बी एच ई एल BHEL A4-10		CE/416/GLAB(E)/PQC REV 01

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PQR REQUIREMENTS FOR LAB ITEMS (ELECTRICAL)

REVISION:01

APPROVED		
-sgnd- SAPNA RAO		
PREPARED	**ISSUED**	**DATE**
K. Rajasekar. K.RAJASEKAR	416	26/11/19

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SL.NO	PROJECT	CUSTOMER/CONSULTANT
1	MAITREE (2x660 MW)	CUSTOMER : M/s BIFPCL CONSULTANT : M/s FICHTNER, GERMANY

SECTION-A

GENERAL INSTRUCTION TO BIDDERS

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Introduction: Bidders are required to offer Laboratory Instruments (C&I Pacakge) as per BHEL Technical Specifications for this project.

1.0 ALL REQUIRED DOCUMENTS AGAINST THIS TENDER/SPECIFICATION SHALL BE SUBMITTED IN ENGLISH ONLY.

2.0 In order to accept the Technical offers/ proposals from Bidders mentioned in BHEL Technical Specification, certain Pre-qualification criteria Requirements are to be met by Bidder.

3.0 Pre – qualification requirements (PQR) are clearly mentioned in Section-B of this Specification. Bidder to read the same carefully and submit the details/documents required for BHEL's acceptance.

4.0 If a Bidder does not submit Complete PQR Documents or the Documents submitted by vendor does not meet the PQR Criteria mentioned , offer of such bidders will be summarily rejected and will not be considered for Further evaluation in the tender.

5.0 Technical Bid's of those bidders who meet the PQR Criteria shall be opened for Evaluation and further consideration by BHEL.

6.0 Changes in technical specification scope/BOM , If any shall be informed to participating bidders only.

7.0 If a vendor does not quote for all the listed items, then his complete offer will be technically rejected. Please note that essence of this tender is packaging and hence all items within this project are to be offered so as to have one packaged vendor for this project/Projects.

8.0 Evaluation methodology: BHEL shall initially open Bidder's PQR documents only as per Section-B of this specification for review & acceptance. Only after acceptance of PQR documents, BHEL shall open Bidder's technical offers for evaluation. Bidders whose technical offers are complete in all aspects will be taken up End User / Customer for approval. Only bidders who are approved by End user / Customer, technical offers /commercial bids of those bidders will be considered for further evaluation by BHEL. Bidders to fill FICHTNER sub supplier form along with Attachments(annexure1,2,3) and submit along with RFQ.

9.0 BHEL shall initially open Bidder's Part1 (PQR documents) only as per Section B (Pre-qualification Requirements) of this specification for review acceptance. Only after acceptance of PQR evaluation, BHEL shall open Bidder's Technical offer(Part2) for evaluation.

10.0 <u>Bidders are required to submit offers as detailed below:</u>

aa. Documents pertaining to Pre-Qualification requirement shall be Uploaded in E-procurement system under attachment titled "PQR Documents " (Part1)

bb. Technical offers/proposals (Part2) for requirements mentioned in BHEL Technical Specifications shall be submitted /uploaded in E-procurement system as attachments

11.0 If Bidder is not Registered in BHEL-EDN or any other unit of BHEL For supply of Lab equipment package ,Submit duly- filled Source Request form (SRF), which shall be downloaded by Bidder from bhel website .**http://supplier.bhel.in/** and to be submitted along with offer.

12.0 Name & registered address of The Bidder with Organization chart, service team and contact details shall be submitted

13.0 Bidder shall be responsible for complete package supply, installation/commissioning and satisfactory demonstration and handing over to customer. Wherever OEM Representative to be deputed for commissioning bidder shall coordinate at his own cost and complete the work. Qualified technical persons shall only be deputed by the bidder for commissioning of the items in the package.

14.0 Whenever required during evaluation of PQR and Technical offers/bids, vendor/vendor representative is required to be present at BHEL Electronic Division, Bangalore, for discussions. Further in the event of order, during approval of the Vendor documents by End-users/Customers, Vendor shall accompany BHEL representative for discussions(If Required).

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SECTION-B

PRE-QUALIFICATION REQUIREMENTS

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AA.Pre-Qualification Requirements (PQR) bidders for Lab instruments (C& I Package) as Part of offer

1.0 Vendor should have supplied Lab instruments(C& I Package) to process plant/ refinery/ power plant/ nuclear plant / testing Lab.

2.0 Vendor should be in the business of supplying Lab instruments (C& I Package) in the period Past within Five (5) years from the date bid opening . (Po's to be submitted of package or individual items)

3.0 Minimum One no. purchase order for *Lab instruments* Package* shall be submitted which should not be more than 5 years old in the period past , from date of bid opening .

4.0 Bidder has to submit letter of undertaking stating that they will take care of service Requirements till guarantee /warranty period/ commissioning & Demonstration and handing over whichever is later

5.0 Bidders has to compulsorily fill the vendor approval formats(Annexure-1,2,3) attached at the end of technical specifications and submit it along with supporting documents (if any Required) Incomplete formats are liable for PQR Rejection.

6.0 Bidder should have a Clean track Record , i.e the Bidder should not be under Hold or blacklist by any of the BHEL units/any Govt of india PSU/Govt of india as on bid submission date.To this effect a declaration should be given by the bidder.

Note : Proof for Points 1,2,3,4 should be submitted.

6.0 **Important note: -** In case Bidder does not submit clause wise details mentioned in above clauses or meet the requirements of Pre-qualification requirements, Offers will be summarily Rejected and Bidder's Technical offers/proposals will not be Evaluated. Please read carefully the General instructions in Section A of this specification.

**Lab instruments Package : (Please Refer next page)*

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**Lab instruments Package : purchase order submitted under clause 3(* AA.Pre-Qualification Requirements) *of previous page should have minimum 15 items of below instruments listed .*

1. Portable Digital vibration analyser (digital)
2. Portable Digital Vibration meter
3. Electronic test bench with computerized calibration system
4. Electronic Test Bench
5. Electronic Module tester
6. Power meter with Harmonic analyser
7. Portable Multifunction calibrator (Microprocessor based) (Handheld)
8. Portable Multifunction calibrator (Microprocessor based) (Bench type)
9. Field transmitter calibrator
10. Hand held oscilloscope
11. Digital oscilloscope
12. Desktop digital multimeter
13. Portable Dgital multimeter
14. Ac Power supply
15. DC regulated Power supply
16. Portable Trend Recorder
17. Digital LCR meter
18. Stabilised Power Supply
19. Frequency Counter
20. Milliamp calibrator (table mounted)
21. ,Miilamp calibrator (Portable)
22. Millivolt calibrator (table mounted)
23. ,Miilvolt calibrator (Portable)
24. Decade Resistance Box (Analog)
25. Decade Resistance Box (Digital)
26. Dc Regulated power Source
27. Hand Held Thermocouple and PT-100 OHM Simulator and Indicator
28. SMD Rework station
29. Soldering/Desoldering station
30. SMD rework station
31. Vibration pickup tester.
32. Signal generator /Function generator
33. Ac universal Bridge
34. AC/DC Clamp meter/Tong tester
35. Digital cable fault locator /Lan tester
36. DC earth fault locator
37. Digital tachometer
38. Digital RCL meter
39. Digital tachometer
40. Standard AC Voltage source
41. Digital /Analog Phase sequence indicator
42. Digital Frequency Mter
43. Test RTD./ Thermocouple
44. Digital Automatic Insulation Tester
45. Digital insulation tester /Megger
46. Mega ohm meter
47. Portable reference meter
48. Substandard Frequency meter/frequency meter
49. Powerfactor meter
50. Phase sequence indiactor (Digital/Analog)
51. Portable Sound level meter
52. Single phase varaiac
53. Polyphase varica
54. Variable frequency source.
55. HV testing kit

56. Logic Analyzer
57. High speed digital acquisition recorder
58. Radio system analyzer
59. Digital frequency meter and harmonic analyzer
60. RF power meter / VSWR (voltage standing wave ratio) meter
61. RF / Video Scanner
62. RF calibration source
63. Video pattern generator
64. Fiber optic cable tester / analyzer
65. Energy / power analyzer
66. Spectrum Analyzer
67. Color Spectrometers
68. Wave synchronizer
69. Transient recorder
70. EPROM, E2PROM, Flash programmer / copier
71. Digital / analog IC tester
72. PIC programmer

If any other item other than above is submitted in Purchase order submitted , BHEL reserves the right to determine and accept whether the items comes under C&I Lab instruments (Electrical).

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PROJECT : MAITREE (2x660 MW)

CUSTOMER : M/s BIFPCL

CONSULTANT : M/s FICHTNER, GERMANY

LABORATORY INSTRUMENTS (ELECTRICAL)

REVISION:00

APPROVED
-Sgnd-
SAPNA RAO

PREPARED	ISSUED	
K.RAJASEKAR	416	26.11.19

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S.No	Description	Reference
1.	SCOPE OF SUPPLY	CE/416/GMAI/LABI/SOS Rev 02, Pages 05
2.	TECHNICAL SPECIFICATIONS	CE/416/ GMAI /LABI/TS Rev 02, Pages

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SCOPE OF SUPPLY

The scope of supply consists of LABORATORY INSTRUMENTS (C&I) Package for the project mentioned

Although immense care has been taken to cover all the items applicable for the project, it is possible that some items may have been missed (which needs to be added) or some items have been already supplied which are not to be supplied now for these projects. Then in either case, unpriced impact (technical) and price impact will be taken from participating vendors. But please note that if a vendor has not participated in this RFQ and if the impact is applicable due to change in quantities or due to acceptance of deviations, non-participating vendor will not be sent intimation (under this RFQ) as the changes are very, very minimal keeping the non-participating vendor still debarred under this packaged RFQ. Hence, all vendors should actively participate offering all the items. If a vendor does not quote for all the listed items, then his complete offer will be technically rejected. Please note that essence of this tender is packaging and hence all items within this project are to be offered so as to have one packaged vendor for this project.

