

I/P Converter

Input : 4 - 20 mA,

Output : 3 -15 psig,
Air Supply : 1.4 bar,
Connection : ¼” NPT (F),

Rota meter:

Service :Water,
Range : Suitable,
Connection : ½”,
Metering Tube : Borosilicate Glass,
Float : SS,
Valve : Needle type, integrated

Integrated, Heat Exchanger:

Construction : Shell & Tube type,
Material : SS 304,
Service : Water,
Shell Dia. : 100 mm,
Exchanger Length : 500 mm,
Tubes : 10 - 14 nos. seam less minimum

Cold Water Sump Tank:

Service : Water
Capacity : 100 liters
MOC : SS-304,

Hot Water Tank:

Service : Water
MOC : SS-304,
Heaters : 2 kW, immersion type mounted on tank

Pump:

Type : Monoblock,
MOC : SS body,

Nos. : 2,

Air Regulator:

Service : Air
Max. Input Pressure : 10 kg/ cm²,
Hose Connection : ¼",

Current Meter :

1. To indicate & measure Temperature Transmitter Output (4 - 20 mA),
2. To indicate & measure I/P Converter Input (4 - 20 mA),

Pressure Gauge:

To indicate & measure supply air pressure to I/P Converter

Thyristor Drive:

Rating : 2000 W,
Operating Voltage : 230 V AC,/50 HZ
Input Signal : 4-20 mA,
Output : to Heater of Hot water tank,

Heater Controller:

Type : PID,
Input : RTD/ TC
Output : 4 - 20 mA,
Display : Digital,
Power Supply : 230 V AC, 5 amp.

Temperature Scanner:

Input : Thermocouple of Shell and Tube Heat Exchanger,
No. of Channel : Minimum 6,
Power : 220 V AC, 50 Hz, With selectable switch.
Communication : RS 485 ASCII/ Modbus

Circular Chart Recorder:

Input : 4 - 20 mA,
Display : Digital
Range : 0 to 100%,

Resolution	:	0.1%,
Accuracy	:	+ 0.5%,
Recording	:	Steeper motor controlled
Repeat ability	:	0.5% resolution
Pen	:	Red color,/blue colour
Power supply	:	180/ 260 V AC 50 Hz

RS 485 to USB Converter:

Suitable RS 485 to USB Converter should be provided to connect instrument with computer.

Software:

The software package offered contains necessary hardware and software required to interface the setup to a personal computer thus creating full software controlled experimental and instructional environment. The package should enable students to investigate and understand the principles of process control in a laboratory environment with the minimum technical support., Windows compatible software package has been developed using SCADA software., This provides direct control of the processes (control trainer) used, including open and closed loop control, plus multi loop configurations associated with remote set point control (as appropriate).

Comprehensive laboratory sheets are included in the manual with setting up information, background theory, operational procedures and all other relevant information., Industrial SCADA software., User friendly Windows interface., Two way communication for control and data acquisition., Auto-configuration with multi-port selection option., Manual (Open Loop) and automatic control (Closed Loop)., Selectable P, P+I, P+D and P+I+D mode., Bump less transfer between open and closed loop operation., Live mimic diagrams of the process including set point, process variable and output., Dynamic multi-colour data display capability (tabular, chart or graphical form)., Powerful graphics and trend chart capabilities with customization., Simulation Studies of Temperature Control Trainer, This simulation provides a comprehensive experimental introduction to the fundamentals of process control using an example of Temperature Control Trainer. The Simulation Package of Temperature Control Trainer is menu-driven. The screens display the corresponding Temperature Control Trainer Process Diagram including online display of all relevant data. Simulated data can be saved. The graphical display of the step response and the alarm triggering complete the capabilities of the process control simulation. , Trainer kit helps students to learn how PID works., Optimization of control behaviour, Process diagrams including online display of all process data, Facility to monitor behaviour of the PID output and process variable on the PC, Screen, Set point and Disturbance response, Investigation of the properties of the open and closed control loops, Alarm triggering including logging.

25. Digital temperature calibrator, mV/mA injector and measuring unit **Technical Specifications:**

The Set -Up consist of a 5-liter SS water bath with 1 kw Heater and Digital PID Controller to control the temperature of the bath with necessary thyrister drive. A F.H.P gear motor with agitator also mounted on the same unit for the stirring of the water inside bath for uniform temperature distribution. Different thermocouple types with mV Vs. Temperature Table are also included in scope of supply.

The Thermocouples and RTD will also supply as per below mentioned.

Thermocouples:

Type : Any Four type
Size : 8 mm dia.,
Length : Minimum 200mm Required

RTD:

Type : Any One type,
Size : 8 mm dia.,
Length : Minimum 200mm Required

Calibrator:

Calibrator is the compact, rugged and easy to use hand held device with graphical user interface for precise measuring and sourcing of electrical and physical parameters.

Electrical Measurement Parameters and Accuracy

V : 0 to 30.00 VDC

mA : 0 to 24.000 mA

Electrical Simulation Parameters and Accuracy

V : 0 to 12.00 VDC

mA : 0 to 24.000 mA

Frequency Measurement : 1 to 50000 Hz

Frequency Generation: 1 to 10000 Hz

Resistance Measurement : up to 400 ohms

Resistance Simulation : up to 400 ohms

Display : 3.2" TFT LCD, 262K Color, Graphical, 48.6 mm x 64.8 mm, 240x320 pixels, White LED Backlight

26. STRIP CHART AND PNEUMATIC RECORDER BOTH SINGLE AND MULTI-POINT

Technical Specification:

- Digital current source
- Air Regulator (0-30) psi

- Pressure Gauge (0-60) psi
- Temperature sensors
- Pneumatic Type Recorder – 01 No. (Input 3 to 15 psi electrical chart drive, zero adjustment and wall mounted)

Case : Aluminum/MS

Connection : ½” and ¾ BSP

Chart : 12” circular type

Pressure Ranges : 0-15 PSI

Chart Recording : Motorized Type

Pen : Single pen type

- Electronic Type Recorder (anyone fixed input for each channel RTD, Thermocouple or 4 to 20 mA)

1. Electronic Strip chart Recorder with single pen: 1 No

Range : 0-100 %

Chart Speed : 100 mm/hr to 3000mm/hr

Chart Size : 100 mm width, 10 meter length

Input : RTD

No. of Pen : 1

Pen Marking : Continuous

Overshot : None

Chart ranges : Standard/Customized

Status Indicators : Channel number corresponding parameter value

Mounting options : Panel or wall mount

Voltage : 180 to 260V AC, 50 Hz

Consumptions : <20 VA

Protection : EMI filter with additional fuse included

2. Electronic Strip chart Recorder with multi pen: 1 No

Range : 0-100 %

Chart Speed : 100 mm/hr to 3000mm/hr

Chart Size : 100 mm width, 10 meter length

Input : Channel 1 -Thermo couple, Channel 2 - 4-20 mA

No. of Pen : 2

Pen Marking : Continuous

Overshot : None

Chart ranges : Standard/Customized

Status Indicators : Channel number corresponding parameter value

Mounting options : Panel or wall mount

Voltage : 180 to 260V AC, 50 Hz
Consumptions : <20 VA
Protection : EMI filter with additional fuse included

3. Electronic Circular chart Recorder with single pen: 1 No

- Single Pen Circular Chart Recorder with Display

Power Supply : 85-264 VAC
Range : Programmable
Chart Speed : Programmable (24Hrs)
Input : Universal
Recording : Stepper motor controlled
Pen : Red or Blue color
Power supply : 180/ 260 V AC 50 Hz
Display : LED/LCD

4. Electronic Circular chart recorder with multi pen: 1 No

- Single Pen Circular Chart Recorder with Display

Power Supply : 85-264 VAC
Range : Programmable
Chart Speed : Programmable (24Hrs)
Input : Universal
Recording : Stepper motor controlled
Pen : Two different color
Power supply : 180/ 260 V AC 50 Hz
Display : LED/LCD

- All fitted on panel and stand with necessary electrical accessories.

27. HYDRAULIC ACTUATORS

Technical Specifications:

1. Hydraulic Actuator:

Travel : 50 mm
Type : Hydraulic Cylinder
Action : Double Acting
Power Pack : Assembled power pack with control panel, motor pump, filter, regulator, oil tank filled with hydraulic oil, level gauge,

- Necessary Drain facility complete arrangement to be fitted on MS fabricated powder coated Table with necessary piping and wiring.

28. HART/FIELD BUS FINAL CONTROL ELEMENTS (TWO DIFFERENTTYPE)

HART/Field bus Valve positioned with two different characteristics control valve. Operated with mA source. Electro pneumatic positioned having facility of auto tuning, suitable with both fail safe modes and auto and manual mode facility. S.S. measuring tank, S.S. sump tank, pumps to full flange operation mounted on suitable frame structure.

Technical Specifications:

HART final control elements consist of two different control elements

1. Equal percentage
2. Linear

With Electro pneumatic valve positioner fitted on control valves.

Rota meter:

Service	: Water
Range	: Suitable
Connection	: ½"
Metering Tube	: Borosilicate Glass
Float	: SS
Valve	: Needle type,

Integrated Air Regulator:

Service	: Air
Max. Input Pressure	: 10 kg/ cm ²
Hose Connection	: ¼"

Sump Tank:

Service	: Water
Capacity	: 60 liters
MOC	: SS-304

Measuring Tank:

Service	: Water
Capacity	: 30 lit. approx.
MOC	: SS-304

Pump:

Voltage	: 220 V AC
Power	: ½ HP
MOC	: SS 304 Body

1. Control Valve:

Body Type : Globe Valve
Nominal Size : 15 mm
Stem Diameter : 10 mm
Characteristics : Equal Percentage

Actuator:

Fail Safe Action : extends
Bench Range : 0.2-1.0 bar

Valve positioner:

Positioner : Electro Pneumatic type with HART compatible.