Please note that if any item requires battery, same should be rechargeable type of same item make or equivalent good make. Then the corresponding charger is also to be provided. Also, please note that computer interface is to be provided with relevant pre-fabricated cable of 2 or 3 meters length for connectivity to computer, Current Probe and High Voltage Probe as and where applicable for the individual instrument. If any application software is required due to this, same is also to be provided as and where applicable for that particular instrument.
.
If any deviations are accepted by bhel During evaluation stage and subsequently not accepted by end customer during datasheet submission stage ,then vendor has to replace the model without any financial implication to BHEL.

Project wise unit rates are to be offered taking care of applicable BOM for individual project since the items are being enquired as a package for individual project. Subsequently, after ordering, unit rates of each and every BOM item of project is to be provided to take care of any addition/deletion during detailed engineering stage. Erection supervision and commissioning is also to be offered with lump sum rates each project wise.

Please note that for any item offered by vendor BHEL reserves the Right to ask the vendor, any or all of these credentials *(*Po copies of Past supplies / commissioning Reports(MoM*)*.If the credentials are not submitted/not satisfactory , the item will not be acceptable and supplier has to offer any other suitable make /model without any impact to BHEL. BHEL Fully reserves the right to decide on the above .

All the electronic M&C items shall be microprocessor based and shall have the data logging facility for keeping calibration/maintenance records with proper communication facility for downloading these data on the Lab PC. Wherever such facility is available in the Equipment offered
The vendor if required has to visit BHEL-EDN for technical clarifications during technical evaluation
After order and datasheet submission to customer/consultant vendor has to visit Customer /consultant (if required) with BHEL for resolving any technical clarifications required by them.

The calibration standards of all M&C equipments furnished under this sub-section shall be traceable to National Bureau of Standards, USA or NPL, India or to the applicable standards existing in the country where the equipment is manufactured.Dust proof carrying case and Rechargeable battery along with external charger shall be provided
For the project site under this RFQ vendor has to offer following option:-

1.) Despatch of items Should be done in standard Railway container

ERECTION SUPERVISION & COMMISSIONING:
Please note that Erection Supervision & Commissioning is to be offered project wise and same will be considered while evaluating lowest commercial tender. The commissioning will involve demonstrating the healthiness and working of all the items within the project to the satisfaction of BHEL site office/end-user.

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TECHNICAL DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER(MANDATORY):

1.) Technical bid should be having Desc, Qty, make,Model , Strictly as per the Template format given below (In Pdf and excel)

2.) Catalogues of all the items in soft copy

DOCUMENTS TO BE SUBMITTED AFTER PLACEMENT OF ORDER:

a.Datasheets along with catalogs for each and every item properly indexed.

b. Mounting details including necessary accessories (If applicable)

c) Recommendations (if any) for installation/ storage etc

d) Spare part list

e) Consumable list

f) Training details

g) O&M Manual (*After datasheet approval)*

h) Any other scheme, data, drawing, document, etc required to establish product quality and completeness of supply.

The above documentation shall be each project wise with around 8 copies or On as required for each project on an average.Apart from hard copies, soft copy in the form of CD/Pen drive should also be provided for each project.

TEMPLATE To be followed for technical bid (Example) :

Slno	Desc	Qty	make	model
1	Soldering Station	2	HAKKO	**FR-810 Accessories :** handpiece holder, FP pick-up (with pick-up wire SS), heat resistant pad, power cord,

The handing over of the workshop and store equipment shall be done in one lot and accompanied by function check and demonstration of operation and all functions performed by the Contractor in presence of the O/E. Equipment that did not perform according to the requirement shall be replace by the turned to the Contractor for replacement to no expenses to the Employer. The necessary operational manuals are to be delivered by the Contractor before handing over workshop and store equipment.

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PACKING INSTRUCTIONS

All equipment and materials shall be suitably coated wrapped or covered and boxed or crated for export shipment and to prevent damage during handling and storage at the site. Cardboard containers shall be enclosed in a solid wooden container.

Equipment and process materials shall be packed and semi-knocked down, to the extent possible, to facilitate handling and storage and to protect bearings and other machine surfaces from oxidation. Each container, box, crate or bundle shall be reinforced with steel strapping in such a manner that breaking of one strap will not cause complete failure of the packaging. The packing shall be of best standard to withstand rough handling and to provide suitable protection from tropical weather while in transit and while awaiting erection at the site.

Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All parts subject to damage when in contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.

Each package or shipping unit shall be clearly marked or stenciled on at least two sides as follows:

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (Pvt.) LIMITED
2x660 MW MAITREE SUPER THERMAL POWER PROJECT
BANGLADESH
BHARAT HEAVY ELECTRCALS LIMITED, ELECTRONICS DIVISION
BENGALURU

In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.

Each case shall contain a packing list showing the detailed contents of the package. When any technical documents are supplied together with the shipment of materials no single package shall contain more than one set of such documents. Shipping papers shall clearly indicate in which packages the technical documents are contained.

The case number shall be written in the form of a fraction, the numerator of which is the serial number of the case and the denominator the total number of case in which a complete unit of equipment is packed.

Wherever necessary besides usual inscriptions the cases shall bear special indication such as “Top”, “Do not turn over”, “Care”, “Keep dry”, etc., as well as indication of the centre of gravity (with red vertical lines) and places for attaching slings (with chain marks).

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		REV 02

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PROJECT : MAITREE (2x660 MW)

CUSTOMER : M/s BIFPCL

CONSULTANT : M/s FICHTNER, GERMANY

TECHNICAL SPECIFICATIONS FOR LABORATORY INSTRUMENTS(ELECTRICAL)

Note : Package is Common for total plant

REVISION:00

APPROVED		
K.C.RAMAKRISHNAN		
PREPARED	**ISSUED**	**DATE**
K.RAJASEKAR	416	26.11.19

BILL OF MATERIALS

Sl No.	Description of Item		Qty
	B12.2.7 Mechanical Tool Store for workshop		
1	Instrument mechanic's and electronics tool kit, Bach in accordance with DIN or equivalent standard complete	set	10
	B12.2.8 Electrical Workshop		
2	Digital data acquisition recorder with integrated printer	Nos	2
3	Digital transient recorder with integrated PC	Nos	1
4	Set 24 volts DC source; as per latest technology	Nos	1
	B12.2.9 INSTRUMENT AND PNEUMATIC WORKSHOP		
5	B12.2.9.1 INSTRUMENT WORK BENCHES	Nos	1
	B12.2.9.3 Loose Equipment For Instrument and pneumatic Workshop		
6	Soldering iron sets with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench	Nos	9
7	Stationary solder remover with vacuum pump, pipes, tips, etc. for each workbench	Nos	9
8	Standard rotatable vice, mounted on each of the regular workbenches	Nos	1
9	Storage metal cabinets for electronic equipment with shelves, shelters, boxes, etc. min. dimensions (W x D x H) 0.8 x 1.8 x 0.6 m	Nos	1
10	Heavy duty chairs for the workbenches	Nos	1
11	Light sources/ lamps adapted to the workbenches	Nos	1
12	RTD Simulator / Tester for different types of RTDs	Nos	12
13	Standard Th/C, mV calibrator precision source / Thermocouple/ RTD simulation equipment (mV, ohm) for different types of thermocouples	Nos	12
14	Direct temperature indicating meter suitable for direct measurement of different types of thermocouples and resistance thermometers with additional hand-held thermo probes for temperature measurements from -20 to + 600 deg C	Nos	12
15	Standard pH Tester	Nos	12
16	Multi-Function Process Calibrator Handheld &Bench type (12 Nos Hand held & 12 Nos bech type)	set	1
17	Loop Calibrator	Nos	12
18	Voltage / Current / temperature Reference generator	Nos	12
19	Intrinsic safe Multifunction Calibrator DRUK TRX II IS	Nos	12
20	Portable Hand-Held Tacho-Meters	Nos	8
21	Double channel digital storage oscilloscope (DSO) minimum bandwidth 0-100 MHz (-3 dB), 2 channels with memory for 4 waves, with RS 232 (or similar) interface, cable and user program for PC with one set of measuring heads		6
22	Conductivity Meter	Nos	12
23	Electronic Stethoscope	Nos	12
24	General Purpose Vibration Meters	Nos	8
~~25~~	**~~Hand held Thermometers~~**	**~~Nos~~**	
26	Set of precision resistance decades, 10 boxes, covering ranges from 0.1 ohm to 10 k Ohm	set	8
27	Portable electronic chart recorder- with variable speed setting, Accuracy +0.5%, with switchable input ranges 0-20 mA, 0-10V, 0- 10 mV, 0-50 mV, RTD thermocouple, communication at least RS232/485 sampling time 10 mS or better, 6 channels.	Nos	4
28	230 V AC Extension cables Length 50 m with multiple sockets and switch	Nos	20
29	Measuring cables of different lengths and color, complete with banana plugs	Nos	30
30	Portable sound level (dBA) meter	Nos	4
31	Stop watch		4