2 Control Valve:

Body Type : Globe Valve
Nominal Size : 15 mm
Stem Diameter : 10 mm
Characteristics : Linear

Actuator:

Fail Safe Action : extends
Bench Range : 0.2-1.0 bar

Valve positioner:

Positioner : Electro Pneumatic type with HART compatible

Current Source For each valve:

Type : Digital
Range : 0 - 25 mA

- Above two types are of different control valves which will be mounted on suitable MS structure with good quality paint.

29. DATA ACQUISITION SYSTEM (DAS)

- Temperature, Flow, Level, and Pressure Measurement
- Should use Industrial Process Control elements like Capacitive Level Transmitter, Temperature Transmitter, Flow Transmitter, Pressure Transmitter, RTD and K Type, Thermocouple Sensor, Rotameter and PID Controller, Solenoid Valve
- M.S Powder Coated Electrical Control Panel contain Start , Stop , Pump, Solenoid Valve , Stirrer button ,Indicators for Pump, Heater, Stirrer, Solenoid Valve, Audio Indicator, Visual Indicator , Ammeter

- Real-time Ethernet based DAQ interface with Analog input/output & Digital input/output.

Technical Specification:

Measuring Tank:

MOC : SS
 Diameter : 200 mm
 Height : 550 mm

- With heater and drain valve arrangement.

Temperature Transmitter:

Type : RTD
 Power Supply : 24 VDC
 Output : 4 to 20 mA
 Mounting : Head Mounting

Electronic Level Transmitter:

Service : Water
 Measuring Principle : Capacitance type
 Range : 0 – 500 mm WC
 Accuracy : +/- 3 %
 Output : 4-20 mA DC
 Probe : fully insulated rod probe with preamplifier mounted on probe head
 generates RF. Signal and converts detected capacitance signal to current Signal.

Pressure Transmitter:

Principle : Piezo Resistive Measurement
 Range : 0 - 1 bar
 Output : 4-20 mA, 2 wire
 Power Supply : 24 V DC
 Diaphragm : SS
 Process Connection : ½” or ¼” BSP (M)
 Temp. Limit : Up to 80°C
 Degree of Protection : IP65

Flow meter:

Flow range : 0 to 20(LPM)
 Max. temp : 65 C
 Rotor : PP
 Output : 4-20 mA linear
 Power supply : 12 to 28 V DC

Sump Tank:

Service : Water

Capacity : 60 liters
MOC : SS-304

- With drain valve arrangement

Pump:

Type : Mono block
MOC : SS body
Power : 0.5 HP, Single Phase

Scanner:

Type : Digital
Channel : 8 channel
Display : Dual type
Input type : Universal input
No. of Input : 8 nos.
Accuracy : +/- 0.1 of Span +/- Count

- Appropriate DAS with necessary hardware and software will also be included in scope of supply.
- Instrument will also consist of mimic diagram and manual.
- Whole assembly will be mounted on MS structure.
- All Valves will be made up of SS or Brass.

It will mounted on Robust Caster Wheel.

30. Digital I/O cards

Technical Specification:

Level control setup

It Controls the Level of Process tank through 2 Level switch & Solenoid valve

Process tank:

MOC : acrylic
Capacity : 5 liter
Measurement : high level & low-level conductivity type sensor

Sump tank:

MOC : acrylic
Capacity : 10 liter
Drain valve : ¼”

Solenoid Valve:

Power Supply : 230 VAC
Size : ½” / ¼” / 1”

Pump:

Type : Submersible
Power : Single Phase

RPM Counter

Rpm Counter with The Help of Proximity Sensors of Mounted Motor with the Help of PLC Output

I/O Module

16k Program Capacity, Built-in Ethernet Port, Built-in 3 COM Port, Max. expandable 480 I/O, 32-bit CPU, 12k Data Register, 24V DC Supply, 4 points high speed pulse output 100kHz/2 points, 10kHz/2 points, Input Type DC Sink / DC Source, 4 points high speed pulse input 100kHz/2 points, 10kHz/2 points 50kHz A/B Phase, Output Type Relay / Transistor, 100 ms / 10 ms / 1 ms Timer, 16 bit / 32-bit counter, 8 groups of Analog Inputs – Resolution 14 Bit -10 ~ 10 V, -20 ~ 20 mA, 8 groups of Analog Outputs – Resolution 12 Bit - 0 ~ 10 V, 0 ~ 20 mA ,CE / UL Certified.