32	rechargeable torches complete with batteries/ battery charger	Nos	25
33	Whiteboard (wall fixed) with 3 sets of pens in different colors and eraser	Nos	2
34	230/12V lighting transformer with hand lamps	sets	6
35	Megger C/w test leads, carrying case, high voltage probe, battery cells, measuring range 0 to 10 MOhm	Nos	5
36	HART communicator	set	15
	B12.2.10 Electronic and communication workshop		
37	B12.2.10.1 Electronic Workbenches	Nos	6
	B12.2.10.2 Loose Equipment for Electronic and communication Workshop		
38	Different purpose soldering station also usable for SMD technology with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench	Nos	6
39	Stationary de-soldering station with vacuum pump, pipes, tips, etc. for each workbench usable for SMD technology too.	Nos	6
40	Standard rotatable vice mounted on each of the regular workbenches	Nos	6
41	Storage metal cabinets for electronic equipment with shelves, shelters, boxes, etc. min. dimensions (W x D x H) 0.8 x 1.8 x 0.6 m	Nos	6
42	Heavy duty chairs for the workbenches	Nos	6
43	Light sources/ lamps adapted to the workbenches	Nos	6
44	Variable transformer (variac), single phase, 230 V +10%/1000 VA	sets	6
45	Variable transformer (variac), three phase, 400V + 10%/5000 VA	sets	6
46	Current and voltage sources 0 - 20 mA 0 - 10V accuracy ± 0.3%	sets	4
47	Variable DC power supply laboratory-type unit with controlled and adjustable current and voltage output: 0 - ±50 V, 0 - 25 A 0 300 V, 0 100 mA	Nos	12
48	General purpose amplifier Suitable as pre-amplifier to rise level of a signal or as buffer Shall provide stable 20 and 40 dB gain over a wide frequency range with fast rise time	Nos	4
49	Pulse/function generator range 1 Hz to 20 MHz with digital display	Nos	6
50	Digital hand held and bench type multimeters for AC/DC, frequency, ohms, diode tests, etc., 4 - ½ digit, wide bandwidth with auto-ranging. (To be used for calibration DC AC Capacity 0 - 200 µF ± 1 % + 3 digits lowest range 5 nF Ranges 0 - 1000 V ± 0.5% + 2 digits at 60 Hz lowest range 400 mV 0 - 10 A ± 1.0 % + 2 digits lowest range 40 mA 0 - 20 kHz ± 0.005% + 1 digit lowest range 200 HzRanges 0 - 1000 V ± 0.05% + 1 digit lowest range 400 mV 0 4000 µA ± 1.0 % + 2 digits lowest range 400 µA 0 - 10 A ± 0.2 % + 2 digits lowest range 40 mApurposes) Resistance 0 - 50 Mohm ± 0.2% + 1 digit lowest range 250 ohms **(4 1/2 Digit Portable -8 Nos and 4 1/2 Digit Bech type -8 Nos)**	sets	1
51	Digital hand-held and bench type multimeters 3-1/2 digit display, for DC/AC voltage and current measurements, resistance, capacitance and frequency measurements, continuity checking, etc. with temperature probe **(3 1/2 Digit Portable -8 Nos and 3 1/2 Digit Bech type -8 Nos)**	Set	1
52	Frequency meter/timer/counter 8 digit display frequency 0 - 100 MHz period 10 us - 105 s ratio 0.1 Hz-100 Hz	Nos	4
53	Universal Counter	Nos	4
54	Electronic DC Load Simulator 100 W / 50 V	Nos	4
55	Precision current / voltage calibrator Including mV & mA	Nos	4
56	Multi frequency Load Current Resistance meter resolution 5 1/2 digit, 0.1% basic accuracy, with auto ranging	Nos	42
57	Set of precision resistance decades covering ranges from 0.1 ohm to 100 kohm	Set	6
58	Set of precision capacitance decades covering ranges from 1 pF to 10,000 µF	Set	6
59	Set of precision inductance decades covering ranges from 1 µH to 100 H	set	6

60	Portable electronic chart recorder with variable speed setting, accuracy ± 0.5%, with switchable input ranges 0 - 20 mA, 0 - 10 V, 0 - 10 mV, 0 - 50 mV, RTD, thermocouple; communication at least RS232/ 485	Nos	4
61	Digital/ Analog double channel digital storage oscilloscopes (DSO), minimum bandwidth 0-100 MHz (-3 dB), 2 channels with memory for 4 waves, with RS 232 (or similar) interface, cable and user program for PC with one set of measuring heads	Nos	4
62	Hand-held Graphical Display Meter (DSO-meter) with big size display for waveform representation (industrial frequencies). Further features: 2 pcs Storage capacity for at least 8 curves Max. sampling rate at least 20 MS/s Band with 100 kHz Horizontal time base from 5 µs/div, auto trigger 10"LCD at least RS 232 (or similar) interface, cable and user program for PC Additional DMM operation (Digital MultiMeter)	Nos	6
~~63~~	~~Logic Analyzer~~	~~Nos~~	
64	Digital / analog IC tester	Nos	6
65	PIC programmer	Nos	4
66	EPROM, E2PROM, Flash programmer / copier	Nos	4
67	UV EPROM eraser	Nos	4
68	Clip-on Ammeter AC	Nos	6
69	Clamp Meter DC	Nos	6
~~70~~	~~Spectrum Analyzer~~	~~Nos~~	
~~71~~	~~Color Spectrometers~~	~~Nos~~	
~~72~~	~~Wave synchronizer~~	~~Nos~~	
73	Transient recorder	Nos	4
74	High speed digital acquisition recorder	Nos	4
~~75~~	~~Radio system analyzer~~	~~Nos~~	
76	Digital frequency meter and harmonic analyzer	Nos	4
77	RF power meter / VSWR (voltage standing wave ratio) meter	Nos	4
~~78~~	~~RF / Video Scanner~~	~~Nos~~	
~~79~~	~~RF calibration source~~	~~Nos~~	
~~80~~	~~Video pattern generator~~	~~Nos~~	
81	Audio / video oscillators / function generators	Nos	4
82	230 V AC Extension cables with multiple sockets and switch	Nos	20
83	Measuring cables of different lengths and color, complete with banana plugs	Nos	30
84	Cable clips: Single and multiple (for IC's) cable clips hook and pin types, banana plugs, etc., as required	Nos	50
85	Sets of SMD modules Including resistors and capacitors of different values of each type at least 20 pieces	Nos	6
86	Hot air guns	Nos	6
87	Stop watch	Nos	2
88	rechargeable torches complete with batteries/ battery charger	Nos	6
89	Earth, Megger Test Equipment	Nos	2
90	Insulation tester	Nos	2
91	Energy / power analyzer	Nos	2
92	Thyristor tester	Nos	2
93	Phase rotation tester	Nos	2
94	Circuit continuity testers with buzzers and light indication	Nos	4
95	Fiber optic cable tester / analyzer	Nos	2
96	LAN / WAN tester	Nos	2
97	Telephone test equipment	Nos	4
98	Cable tracer / fault finder	Nos	2
99	Video monitors for PAL, SECAM, NTSC standard	Nos	4
100	Whiteboard (wall fixed) with 3 sets of pens in different colors and eraser	Nos	2
101	230/12V lighting transformer with hand lamps	set	6
102	Rechargeable flash light complete with battery and battery chargers	set	6

103	Digital semi-conductor testers	Nos	6
104	Different ranges soldering iron (40, 100, 150, 250, 500 W)	set	4
105	Gas soldering iron, 300°C to 500°C	set	2
106	De-soldering pump	set	20
107	Heat gun, 600°C	set	10
108	Rheostat (high watt different ranges)	set	5
109	LCC meter bridge	**set**	**3**
110	Universal IC programmer and tester	set	3
111	TTL logic probe	set	4
112	CMOS logic probe	set	4
113	Tachometer	set	5
114	Stroboscope	set	2
115	Gauss meter	set	3
116	Anemometer	set	2
117	Galvanometer	set	5
118	Auto transformer (2, 5, 10 A) primary 220 VAC, secondary variable	set	3
119	Data plug termination tool		2
120	Fiber optics connectors	set	6
121	Fiber optic terminated leads PCS (plastic coated silica), 200 mm core dia, terminated with 9 mm SMA connector at both ends, 800 nm 880 nm wave length	set	6
122	Auto trim termination tool	set	2
123	IDC terminal professional tool	set	2
124	540 tone generator and inductive speaker probe	set	1
125	Telephone cordage	set	2
126	Connection tools	set	2
127	Hand termination tools	set	2
128	Fiber optic tool kit (basic kit)	set	2
129	Fiber optic tool kit (universal kit)	set	2
130	Fiber optic light source	set	2
131	Fiber optic power meter	set	2
132	Wilcom fiber identifier	set	2
133	Fiber optic stripping kit	set	2
134	Fiber optics stripping tool	set	2
135	Fiber optic talk set	set	1
136	Test telephone	set	2
137	Optical tachometer range 30 ~ 50,000 rpm	set	2
138	Digital frequency counter with accessories 5 Hz 1300 MHz	set	2
139	3 meter SM patch cord	Nos	15
140	FC/PC D-Mount SM adapter coupling	set	6
141	Fusion holder for ultra sleeve	set	12
142	Magna focuser magnifier	Nos	4
143	Heat shrink tube RED 3/16 inch	ft	30
144	Heat shrink tube GREEN 3/16 inch	ft	30
145	High precision optical fiber cleaver, hand held	set	1
146	Replacement blades for optical fiber cleaver	set	3
	B12.3 Central Control Building DCS Workshop		
147	B12.3.1 WORKBENCHES IN THE DCS WORKSHOP	Nos	6