HMI Module

4.3” TFT LCD Display, 480 * 272 Resolution, 256 MB Flash ROM, 512 MB RAM, Ethernet 10/100 MBPS one port, USB Slave Host 2.0, COM1 : RS232, COM2 : RS485 / RS232, Built-In RTC Function, CE / UL Certified, IP65 / NEMA4 / UL Type4 (Indoor Use) ,24V DC Supply, Power Consumption 5.8W (max), Operating Temperature 0~50 C

Four-way Traffic Light Simulators on HMI.

Linear input and output source Current source as Linear input should be provided for input simulation. And current indicator should be provided for visualization of variation in linear output.

Current Source

Power Supply : 230 VAC
Range : 4 to 20 mA
Output : 4 to 20 mA.
Display : Digital
Qty : As per Requirement

Current Indicator

Power Supply : 230 VAC
Range : 4 to 20 mA
Output : 4 to 20 mA.
Display : Digital

Qty : As per Requirement

Control Panel:

- Mains
- Switches for Operation as per Requirement
- Lamps for Indication
- HMI for operation of Process
- Current Indicators and Source for Linear Input / Output Operation

31. Conductivity meter & TDS meter

Conductivity meter:

Conductivity Range : 0 to 1000 m MHO/cm or m S/cm

Measuring Accuracy : $\pm 0.5\%$ of F.S. in all the ranges, ± 1 count.

Temperature range : 0 to 70 deg c (auto & manual)

Display : 2½ Digit Digital Panel Meter.

Conductivity cell : Approx 1.0 cell constant

Power Requirement : 230 volt $\pm 10\%$, 50 Hz

Standard Accessories : Conductivity Cell, Manual, Stand

TDS meter:

CONDUCTIVITY RANGE : 0 TO 20.00,200.0,2000 μ S/CM / TO 2.00,200.0 M S

CONDUCTIVITY RESOLUTION : 0.1 μ S/CM / 0.1 MS/CM

TDS RANGE : 0 TO 10.00,100.0,1000PPM/ 10.00,100.0 PPT

TDS RESOLUTION : 0.1 PPM / 0.1 PPT

DISPLAY : 20 * 4 ALPHANUMERIC LCD

CELL CONSTANT : 0.1 TO 5.0 AUTO SELECTED

ADJUSTABLE CELL CONSTANT : 0.09 TO 5.01 C.C.

COND. TO TDS FACTOR : 0.40 TO 1.00 SELECTABLE

TEMP.RANGE : 0 TO 99.9 DEG CENTIGRADE

TEMP RESOLUTION : 0.1 DEG CENTIGRADE

TEMP. COMPANSATION BOTH AUTO AND MANUAL

TEMP COEFFICENT : 0.10 % PER DEG

POWER REQUIREMENT : 230 VOLT + OR - 10 %, 50 HZ

STANDARD ACCESSORIES:

- CONDUCTIVITY CELL1.0 C.C,
- INSTRUCTION MANUAL.,

- STAND AND CLAMP
- Temp. probe, Dust cover, power adapter

32. PH METER (DIGITAL) PORTABLE

Technical Specification:

pH Range	: 0 to 14 Ph
Mv Range	: 0 to 19991mv
Resolution	: 0.01 pH, 1 mv in mv range
Repeatability	: 0.01 pH 1 digit 1 mv 1 digit in std. condition
Standardization Range	: Min. 2 pH.
Temp compensation	: 0 - 100C (Manual)
Display point	: 3½ digits LED with auto polarity & Decimal
Power	: 230V 10%, 50 Hz
Accessories	: Combine Electrode, Stand, Clamp, Manual

33. EXPERIMENTAL SET UP FOR ONLINE CONDUCTIVITY MEASUREMENT

Conductivity meter with 4-20mA output, Conductivity sensor, SS Reactor tank, SS feed tanks, variable speed pump, stirrer, hardware and electrical accessories mounted on good quality framework with software.

Technical Specifications:

The Set up will consist of reagent feed tanks, reagent feed pumps, Instrumentation for conductivity and temperature measurement and display and a, Control panel.

The Unit Will Have Provision to connect the setup to a computer for the purpose of operation, control, Data logging and plotting will be provided on the control panel. Custom designed, User friendly software will also supplied for the purposes mentioned above.

Reactor Unit:

Reactor Volume : 1 Litre
MOC : SS 304 Variable Speed Motor and Agitator, The reactor is mounted on a PVC base plate.

Reagent Tanks:

Quantity : 2 Nos.
Capacity : 2 litre each, SS 304,

Peristaltic pump:

Quantity : 2 Nos. for Reagent Feed
Speed : variable
Flow rate : As suitable
Display : LED,

Conductivity Meter:

Standard conductivity meter with conductivity measuring probe of suitable range, Salient , Display red LED, 7 segments & 4 digit, Selectable measuring scales, Temperature display in either °C or °F, Dual set-point with hysteresis, delay and min/max. Programmable functions. Automatic or manual temperature compensation. Selectable and galvanic isolated 0-20mA or 4-20mA output, Universal power supply 85/264 VAC – 50/60 Hz, Selectable input – pt 100 or pt 1000, Automatic overload protection and reset facility. Extractable terminal blocks. User friendly.

Measuring range : 0.2 S/m
Display : LED 7 segment 4 digits,
Input : conductivity probe, ,

Temperature:

Compensation : automatic / manual,
Temperature range : 0 - 100°C,
Set point : two (high & low) selectable,

Output : 4 – 20 mA (isolated),
Power supply : 85 to 264 VAC \pm 10%, 50 Hz,

Online Conductivity Electrode:

Range : 0 to 80 S/m
Electrodes : Two Graphite Electrode
Temperature Range : 0°c to 80 °c
Pressure : 10 bar
Cable length : 4 meter
Control panel : Conductivity Meter Display, Speed Controller, And Computer Plug- in
Connection, MCB ON/OFF switches with lamp indicator.

Software:

The software package offered contains necessary hardware and software required to Interface the set up on personal computer thus creating full software controlled experimental and instructional Environment. The package will enable students to investigate and understand the principles of process in a laboratory environment with the minimum technical support. Latest Windows Interface. Two way communication for control and data acquisition, Data display capability.

SIMULATION:

To Learn Process Behavior and Various Control Strategies Latest Software Based Simulation will Be Provide.

34. EXPERIMENTAL SET UP FOR ONLINE PH MEASUREMENT

PH Meter, PH Electrode, SS reactor tank, SS feed tank, Variable speed pump, Stirrer, hardware and electrical accessories on stand with software.

Technical Specifications:

- The Set up will consist of feed tanks, feed pumps, Instrumentation for pH measurement and display and Control.
- The Unit Will Have Provision to connect the setup to a computer for the purpose of operation, control, Data logging and plotting will be provided on the control panel.
- Custom designed, User friendly software will also be supplied for the purposes mentioned above.

Process/Reactor tank:

Capacity : 1Litre
MOC : SS 304, with Variable Speed Motor and stirrer,

Reagent Feed Tanks:

Quantity : 2 Nos.
Capacity : 2 liter each, SS 304,

Peristaltic/Variable Speed pump:

Speed : variable
Flow rate : As suitable

pH Meter with Electrode:

Standard pH Meter with pH measuring electrode of suitable range, Display LED/LCD, Selectable measuring scales, Selectable temperature display, 4-20 mA output

Control Panel:

- pH Meter Display,
- Speed Controller,
- MCB and ON/OFF switches with Indicating lamps.

Software:

The software package offered contains necessary hardware and software required to, Interface the setup on personal computer thus creating full software controlled, Experimental and instructional Environment. The package will enable students to, Investigate and understand the principles of process in a laboratory environment with, The minimum technical support. User friendly Windows interface. Two-way communication for control and data acquisition, Data display capability.

35. EXPERIMENTAL SET UP FOR ONLINE DISSOLVED OXYGEN MEASUREMENT

SS Measuring Tank, Dissolved oxygen Meter, dissolved oxygen sensor, mini air compressor, hardware and electrical accessories on stand

Technical Specifications:

The Set Up will consist of measuring tank, instrumentation for dissolved oxygen and temperature measurement and display and a control panel.

Measuring Tank:

Capacity : 3 Liter
MOC : SS 304, With air distributor, Variable Speed Motor and Agitator

- The tank will be mounted on a PVC base plate.

Dissolved oxygen Meter (Micro Processor based):

Standard dissolved oxygen meter with dissolved oxygen measuring probe of suitable range, 4 Digit LED Display, Selectable Measuring Scales. , Input from Pt 100/pt 1000 Temperature Sensors, Automatic/ Manual temperature Compensation, Selectable and Galvanic Isolated 0-20 mA or 4-20 mA Output, Configurable input for Hold or Alarm function, Selectable Dual set point min/max and delay.

Universal Power Supply : 85/264 V AC- 50/60 Hz.

Password protection : set by user

- Membrane Keypad.
- Zero and Sensitivity Calibration with Front Panel Switches, Set point Value Adjustment with Front Panel Switches.

SPECIFICATIONS:

MOUNTING : PANEL MOUNTED

INPUT : SENSOR(Appropriate)

AUTOMATIC TEMPERATURE COMPENSATION: With RTD Pt 100

RANGE : 20 mg/l

POLARISATION : ± 1000 Mv

SET POINT FUNCTIONS : ON/OFF Function, min/max Function, , Delay 0/99.9 Sec, Relay Contacts SPST, 220 V 5A Resistive

ALARM : min/max, configurable on all main scale , Active/ Non active function, Selectable Delay 0/99.9 Sec , Relay Contacts SPDT, 220 V AC, 5 Amp Resistive

RELAY CONTACTS : SPDT 5 Amp 220 V Resistive Load,

TEMPERATURE : 50 ° C,

POWER SUPPLY : 85/264 V AC, 50 / 60 Hz,

ANALOG OUPUT : Selectable 0-20 mA or 4-20 mA, Isolated 250 V, Response time 2 sec at 98% , Max load- 600 Ohm,