<u>Note :</u> The Above Items should be supplied in Standard Railway containers

TECHNICAL SPECIFICATION

Sl No.	Description of Item		Qty
B12.2.7 Mechanical Tool Store for workshop			
	Instrument mechanic's and electronics tool kit, Bach in accordance with DIN or equivalent standard complete ***Mechanic's Master Tool Set*** *10Pc 1/4" Drive 6 Point Inch Sockets: 5/32", 3/16", 7/32", 1/4", 9/32", 5/16", 11/32", 3/8", 7/16", 1 /2''* *10Pc 1/4" Drive 6 Point Metric Sockets: 4, 5, 6, 7, 8, 9, 10, 11, 12,13mm* *6Pc 1/4" Drive Deep 6 Point Metric Sockets: 4, 5, 6, 7, 8, 9mm* *3Pc 3/8" Drive Phillips Bit Sockets: #1, #2, and #3* *9Pc 3/8" Drive 6 Point Inch sockets: 3/8", 7/16", ½", 9/16", 5/8", 11/16",3/4", 13/16", 7/8"* *6Pc 3/8" Drive Deep 6 Point Metric Sockets: 10, 11, 12, 13, 14, 15mm* *2Pc 3/8" Drive Extension Bar - Locking: 3", 6"* *2Pc 3/8" Drive Spark Plug Metric Sockets: 16, 21mm* *6Pc 1/2" Drive Deep 6 Point Metric Sockets: 10, 12, 13, 14, 17, 19mm* *8Pc 3/8" Drive 6 Point Torx Sockets: E8, E10, E11, E12, E14, E16, E18, and E20* *11Pc 3/8" Drive 6 Point Metric Sockets: 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19mm* *4Pc 1/2" Drive Impact 6 Point Metric Sockets: 17, 19, 21, 23 mm* *4Pc 1/2" Drive 12 Point Inch Sockets: 15/16", 1", 1-1/16", and 1-1/4"* *7Pc 1/2" Drive 12 Point Metric Sockets: 20, 21, 22, 24, 27, 30, 32mm* *2Pc 1/2" Drive Extension Bar: 5", 10"* *3Pc 3/8" Drive Slotted Bit Sockets: 4.0, 5.5, 6.5mm* *7Pc 3/8" Drive Torx Bit Sockets: T-20, T-30, T-40, T-45,T-50, T-55, T-60* *6Pc 3/8" Drive Hex Bit Sockets: 3, 4, 5, 6, 8, 10mm* *3Pc 3/8" Drive Pozidriv Bit Sockets: #1, #2, #3* *12Pc Full Polish Long Panel Combination Wrenches: 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19mm* *3Pc Double Box Reversal Metric Ratcheting Wrenches: 8X9, 12X13, 17X19mm* *7Pc 1/4" Drive Torx (Hole) Bit: T-10, T-15, T-20, T-25, T-27, T-30, T-40* *10Pc L Hex Key: 1.5, 2.0, 2.5, 3.0, 4, 5, 6, 7, 8, 10mm* *1Pc 1/4" Drive Pear Head Ratchet With Comfort Grip* *1Pc 1/4" Drive Extension Bar 4"* *1Pc 1/4" Spinner* *1Pc 1/4" Drive Universal Joint* *1Pc 1/4" Adapter* *1Pc 3/8" Drive Pear Head Ratchet With Comfort Grip* *1Pc 3/8" Drive Universal Joint* *1Pc 1/2" Drive Pear Head Ratchet With Comfort Grip*	sets	10

	1Pc ½" Drive Universal Joint *Electronics Tool Kit:* *Ideal for technicians, a comprehensive electronics toolkit supplied within a handy zipped tool bag -* *Kit Contents:* *20W/130W Soldering iron* *Desoldering pump* *Multimeter* *5" Long nose pliers* *5" Side cutters* *Slotted precision screwdriver: 2.5 x 75mm* *Phillips precision screwdriver: PH00 x 75mm* *Slotted screwdrivers: 4 x 75, 5 x 75, 6 x 125mm* *Phillips screwdrivers: PH0 x 75, PH1 x 75, PH2 x 125mm* *Mains tester screwdriver* *Wire stripper/cutter* *8pc Hex key set: 1.5, 2, 2.5, 3, 4, 5, 5.5, 6mm* *IC extractor* *Tweezers*		
B12.2.8 Electrical Workshop			
2	Digital data acquisition recorder with integrated printer Analog channels: 8,Binary channels: 8 Sampling rate > 400 Hz Paper width: 250 mm Paper speed :5mm/h … 50mm/sec Complete with all accessories	Nos	2
3	Digital transient recorder with integrated PC Analog channels: 8,Binary channels: 8 Sampling rate > 15 kHz Complete with all accessories	Nos	1
4	Set 24 volts DC source; as per latest technology **(10A)** **DC Regulated Power supply :** 01. Range : 0 to 24V DC, 10A 02. Display : LCD/LED INDIACTION 03. Power supply : 240V AC, 1 Phase, 50Hz 04. Mode Indication : LED indication for constant voltage/ constant current operating mode 05. Load Regulation : (i) 0.1% variation in voltage (ii) 0.2% variation in current 06. Ripple and Noise : Less than 1mV 07. Resolution : 50 mv/ ma 08. Features : Overvoltage protection/ Overcurrent protection 09. Accessories : Test lead	Nos	1
B12.2.9 INSTRUMENT AND PNEUMATIC WORKSHOP			
5	**B12.2.9.1 Instrument workbenches** Instrument workbench with a vertical top section for the installation of the instruments listed below shall be provided. The dimensions of the instrument workbenches shall be at least as specified for the mechanical workbenches and shall be suitable for a logical distribution of instruments on the vertical section and for the loose distribution of test instruments and tested devices on the horizontal surface.	Nos	1

	The instrument board console shall be composed of sheet steel with a minimum thickness of 2.5 mm and shall be totally closed. Connections to the installed instruments shall be fixed at the front of the instrument board for prompt access. Earthing arrangement for the Workbench and for measurements shall be provided. The workbenches shall be equipped with drawers. **The following equipment shall be integrated into the vertical section of each of the workbenches:**		
	DC power supply laboratory-type unit with controlled and adjustable current and voltage output 0 - 50 V, 0 - 25 A **-2 pcs**		
	DC power supply unit with adjustable and controlled voltage output: 220 V, approximately 1 Kw **-2 pcs**		
	AC power supply unit with adjustable current and voltage output: for 0 - 240 V, 0 - 10 A **2 pcs**		
	Stabilized power supply unit 230V DC/1500 VA, Ferro resonant type or similar static type with sinusoidal waveform, the voltage adjustable between 5% **2 sets**		
	24 V DC relays with 2 sets of switch-over contacts with front banana sockets for the supply and for contacts **2 sets**		
	Timer relay(s) with front banana sockets for contacts and with front adjusting knob (s). The time shall be adjustable between: 0.5 sec. - 30 sec. 10 sec. - 5 min 1 min. - 1 hr **2 sets**		
	Power supply sockets for normal AC (220 AC and 110 AC) **-4 pcs**		
	Power supply sockets for stabilized AC (220V AC and 110 V AC)- **4 pcs**		
	Bench type digital multimeter 6 ½ Digits -2 Pcs		
	Approximate Dimension is 2000mm(L)X1485mm(H)X900(D)		
B12.2.9.3	**Loose Equipment For Instrument and pneumatic Workshop**		
	All portable equipment shall be supplied with carrying case, exchangeable batteries and charger from the equipment manufacturer (if available). 2 (two) sets of new rechargeable batteries shall be delivered for each portable equipment. The following list sets out the scope of requested supplies and services, but without excluding necessary components and services not mentioned.		
6	Soldering iron sets with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench **Note : Basic soldering station to be supplied**	Nos	9
7	Stationary solder remover with vacuum pump, pipes, tips, etc. for each workbench **Note : Basic Desoldering station to be supplied.**	Nos	9
8	Standard rotatable vice, mounted on each of the regular workbenches (one for each regular workbench)	Nos	1
9	Storage metal cabinets for electronic equipment with shelves, shelters, boxes, etc. min. dimensions (W x D x H) 0.8 x 1.8 x 0.6m (one for each regular workbench)	Nos	1
10	Heavy duty chairs for the workbenches(one for each regular workbench)	Nos	1
11	Light sources/ lamps adapted to the workbenches	Nos	1