POWER : 5 VA Max., with Overload Protection,

DIMENSIONS : As per requirement

MARKING : CE, POLAROGRAPHIC D.O. CELL WITH BUILT IN RTD

SENSOR

Type : paleographic high current cell,

Body : pvdF, Temperature: 45 ° c,

Dia : 12 mm,

Body : epoxy

Length : 110 mm

Length of cable : 6 Mt, spare membrane and electrolyte

Mini Air Compressor Type : Diaphragm type

Power : 1/3 HP,

SUPPLY VOLTAGE : 230 V AC, 50 HZ,,

MAX. PRESSURE : 30 PSIG, Mini Air Regulator

SOLENOID VALVE:

Type : Plunger

SUPPLY VOLTAGE : 230 V AC OR 24 V DC
SIZE : 1/4"

Control Panel:

Dissolved oxygen Meter Display, Speed Controller, MCB, ON/OFF switches With Indicating lamps.

36. HART/FIELD DEVICES (PRESSURE/FLOW/LEVEL)

Electronic Level Transmitter (With HART facility):

Frequency : 54 KHz
Measuring Range : 0-4m
Wet-side material : ABS (Simple anti-corrosion)
Output : 4-20mA
Communication : HART Protocol
Switch Output : None
Power Supply : DC24V

Pressure Transmitter (With HART facility):

Accuracy : $\pm 0.065\%$ of span
Sensor Type : Piezo-resistive
Output : 4-20mA with HART
Span[1] : 0-25 to 2500mbar
Diaphragm : 316L Stainless Steel
Filling Fluid : Silicone Oil
Process Connector Accessory: 1/2 inch NPT

Female Thread:

Special function : None
Mounting Bracket : Carbon Steel Galvanized
Integral Indicator : Backlit LCD Display
Explosion-Proof Option : None
Enclosure Material : Die Cast Aluminum

For Flow Transmitter with HART Facility:

Accuracy : $\pm 0.065\%$ of span
Sensor Type : Piezo-resistive
Output : 4-20mA with HART
Span : 0-20 to 400mbar
Diaphragm & Filling Fluid : 316L Stainless Steel, Silicone Oil
Working Pressure : 16MPa
Process Connection : 1/4 inch NPT female thread
Process Connector Gasket : Perbunan (NBR)

Special function : Square root output
Mounting bracket : Carbon Steel Galvanized
Process Connector Accessory: None
Integral Indicator : Backlit LCD Display
Explosion-proof option : None
Enclosure Material : Die Cast Aluminum

Current Indicator:

Power Supply : 230 VAC
Range : 4 to 20 mA
Output : 4 to 20 mA.
Display : Digital
Qty : As per Requirement

MS structure with Fittings:

- The setup should be supplied with transducers/transmitter and DC power supply for transmitter.
- The total assembly should be mounted in suitable MS framework painted with good quality paint.
- The operating and instruction manual should be supplied.

37. REAL PID CONTROLLER TRAINING KIT

Set should be comprises of Sump Tank, Measuring Tank, Temperature Sensor, Thermocouple Sensor, Solenoid Valve, Level Transmitter, Data Acquisition System.

Machine Description:

The setup should consist of insulated heating tank (5 liter, SS 304 , insulated) heated with the help of thyristorized heater (1.0 kW capacity) and the flow rate of the water can be measured with the help of a Rotameter (10-100 LPH capacity). Temperature of the heated water is to be sensed by temperature sensor (RTD PT-100 type) Sensed temperature is transmitted to the PID temperature controller. The heating tank should also consists of stirrer with gear motor with variable speed.

Pump:

Type : Monoblock
MOC : SS body
Power Supply : 230 VAC

Sump Tank:

Service	: Water
Capacity	: 60 liter
MOC	: SS-316

PID CONTROLLER:

Type	: Digital
Display	: LCD/LED
Bar graph	: for output
Input type	: PT100, J, K, 0 - 10V DC, 0 - 20mA DC, 4 - 20mA DC
Range	: Settable as per input type
Resolution	: 1 to 0.001 as per input type
Accuracy	: $\pm 1\%$ of FSD $\pm 1^\circ\text{C}$ FSD
Output	: 2 nos. Relay Analog
Output	: 4 to 20 mA DC
Operating Temp.	: 0°C to 55°C Relative
Humidity	: UP to 95% RH
Protection Level	: IP-65 Communication
	: RS - 485 MODBUS

Control trainer software:

The software package offered contains necessary hardware and software required to interface the setup to a personal computer thus creating full software controlled experimental and instructional environment. The package will enable students to investigate and understand the principles of process control in a laboratory environment with the minimum technical support. Windows compatible software package has been developed using SCADA software.