12	RTD Simulator / Tester for different types of RTDs Measure /Simulate RTD : Range : -200°C to 800 °C Measure/Simulate Resistance Range: 0 to 400 Ω	Nos	12
13	Standard Th/C, mV calibrator precision source / Thermocouple/ RTD simulation equipment (mV, ohm) for different types of thermocouples Source and measure different type Thermocouples : -200 to 1800 Deg c Accuracy : 0.05%+1DegC RTD Range : -200°C to 800 °C Accuracy : 0.05%+0.6 Deg C mv Range : 0-± 100mv Accuracy : 0.05 %+30µV Ohms Range : 0-400 Ω Accuracy : 0.05%+0.2 Ω	Nos	12
14	Direct temperature indicating meter suitable for direct measurement of different types of thermocouples and resistance thermometers with additional hand-held thermo probes for temperature measurements from different type Thermocouples : -200 to 1800 Deg c Accuracy : 0.05%+1DegC RTD Range : -200°C to 800 °C Accuracy : 0.05%+0.6 Deg C mv Range : 0-± 100mv Accuracy : 0.05 %+30µV Ohms Range : 0-400 Ω Accuracy : 0.05%+0.2 Ω	Nos	12
15	**Standard pH Tester** Range : 0 – 14 pH in steps of 1 pH Accuracy : ±0.01 Ph	Nos	12
16	**Multi-Function Process Calibrator Handheld &Bench type** (12 Nos Hand held & 12 Nos bench type) *Portable Multifunction Calibrator shall be supplied for testing and calibration of process instruments. The calibrator shall have facility for measurement and simulation of the following instruments and parameters :-* *a) Pressure and DP transmitters b) Electro-pneumatic converters.* *c) Thermocouples and RTD d) Electronic receivers and controllers* *e) DC voltage & current generation f) Frequency* *The calibrator shall have large multiple digital indicator 4 to 5 digits. It can operate according to function and menu guided set up mode. The calibrator shall have storing facility of field calibration data together with set up information as per requirement.* *The calibrator shall be microprocessor based with latest state of the art design and shall have LCD display simultaneously for both input and output signal, membrane type key pad with tactile sound, 230V AC mains supply, in built battery & battery charger, carrying case, test probes, fuse etc* *Suitable pressure modules and pumps to meet the pressure range -1 to 2 bar, and 0 TO 70 bar and 0-350 bar to be suppliedPneumatic and hydraulic hose kit /test pumps also to be supplied along with any other accessories required.*	set	1
17	**Loop Calibrator** *Measure /source loop current (0 mA to 20 mA) signals, with **0.02 %** accuracy and 0.001 mA resolution* *Source precision voltage signals up to **12 V with 0.03 % accuracy**,* *Measure voltage 0-25V 0.03% accuracy* *Source or simulate 20 mA loop current • 24 V loop supply with simultaneous current measurement*	Nos	12
18	**Voltage / Current / temperature Reference generator** *source signal and measurement signal options: voltage, current, resistance, thermocouple (TC), resistance temperature detector (RTD), frequency, pulse), can be measured with a basic sourcing accuarcy of 0.05% and measuring accuracy of 0.05%*	Nos	12

	Voltage Range : 0-30V *Current : 0-20 millimaps* *Resistance : 0-3200 Ohms* *Loop Power : 24V DC*		
19	**Intrinsic safe Multifunction Calibrator DRUK TRX II IS** With Spare Battery,Charger and USB cable	Nos	12
20	**Portable Hand-Held Tacho-Meters** Range (RPM) Photo mode :10 to 99,999 Contact mode : 0.5 to 20,000 Accuracy 0.05% rdg +1 digit Surface Speed 0.2 to 6560ft/min 0.05 to 1999.9m/min	Nos	8
21	**Double channel digital storage oscilloscope (DSO)** minimum bandwidth 0-100 MHz (-3 dB), 2 channels with memory for 4 waves, with RS 232 (or similar) interface, cable and user program for PC with one set of measuring heads	Nos	6
22	**Conductivity Meter** **EC Range:** 0.000 to 9.999 µS/cm*; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 1000.0 mS/cm **EC Resolution:** 0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm **EC Accuracy:** ±1% of reading (±0.01 µS/cm or 1 digit, whichever is greater) **TDS Range** 0.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 ppt (g/L); 10.00 to 99.99 ppt (g/L); 100.0 to 400.0 ppt (g/L) **TDS Resolution** 0.01 ppm; 0.1 ppm; 0.001 ppt (g/L); 0.01 ppt (g/L); 0.1 ppt (g/L) **TDS Accuracy** ±1% of reading (±0.05 mg/L (ppm) or 1 digit, whichever is greater) **EC/TDS Temperature Compensation** noTC, Linear (-20 to 120 °C; -4 to 248°F), Non Linear - ISO/DIN 7888 (-0 to 36 °C; 32 to 96.8°F) **Temperature Correction Coefficient** 0.00 to 10.00 %/°C EC to TDS Conversion Factor 0.40 to 1.00 **Reference Temperature** 15°C, 20°C and 25°C EC/TDS Multi-range Measurement Modes autorange, autoend, lock and fixed rang **Battery Type/Life :** 1.5V AA batteries (4) / approximately 100 hours of continuous use (without backlight), 25 hours with backlight Instrument to be supplied with conductivity probe, calibration solution PC software,micro USB cable, 1.5V AA batteries (4), instruction manual, quick start guide, quality certificate and rugged carrying case.	Nos	12
23	Electronic Stethoscope ***Electronic Stethoscope with Piezo transducer, 30 Hz-15 Khz, Probe lengths 60 to 70 mm and 220 to 300 mm, headset with ear defender***	Nos	12
24	**General Purpose Vibration Meters** Displacement: - 20 microns, 200 microns, 2,000 microns pk-pk Velocity: - 20 mm/sec, 200 mm/sec, 2,000 mm/sec pk Acceleration: - 20 g, 200 g, 2000 g pk **Accuracy** Instrument: - 1% of Full Scale Reading (FSR) Input: - Accelerometer Output: - LCD Digital Display (3½ Digit)	Nos	8

26	Set of precision resistance decades, **10 boxes**, covering ranges from 0.1 ohm to 10 k Ohm *Range of resistance box shall typically be 0.1 ohm to 10 K ohms. The direct-reading accuracy of the resistance box shall be ± 0.3 % for 0.1 decade, ± 0.05% for 1,10,100,1K, 10K decades*	Set	8
27	**Portable electronic chart recorder-** with variable speed setting, Accuracy +0.5%, with switchable input ranges 0-20 mA, 0-10V, 0-10 mV, 0-50 mV, RTD thermocouple, communication at least RS232/485 sampling time 10 mS or better, 6 channels.	Nos	4
28	230 V AC Extension cables Length 50 m with multiple sockets and switch *230 V AC Extension cables **3 core** Length 50 m with multiple (minimum 4) **universal sockets 13 A** and switch*	Nos	20
29	Measuring cables of different lengths and color, complete with banana plugs *Measuring cables of different lengths and color, complete with banana plugs (4 mm right angel stackable, shrouded banana plug on one end and 4 mm shrouded banana plug on the other end in five colors (Black, Red, Green, Blue and Yellow) and two lengths (one meter and two meter)) i.e 3 pcs of each type total 30 nos.*	Nos	30
30	Portable sound level (dBA) meter Bidder shall supply one (1) no. portable sound level meter. Sound analysis amplitude range shall be 45 – 130 dB. The instrument shall be electronic type with LCD display and shall be provided with battery and battery charger. Bidder shall supply all other standard features and accessories	Nos	4
31	Stop watch *Digital Type*	Nos	4
32	rechargeable torches complete with batteries/ battery charger *rechargeable torches complete with batteries/ battery charger, **3 W LED, built in charger and plug, charging indicator LED, 4 hrs when fully charged***	Nos	25
33	Whiteboard (wall fixed) with 3 sets of pens in different colors and eraser *Whiteboard (wall fixed) **(4x3 feet)** with 3 sets of pens in different colors and eraser*	Nos	2
34	**230/12V lighting transformer with hand lamps** *7W Explosion Proof LED Drop Light - Transformer Steps Down 240VAC to 12VDC - 50ft Cord* *The 7 watt explosion proof LED work light should produces 735 lumens of bright white light and supplied with 50 feet of explosion proof cord.* *This explosion proof LED drop light is to be designed with a 12 volt LED bulb to operate with 12V DC for low voltage operation*	sets	**6**
35	Megger C/w test leads, carrying case, high voltage probe, battery cells, measuring range 0 to 10 MOhm ***Nominal test Voltage : 250,500V,1000v,2500v,5000V*** ***Accuracy : +/-5%***	Nos	5
36	HART communicator 1.0 Universal type Handheld Hart Communicator for smart transmitters for calibration of HART compatible Electronic Transmitters for measurement of pressure, flow, Diff. pressure and other HART compatible devices like Level transmitters, control valves & Analysers etc. 2.0 Universal type Handheld HART calibrators shall meet or exceed the following requirements	set	15

	2.1 Memory: 16MB (minimum) to suit all HART foundation DDL with new device software up gradation / down loading option (3years min. from the date of guaranty/warranty expiry condition of the project). 2.2 Operation shall be possible with NiMH batteries or 240VAC ± 10%, 50Hz supply through power adapter & universal plug. 2.3 Facility for data transfer through PC along with interface accessories like cable, software shall be offered etc. **3.0 Accessories to be supplied :** 3.1 Soft carrying case with adjustable shoulder strip & lead compartment inclusive of protective boot. 3.2 HART leads – 1set 3.3 250 ohm load resister – 1No. 3.4 NiMH batteries – 1set. 3.5 NiMH Battery charger set – 1No. 3.6 Power adapter – 1No. 3.7 Universal plug kit for power adapter – 1No. 3.8 Standard banana jacks for HART 4.0 Obsolete /discontinued models are not technically acceptable. Preferably the latest model to be offered		
B12.2.10 Electronic and communication workshop			
37	**B12.2.10.1 Electronic work Benches** Workbench with a vertical top section for the installation of the instruments listed below shall be provided. The dimensions of the workbenches shall be at least as specified for the mechanical workbenches and shall be suitable for a logical distribution of instruments on the vertical section and for the loose distribution of test instruments and tested devices on the horizontal surface. The board console shall be composed of sheet steel with a minimum thickness of 2.5 mm and shall be totally closed. Connections to the installed instruments shall be fixed at the front of the instrument board for prompt access. Earthing arrangement for the Workbench and for measurements shall be provided. The workbenches shall be equipped with drawers. The following equipment shall be integrated into the vertical section of the workbenches:	Nos	**6**
	DC power supply laboratory-type unit with controlled and adjustable current and voltage output 0 - 50 V, 0 - 25 A **-2pcs**		
	DC power supply unit with adjustable and controlled voltage output: 220 V, approximately 1 kW **2pcs**		
	AC power supply unit (with frequency adjustment) with adjustable current and voltage output: for 0 - 240 V, 0 - 10 A **2pcs**		
	Stabilized power supply unit 230V DC/1500 VA, Ferro sonant type or similar static type with sinusoidal waveform, the voltage adjustable between +/- 5%. **2sets**		
	24 V DC relays with 2 sets of switch-over contacts with front banana sockets for the supply and for contacts 2sets		
	Timer relay(s) each with front banana sockets for contacts and with front adjusting knob (s). The time shall be adjustable between: 2sets		
	0.5 sec - 30 sec**-2sets**		
	10 sec - 5 min**-2sets**		
	1 min. - 1 hr **-2sets**		
	Stainless steel tube bending machine for tube dia up to 12 mm OD. **4 Pcs**		

	Stainless steel tube bending machine for tube dia up to 25 mm OD. **4pcs**		
	Power supply sockets for normal AC (220V AC and 110 V AC) **4 pcs**		
	Power supply sockets for stabilized AC (220V AC and 110 V AC) **4 pcs**		
	All portable equipment shall be supplied with carrying case, exchangeable batteries and charger from the equipment manufacturer (if available). 2 (two) sets of new rechargeable batteries shall be delivered for each portable equipment.		
	Approximate Dimension is 2000mm(L)X1485mm(H)X900(D)		
B12.2.10.2 Loose Equipment for Electronic and communication Workshop			
38	**Different purpose soldering station** also usable for SMD technology with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench The station shall operate on 240 V AC.Temperature Controlled station should be supplied.It should also be usable for SMD technology soldering Soldering iron shall be provided along with temperature controlling equipment for precise adjustment of temperature. Different sizes and types of soldering tips shall be provided with the iron. Stand, sponge and other accessories shall be provided. The iron shall be quick-heat type **Accessories :** 1. Stand 2.sponge 3. Soldering tips (3 Different sizes/types -5 No each)	Nos	6
39	**Stationary de-soldering station** with vacuum pump, pipes, tips, etc. for each workbench usable for SMD technology too. The Desoldering station shall be portable with vacuum pump. Desoldering gun shall be provided with temperature controlling equipment for precise adjustment of temperature. Supply voltage shall be 230V AC. Temperature Controlled (160 ° To 480 °C) **Accessories :** 1.spring stand 2. Sponge 3. cleaning pin 4.cleaning drill 5. spare filters 6. desoldering nozzles (0.5mm, 1.0mm, 2mm, 2.5mm (5 Nos each)	Nos	6
40	**Standard rotatable vice** mounted on each of the regular workbenches	Nos	6
41	**Storage metal cabinets** for electronic equipment with shelves, shelters, boxes, etc. min. dimensions (W x D x H) 0.8 x 1.8 x 0.6 m	Nos	6
42	**Heavy duty chairs for the workbenches**	Nos	6
43	**Light sources/ lamps adapted to the workbenches**	Nos	6
44	**Variable transformer (variac),** single phase, 230 V +10%/1000 VA	sets	6
45	**Variable transformer (variac),** three phase, 400V + 10%/5000 VA	Pc	6
46	**Current and voltage sources** 0 - 20 mA 0 - 10V accuracy ± 0.3%	sets	4
47	Variable DC power supply laboratory-type unit with controlled and adjustable current and voltage output: i).0 – ±50 V, 0 - 25 A ii) 0- 300 V, 0 100 mA (12 Nos each type)	set	12
48	General purpose amplifier Suitable as pre-amplifier to rise level of a signal or as buffer Shall provide stable 20 and 40 dB gain over a wide frequency range with fast rise time	Nos	4
49	Pulse/function generator range 1 Hz to 20 MHz with digital display	Nos	6

50	Digital hand held and bench type multimeters for AC/DC, frequency, ohms, diode tests, etc., 4 - ½ digit, wide bandwidth with auto-ranging. (To be used for calibration Purposes) ***DC Ranges*** **0 - 1000 V ± 0.05% + 1 digit lowest range 400 mV** **0 4000 µA ± 1.0 % + 2 digits lowest range 400 µA** **0 - 10 A ± 0.2 % + 2 digits lowest range 40 mA** **AC Ranges** 0 - 1000 V ± 0.5% + 2 digits at 60 Hz lowest range 400 mV 0 - 10 A ± 1.0 % + 2 digits lowest range 40 mA 0 - 20 kHz ± 0.005% + 1 digit lowest range 200 Hz ***Capacity*** 0 - 200 µF ± 1 % + 3 digits lowest range 5 nF ***Resistance*** 0 - 50 Mohm ± 0.2% + 1 digit Lowest Range 400 Ω (**8 Nos Portable & 8 Nos BENCH TYPE)**	Set	1
51	**Digital hand-held and bench type multimeters** 3-1/2 digit display, for DC/AC voltage and current measurements, resistance, capacitance and frequency measurements, continuity checking, etc. with temperature probe **(8 Nos Portable & 8 Nos BENCH TYPE)**	set	8
52	Frequency meter/timer/counter 8 digit display frequency 0 - 100 MHz period 10 us - 105 s ratio 0.1 Hz-100 Hz	Nos	4
53	Universal Counter *350 MHZ , 2 Channels*	Nos	4
54	**Electronic DC Load Simulator 100 W / 50 V** Input Voltage : 0-150V, Input Current : 0.1Ma to 30V, Input Power : 150W Operating Modes : CV Constant voltage,CC Constant current ,CP Constant power ,Constant Resistance CR, Over-current and over-voltage protection	Nos	4
55	**Precision current / voltage calibrator Including mV & mA** A precision handheld instrument primarily used for the calibration and simulation of voltage and current loops. Simulation : 0-12V Accuracy +/-0.02%, 0-20ma Accuracy +/-0.02% Measurement :0-25V Accuracy : +/-0.03%, 0-55ma Accuracy : +/-0.02% Accessories: Loop calibrator to be supplied with user manual, rechargeable battery with charger, calibration certificate and carrying case.	Nos	4
56	Multi frequency Load Current Resistance meter resolution 5 1/2 digit, 0.1% basic accuracy, with auto ranging *Note : Hand held type may be suplied*	Nos	42
57	**Set of precision resistance decades covering ranges from 0.1 ohm to 100 kohm** *The direct-reading accuracy of the resistance box shall be ± 0.3 % for 0.1 decade, ± 0.05% for 1,10,100,1K, 10K and ± 0.5% for 100K decades*	Sets	6
58	**Set of precision capacitance decades covering ranges from 1 pF to 10,000 Mf** Decades of 1pF, 10pF, 100pF, 1nF, 10nF, 100nF, 1µF, 10µF, 100µF, 1000µF. Total capacitance range: 1pF to 10000 µF Accuracy: 5% for 1pF, 10pF,100 µF,1000µF 2.5% for 100pF, 1nF 1% for 10nF ,100nF,1µF, 10µF	**Set**	**6**
59	**Set of precision inductance decades covering ranges from 1 µH to 100 H** Decades of 1microH ,10microH, 100microH, 1mH, 10mH, 100mH,1H,10H Total Inductance range: 1 microH to 100H	**set**	**6**

	Accuracy : 5% for 1microH, 10H 2.5% for 10microH, 1H 1% for 10microH, 100microH, 1mH, 10mH, 100mH		
60	Portable electronic chart recorder with variable speed setting, accuracy ± 0.5%, with switchable input ranges 0 - 20 mA, 0 - 10 V, 0 - 10 mV, 0 - 50 mV, RTD, thermocouple; communication at least RS232/ 485	Nos	4
61	Digital/ Analog double channel digital storage oscilloscopes (DSO), minimum bandwidth 0-100 MHz (-3 dB), 2 channels with memory for 4 waves, with RS 232 (or similar) interface, cable and user program for PC with one set of measuring heads	Nos	4
62	Hand-held Graphical Display Meter (DSO-meter) with big size display for waveform representation (industrial frequencies). Further features: 2 Storage capacity for at least 8 curves Max. sampling rate at least 20 MS/s Band with 100 kHz Horizontal time base from 5 µs/div, auto trigger 10"LCD at least RS 232 (or similar) interface, cable and user program for PC Additional DMM operation (Digital Multi Meter)	Nos	6
~~63~~	~~Logic Analyzer~~	~~Nos~~	
64	Digital / analog IC tester *Analog and digital IC tester which is capable of testing analog or linear ICs upto 20 pins and digital ICs upto 40 pins.*	Nos	6
65	PIC programmer *Accessories: Supplied with USB cable with software and user manual.*	Nos	4
66	EPROM, E2PROM, Flash programmer / copier *A device Reader/Programmer/Copier supporting EPROMs (2716 to 27C801 family) of 16Kb to 8Mb, parallel EEPROMs (28C16 to 28C040 family) up to 4Mb, parallel FLASH memory (28xxx, 29xxx, 37xxx, 39xxx, 49xxx, etc) of 512Kb to 8Mb, I²C and SPI EEPROMs memory (24Cxx, 25Cxx) and SPI FLASH memory (25Fxxxx) until 256Mb. It should equipped with a LED indicating the different status of the programmer, a USB port, a high quality ZIF32 socket supporting devices in DIP packages of 8, 24, 28 or 32 pins and a PLCC32 socket supporting any 32-pin FLASH memory.*	Nos	4
67	UV EPROM eraser *High performance EPROM ERASER which accommodate 12 devices and suits for small developing environment.Suitable for industrial Purpose.*	Nos	4
68	Clip-on Ammeter AC *Tong tester shall be suitable for measuring the current ranges of 0-1000 amps AC with an accuracy of 1% and resistance of 0-2000 ohm with an accuracy of 1.2%. It shall have auto tanging facility along with 31/2 digit LCD display.*	Nos	6
69	Clamp Meter DC *Tong tester shall be suitable for measuring the current ranges of 0-1000 amps AC/DC with an accuracy of 1% and resistance of 0-2000 ohm with an accuracy of 1.2%. It shall have auto tanging facility along with 31/2 digit LCD display.*	Nos	6
~~70~~	~~Spectrum Analyzer~~	~~Nos~~	
~~71~~	~~Color Spectrometers~~	~~Nos~~	
~~72~~	~~Wave synchronizer~~	~~Nos~~	