This provides direct control of the processes (control trainer) used, including open and closed loop control, plus multi loop configurations associated with remote set point control (as appropriate). Comprehensive laboratory sheets for all the experiments are included in the manual with setting up information, background theory, operational procedures and all other relevant information.

Industrial SCADA software.

User friendly Windows interface. Two-way communication for control and data acquisition. Auto-configuration with multi-port selection option. Manual (Open Loop) and automatic control (Closed Loop). Selectable P, P+I, P+D and P+I+D mode. Bump less transfer between open and closed loop operation. Live mimic diagrams of the process including set point, process variable and output. Dynamic multi-color data display capability (tabular, chart or graphical form). Powerful graphics and trend chart capabilities with customization.

MS Structure and Fittings:

- Total assembly should be mounted in suitable MS framework painted with good quality paint

38. Trainer on RS485 to RS232 Converter :-

Trainer with software for test communication with computer.

Technical Specifications:

RS 485 to RS 232 converter Trainer contain converter, controller and testing Software. It will demonstrate the principle and working of RS485 to RS 232 converter.

Signal Conversion	: RS 485-RS232
Power supply	: 230 V ac /50Hz
Interface RS232	: DB9 female connector
Interface RS485	: Terminal
Working mode	: 2-wire, half-duplex
Transmission distance	: RS232: Typical: 15 FT (5m)RS485 : Typical 4000FT (1200m)
Maximum Baud Rate	: 100 Kbit/ s to 10 Mbit/s
Operating Temp.	: 0°C to 85°C

Converter controls the "Receive" and "Transmit" modes automatically with LED indication Controller having facility of RS 485 communication

Testing software to check communication between computers to controller via RS485 to RS232 converter Trainer will be mounted on suitable powder coating M.S. panel.

39. Air-conditioning, indirect system. (Water cooled)

Air conditioning plant indirect system. (water cooled) complete with all controls including humidity control etc. capacity 15000k. cal/hr. with data acquisition system & Fault simulation system & Automatically compressor capacity control

Basic structure :- The complete plant Evaporator , Condensing unit & Control panel assembled should be a single structure and mounted on heavy duty square or round tubular frame Powder coated painted. Unit consists of following items given below.

- 1) Brand New Reciprocating compressor open type 5 Ton capacity with drives, tested and certified by principal manufacturer with model number .
- 2) New Motor 7.5 HP copper winding 1440 rpm, class of insulation F, operated on 3 phase Supply.
- 3) Variable frequency drive of suitable capacity as per above motor for compressor capacity control.
- 4) Evaporator chilled water-cooling coil size 12" *36" five row made of copper tube and

aluminum fins with heavy duty copper winding motor direct coupled with two blowers for indirect system, shell & tube type DX-Chiller Length 40", dia. 6", copper tube 3/4" OD, thickness 21 SWG, no. of copper tubes-24. Complete with 1HP water pump for circulating water in chilledwater coil with thermostatic expansion valve.

- 5) Water cooled 5-ton capacity condenser shell & tube type, shell with cover length 30" dia.- 8", finned copper tube 3/4" OD & number of copper tubes- (28-32), with cooling tower of suitable capacity & 1 hp cooling tower water pump.
Low & high pressure cut out switch.
- 6) Humidity control system for facilities with humidity change.
- 7) SS glycerin Gauges pressure and compound 0-30 kg/sq.cm and 76 mm mercury vacuum and 15 kg/sq.cm
- 8) Hand shut off valve 3/8"
- 9) Solid core filter drier suitable size
- 10) Liquid Line indicator
- 11) Solenoid valve suitable size for liquid line
- 12) Suction accumulator suitable Capacity

13. Control Panel:- It consists of following items

a) Human interface 10" touch display with that is linked with Data Acquisition system and enables the following features: -

- 1) Block diagram with measurement points
- 2) Display of measured values (pressures and temperatures)
 - Voltage, Ampere
 - Suction Pressure
 - Discharge pressure
 - Compressor inlet temp.
 - Compressor outlet temperature
 - Condenser outlet temperature
 - Expansion valve inlet temp.
 - Expansion valve outlet temp.
 - Evaporator outlet temperature
 - Evaporator inside temperature
- 3) Display of electrical failures
- 4) Automatic temperature control & speed control of blower.
- 5) Facility of Automatically Compressor Capacity control of plant through speed control of motor.
- 6) Interface with PC through Direct USB 2.0 port

b) There should be following minimum failures/Faults switch bank, Faults details given below which are activated from fault switch bank showing on display through Data Acquisition system.

- Voltage failure
- Coil of the liquid line solenoid valve broken.
- Compressor failure.
- Failure of evaporator fan.
- Failure of the cooling tower fan.
- Failure of cooling tower pump.

- Failure of chiller pump.
- Failure on the control pressure switch LP.
- Failure on the temperature controller- relay broken.