73	**Transient recorder** Analog channels: 8,Binary channels: 8 Sampling rate > 15 kHz Complete with all accessories	Nos	**4**
74	High speed digital acquisition recorder Analog channels: 8,Binary channels: 8 Sampling rate > 400 Hz Paper width: 250 mm Paper speed :5mm/h ... 50mm/sec Complete with all accessories	Nos	4
~~**75**~~	~~**Radio system analyzer**~~	~~**Nos**~~	
76	Digital frequency meter and harmonic analyzer *Main features:* *• Waveform real-time display (4 voltages/4 currents)* *• Half cycle RMS measurement (voltage and current)* *• Intuitive operation* *• Measure DC component* *• Measurement, calculation and display of harmonics and interharmonics can be up to 50 times.* *• Transient capture* *• Vector, Trend, Bar Graph and events table display* *• Active power, reactive power, apparent power and energy, shift power factor and true power factor* *• Three-phase unbalance (voltage and current)* *• Flicker* *• Inrush current* *• Detection and record of Dips& Swells, Voltage Rapid Change, Interruption.* *•* *Frequency Measurement Range: 42.50~57.50 Hz* *Resolution: 0.01Hz* *Accuracy: ±0.01Hz* *Voltage Input* *Numbers of input: 4 (3 phase + neutral) DC coupling* *Max continuous input voltage: 1000Vrms* *Range of nominal voltage: 50 to 500V* *Max pulse peak voltage: 6kV* *Current Input* *1000/3000A current sensor,* *Resolution: 1A,* *Numbers of input: 4 (3 phase + neutral) DC coupling* *Type: Clamp Current Sensor, with mV output* *Nominal input range: 0~±5.625Vpeak, 0~3.97Vrms sine wave* *Input range: 1 to 3000Arms with supplied current clamp* *Input impedance: 50kΩ* *Sampling System* *Resolution: 8 channels 16 bits AD* *Sampling rate: 20kS/s for each channel, 8 channels sample synchronously* *RMS sampling: 5000 points for 10/12 cycles (according to IEC 61000-4-30)* *PLL sync: 4096 points for 10/12 cycles (according to IEC61000-4-7)* *Waveform display: 4 voltages and 4 currents signal waveforms can be displayed synchronously, displayable under Scope and Transient modes.* *Trend Display: Display Trend record of measurement parameters changes over time (Displayable under voltage/current/frequency, power and energy, dips and swells, inrush current, flicker, monitoring modes)* *Vrms (AC+DC) Measurement Range: 1~1000Vrms,* *Resolution: 0.1Vrms,* *Accuracy: ±0.5% of nominal voltage* *Arms (AC)* *Accuracy: ±1%±2A* *Harmonic number Measurement Range: 1~50* *Harmonic voltage Measurement Range: 0.0~100.0%* *Resolution: 0.1%* *Accuracy: ±0.1%±n×0.1%* *Accessories: Below listed accessories to be provided*	Nos	4

	• Program software for PC (CD) *• 2-meter-long voltage cable (with 4mm caliber banana plug)* *• Crocodile clip* *• Power adapter* *• Power cord* *• Bag* *• Hang strap* *• Flexible Current Sensor*		
77	RF power meter / VSWR (voltage standing wave ratio) meter *• Easy to operate* *• FDR (Frequency Domain Reflectometry) measurement method results in a highly reliable assessment of the health of critical components in your system; ultimately providing a "heads-up" before a failure occurs* *• Fault location or DTF mode indicates VSWR or Return Loss levels at each point along the cable and antenna system length.* *• Cable Loss function measures insertion loss of the cable system over a given frequency range.* *• Units cover frequency ranges of 1-4500 MHz* *• USB communication port for connection to storage device and battery charging.* *• Adjustable pass/fail limit with visual indicator* *• 16GB of internal flash memory for storing thousands of traces and setups* *• Measurement can be Return Loss [dB], Cable Loss [dB], VSWR [ratio], DTF VSWR [ratio] or DTF Return Loss [dB].* *• Measurement units can be Return Loss [dB] or VSWR [ratio].* *• VSWR Measurement Range 1.0 to 65.0*	Nos	4
~~78~~	~~RF / Video Scanner~~	~~Nos~~	
~~79~~	~~RF calibration source~~	~~Nos~~	
~~80~~	~~Video Pattern Generator~~	~~Nos~~	
81	Audio / video oscillators / function generators	Nos	4
82	230 V AC Extension cables with multiple sockets and switch *230 V AC Extension cables **3 core** Length 50 m with multiple(Min 4 Nos) **universal sockets 13 A** and switches*	Nos	20
83	Measuring cables of different lengths and color, complete with banana plugs *Measuring cables of different lengths and color, complete with banana plugs (4 mm right angel stackable, shrouded banana plug on one end and 4 mm shrouded banana plug on the other end in five colors (Black, Red, Green, Blue and Yellow) and two lengths (one meter and two meter)) i.e 3 pcs of each type total 30 nos.*	Nos	30
84	Cable clips: Single and multiple (for IC's) cable clips hook and pin types, banana plugs, etc., as required	Nos	50
85	Sets of SMD modules Including resistors and capacitors of different values of each type at least 20 pieces *Note : 10 Types of Resistor and 10 Types of capacitors of Different values 20 pieces each from low range to high range may be supplied.*	set	6
86	Hot air guns	Nos	6
87	Stop watch *Digital Type*	Nos	2
88	rechargeable torches complete with batteries/ battery charger *rechargeable torches complete with batteries/ battery charger, 3 W LED, built in charger and plug, charging indicator LED, 4 hrs when fully charged*	Nos	6
89	Earth, Megger Test Equipment *Clamp-on type may be supplied. Single-jaw type Earth Resistance Tester* *Resistance Measurement Range : Upto 1500 Ohms, 35A*	Nos	2
90	Insulation tester	Nos	2

	Test Voltage :250V, 500V, 1000V, 2500V & 5000V (DC) Insulation measurement Range :0.1MΩ to 250GΩ Accuracy : (5% rdg + 5 dgt) Display : Digital LCD		
91	Energy / power analyzer Main features: • Waveform real-time display (4 voltages/4 currents) • Half cycle RMS measurement (voltage and current) • Intuitive operation • Measure DC component • Measurement, calculation and display of harmonics and interharmonics can be up to 50 times. • Transient capture • Vector, Trend, Bar Graph and events table display • Active power, reactive power, apparent power and energy, shift power factor and true power factor • Three-phase unbalance (voltage and current) • Flicker • Inrush current • Detection and record of Dips& Swells, Voltage Rapid Change, Interruption. Frequency Measurement Range: 42.50~57.50 Hz Resolution: 0.01Hz Accuracy: ±0.01Hz Voltage Input Numbers of input: 4 (3 phase + neutral) DC coupling Max continuous input voltage: 1000Vrms Range of nominal voltage: 50 to 500V Max pulse peak voltage: 6kV Current Input 1000/3000A current sensor, Resolution: 1A, Numbers of input: 4 (3 phase + neutral) DC coupling Type: Clamp Current Sensor, with mV output Nominal input range: 0~±5.625Vpeak, 0~3.97Vrms sine wave Input range: 1 to 3000Arms with supplied current clamp Input impedance: 50kΩ Sampling System Resolution: 8 channels 16 bits AD Sampling rate: 20kS/s for each channel, 8 channels sample synchronously RMS sampling: 5000 points for 10/12 cycles (according to IEC 61000-4-30) PLL sync: 4096 points for 10/12 cycles (according to IEC61000-4-7) Waveform display: 4 voltages and 4 currents signal waveforms can be displayed synchronously, displayable under Scope and Transient modes. Trend Display: Display Trend record of measurement parameters changes over time (Displayable under voltage/current/frequency, power and energy, dips and swells, inrush current, flicker, monitoring modes) Vrms (AC+DC) Measurement Range: 1~1000Vrms, Resolution: 0.1Vrms, Accuracy: ±0.5% of nominal voltage Arms (AC) Accuracy: ±1%±2A Harmonic number Measurement Range: 1~50 Harmonic voltage Measurement Range: 0.0~100.0% Resolution: 0.1% Accuracy: ±0.1%±n×0.1% Accessories: Below listed accessories to be provided • Program software for PC (CD) • 2-meter-long voltage cable (with 4mm caliber banana plug) • Crocodile clip • Power adapter • Power cord • Bag • Hang strap • Flexible Current Sensor	Nos	2
92	Thyristor tester	Nos	2
93	Phase rotation tester Digital Type	Nos	2