Other electrical items like MCB, phase sequence preventer, Contactor with overload relay, light indicator etc.

40. Package A/C 5 ton capacity, Air cooled type with open type compressor reciprocating type:

- Package A.C 5.0 ton capacity, with data acquisition system , Fault simulation system & Automatically compressor capacity control .

Specification- This Package A/C is floor mounted type with Indoor & Outdoor unit are in separate body.

A) Indoor unit structure made of iron square pipe frame with heavy base for motor & compressor & body of iron frame covered with G.I powder coated sheet in such a way no inner structure of iron frame pipe is showing from outside. Indoor unit consists compressor, motor, evaporator, all refrigeration controlling items & one L band of duct. Unit Consists of following items;

1. Brand new Reciprocating compressor open type 5.0-ton capacity. with drives, tested and certified by principal manufacturer with model number.
2. Motor 7.5 HP copper winding 1440 rpm, operated on 3 phase supply
3. Variable frequency drive of suitable capacity as per above motor for compressor capacity control.
4. Cooling coil. size 30" x 36" x 2 Row made of copper tube and aluminum fins of 5-ton capacity with blower and housing and electric motor copper winding heavy duty.
5. Expansion device thermostatic expansion valve 5-ton capacity
6. Pressure gauge
7. Compound gauge
8. Liquid line indicator
9. Liquid line Solenoid valve
10. Solid core filter drier
11. Liquid receiver with inlet and outlet valve 5 ton capacity
12. Suction Accumulator
13. HP and LP cut out
14. Hand shut off valve 3/8"

B) Outdoor unit structure also made of iron square pipe frame with base & two side covered with powder coated wire mesh & three side covered with G.I powder coated sheet. Unit consist of Air-cooled Condenser coil size 24" * 48" four row capacity 5 ton with two Axial fans & housing.

C) Control Panel:- It consists of following items.

a) Human interface 10” touch display with that is linked with Data Acquisition system and enables the following features: -

1. Block diagram with measurement points
2. Display of measured values (pressures and temperatures)
 - Voltage, Ampere
 - Suction Pressure
 - Discharge pressure
 - Compressor inlet temp.
 - Compressor outlet temperature
 - Condenser outlet temperature
 - Expansion valve inlet temp.
 - Expansion valve outlet temp.
 - Evaporator outlet temperature
 - Evaporator inside temperature
- 3) Display of electrical failures
- 4) Automatic temperature control & speed control of blower.
- 5) Facility of Automatically Compressor Capacity control of plant through speed control of motor.
- 6) Interface with PC through Direct USB 2.0 port

b) There should be following minimum twelve failures/Faults switch bank, Faults details given below which are activated from fault switch bank showing on display through Data Acquisition system.

- Voltage failure
- Dehydrator clogged.
- Coil of the liquid line solenoid valve broken.
- Compressor failure.
- Failure of evaporator fan.
- Failure of the condenser fan.
- Failure of an expansion valve
- Failure on the control pressure switch LP.
- Failure on the temperature controller- relay broken.
- Failure on the temperature controller- temperature probe broken.
- Failure on the condenser- fouled exchanger
- Failure on the evaporator- fouled exchanger

c) Other electrical items like MCB, phase sequence preventer, Contactor with overload relay, light indicator etc.

41.CASCADE REFRIGERATION SYSTEM

Technical Description:

Cascade Refrigeration is a system which employs 2 or more individual refrigeration cycles operating at different temperatures and pressures.

REQUIRMENT FOR OPERATION:

- Electric supply 5A-220 V AC
- Water supply and drainage
- Floor area : 1.5 m x 1m

TECHNICAL SPECIFICATION:

- High Pressure Side Compressor: Hermetically sealed compressor having cooling capacity of (3/4 ton)
- Low Pressure Side Compressor: Hermetically sealed compressor having cooling capacity of (1/4 ton)
- Evaporator: Copper Coil immersed in insulated water tank (shell)of stainless-steel water tank.
- Agitator: Compatible capacity.
- Condenser: Air-cooled condenser with copper fins. This is a tube type condenser, FHP fan motor with fan blade is provided.
- Cascade Condenser: Tube and Tube type Condenser with copper tubes.
- Expansion device: 2 Nos.Capillary Tube:
 - Diameter: Suitable
 - Material: copper.
 - Refrigerant: (R-22) /R-404a/ R-134A.
- Pressure Gauges: 2 Nos.
- Control Panel comprises of:
 - Digital voltmeter 0-500V
 - Digital Multimeter 0-30 A
 - Multipoint Digital Temperature Indicator: 2 No, to measure temperatures at various salient points of therefrigeration cycle.
- HP/LP cut-out: 2 No.
- Filter / Drier: 2 nos.
- Liquid line Indicator- 2 nos.
- Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus
- All the accessories will be mounted on a rigid base frame made of M.S. and it will be powder coated.

Control Panel:

- Standard make on/off switch, Mains Indicator etc.