94	Circuit continuity testers with buzzers and light indication	Nos	4
95	Fiber optic cable tester / analyzer A handheld otdr should be suitable to measure the physical characteristics of optical fiber, such as the length, the transmission loss and the splice loss etc. OTDR should also locate the faults or breaks or optical fiber. Features: ▪ Handheld, lightweight and convenient for carrying ▪ The most advanced technology of double-color and material integrative mould in aspect ▪ Support auto test, manual test and real time test functions ▪ Speed curve analysis, and multiple curves comparison ▪ Visual fault locating ▪ SD card interface supports SD card to transfer data ▪ Battery status indication, and low battery power alarming ▪ Replaceable battery and supports upto 10 hours working time ▪ Energy save function, and adjustable automatic turn-off time Wavelength: 1310nm±20nm / 1550nm±20nm Type of optical fiber: SM Dynamic range : 32dB/30dB Display: LCD Interface: USB, SD card Optical connector: FC/PC, SC/PC Power Supply: AC/DC adapter / Rechargeable Battery	Nos	2
96	LAN / WAN tester The lan/wan tester Provided should have the following features **Installation testing** Cabling: • Network traffic performance test on copper and fibre to IEEE802.3ab standard • Wiremap test for open, shorts, miswires and split pairs to TIA-568 standard • Gigabit link verification for copper and fibre cabling • Use a list of wiremap templates for common Ethernet cable types including CAT6A/7A/8, and non-Ethernet cable, such as Profinet and ISDN. Active network: • Network load testing through switches simulating CCTV/IPTV/VoIP/Web traffic • PoE/PoE+ verification that displays available voltage at device location • Check Ethernet connectivity at device location to 10/100/1000 Mb/s • Verify network configuration (device IP/gateway address/subnet mask) • Switch port identification via LLDP/CDP protocols **Troubleshooting/diagnostics** Cabling: • Distance to fault using TDR technology (copper only) • Ability to identify and trace cables with a compatible amplifier probe (62-164) • Optical power indication (with compatible SFP modules) Active network: • Network load testing through switches simulating CCTV/IPTV/VoIP/Web traffic • Stress test network before installing bandwidth hungry devices • Port blink to visually trace cable from work area outlet to network switch • Displays port ID of LLDP/CDP enabled switches to eliminate manual cable tracing • Identify network connection problems as hardware, network or configuration faults • Ping local network devices and Internet URL's • Count number of hops between network points with traceroute tests • PoE load testing to confirm available power meets PoE device requirements Accessories : Necessary accessories with adapters should be provided with Equipment	Nos	*2*
97	Telephone test equipment *Features* *• Can be used safely on a DSL enabled line*	Nos	4

	• High Impedance Monitor for monitoring line without disrupting existing traffic *• Over voltage and over current protection* *• Tone and Pulse dialing for versatility on old and new phone lines* *• Polarity test with LED indicator* *• 32 digit last number redial and pause* *• 10 number speed dial* *• Adjustable volume control plus mute* *• Pause* *• • Line powered, no battery needed* *• Headset (included) for hands free operation* *• RJ11 socket* *Telephone Test Set with Small Croc Clips*		
98	Cable tracer / fault finder for tracing cables in walls and underground, and locating fuses/breakers on final circuits and locating interruptions and short-circuits in cables should have a transmitter and receiver setup . Voltage Measurement Range : 12V, 50V, 120V, 230V, 400V Frequency Range : 0-60 HZ Output signal : 125Khz Voltage : Upto 400V AC/DC	Nos	2
99	**Video monitors for PAL, SECAM, NTSC standard** ▪ 32" Multisystem LED TV ▪ **Multi-System, 110-220-240 Volts for world wide use** ▪ **Pal / NTSC / Secam compatibility for use world wide** ▪ Full HD (1366 x 768) Television ▪ Mega Contrast ▪ Wide Color Enhancer Technology ▪ 2 HDMI & 1 USB Port	Nos	*4*
100	Whiteboard (wall fixed) with 3 sets of pens in different colors and eraser *Whiteboard (wall fixed)* ***(4x3 feet)*** *with 3 sets of pens in different colors and eraser*	Nos	2
101	230/12V lighting transformer with hand lamps *7W Explosion Proof LED Drop Light - Transformer Steps Down 240VAC to 12VDC - 50ft Cord* *The 7 watt explosion proof LED work light should produces 735 lumens of bright white light and supplied with 50 feet of explosion proof cord.* *This explosion proof LED drop light is to be designed with a 12 volt LED bulb to operate with 12V DC for low voltage operation*	sets	6
102	Rechargeable flash light complete with battery and battery chargers	sets	6
103	Digital semi-conductor testers *_mainly used for testing the dc parameters of semiconductors such as diode, transistor, controlled silicon and field effect transistor. Measuring forward voltage, reverse voltage, forward saturation voltage drop, amplification factor, reverse leakage current of various crystal diode, , silicon controlled rectifier(scr),field effect transistor(fet) ,etc*	Nos	6
104	Different ranges soldering iron (40, 100, 150, 250, 500 W)-1 No each	Sets	4
105	Gas soldering iron, 300°C to 500°C Specs *Self-Igniting*	Sets	2

	Equivalent Wattage: 15 W to 60 W *Run Time 60 min.* *Temperature Range 392° F 932° F* *Refills with butane lighter gas*		
106	De-soldering pump	Sets	20
107	Heat gun, 600°C	sets	10
108	Rheostat (high watt different ranges) *18Amp, 1 ohm* *15Amp, 1.4 ohm* *12Amp, 3 ohm* *8.5Amp, 6.5 ohm* *5Amp, 18 ohm*	Sets	5
109	**LCC meter bridge** Precision LCR Meter which is a impedance test equipment with high accuracy, wide measurement range and six digits resolution. Test Parameters |Z|, C, L, R, X, |Y|, B, G, D, Q, θ, DCR. Basic Accuracy 0.05%. Equivalent Mode Serial, Parallel. Ranging Mode Auto, Hold. Trigger Mode Internal, Manual, DUT, External, BUS. Graphics Scanning Function Frequency, Level, Bias Voltage / Current, DC Source. Display Type LCD/TFT. Memory 100 groups and 500 groups (USB disk). **Test Signal** Test Frequency 20Hz ~ 300kHz, Resolution : 1mHz. Output Impedance 10Ω, 30Ω,100Ω. Test Level 10mV ~ 2V, Resolution : 1mV. 100μA ~ 100mA, Resolution : 1μA. **Meaurement Display Range** |Z|, R, X 0.01mΩ ~ 99.9999MΩ. |Y|, G, B 0.0001μS ~ 999.999S. C 0.00001pF ~ 99.9999mF. L 0.00001μH ~ 99.9999kH. D 0.00001 ~ 9.99999 θ(Deg) -179.9º ~ 179.9º. θ(Rad) -3.14159 ~ 3.14159. Q 0.01 ~ 99999.9. DCR 1mΩ ~ 99.9999MΩ. **Interface** RS232C / USB-HOST / USB-CDC / USB-TMC / HANDLER / GPIB (Option) / SCANNER (Option). Storage / recall of Parameters: real-time storage of all parameters without losing after shutdown; supporting internal storage of 100 groups, external storage and recalling of 500 groups Power Supply Voltage : 99V ~ 242V. Frequency : 47.5Hz ~ 63Hz. Power Consumption **Note :** Desktop model to be supplied	set	3
110	**Universal IC programmer and tester** *FEATURES:* *40 Pin ZIF socket pin-drivers. Interface with LAPTOP, PC or compatibles through USB port, Accepts standard file formats: JEDEC, INTEL (Extended) HEX, HOLTEK, EMC(.CDS), INTEL HEX16, Motorola S record Manages 16 and 32-bit word split (Set*	Sets	3

	Programming) Features Test Vector capability and multiarray fuse map editor Test TTL/CMOS logic ICs Access Memory devices *Optimum programming for each individual device* *Automatically Identifies the manufacturer and type of E(E)PROMs, Auto identifies TTL/CMOS logic IC* *Device insertion and poor-pin-contact check* *Support 1.5v Low voltage devices, Not need exterior adapter for mostly devices.Auto-run mode starts programming automatically upon detection of chip insertion* *IC TEST:* *TTL (74 series), CMOS (40/45 series) Logic IC*		
111	TTL logic probe *Max. Input Signal Frequency : 50MHz* *Input Impedance : 120kΩ* *Operating Supply Range: 4V DC Min., 18V DC Max.* *TTL : Logic "1" (Hi LED) : >3 ±0.25V* *Logic "0" (Lo LED) : <0.75±0.25V* *CMOS : Logic "1" (Hi LED) : >60% Vcc±5%* *Logic "0" (Lo LED) : <15% Vcc±5%* *Min. Detectable Pulse Width : 10 Nanoseconds* *Max. Signal input Protection : ±70V AC/DC (for 15 seconds)* *Power Supply Protection : ±20V DC*	sets	4
112	CMOS logic probe *Max. Input Signal Frequency : 50MHz* *Input Impedance : 120kΩ* *Operating Supply Range: 4V DC Min., 18V DC Max.* *TTL : Logic "1" (Hi LED) : >3 ±0.25V* *Logic "0" (Lo LED) : <0.75±0.25V* *CMOS : Logic "1" (Hi LED) : >60% Vcc±5%* *Logic "0" (Lo LED) : <15% Vcc±5%* *Min. Detectable Pulse Width : 10 Nanoseconds* *Max. Signal input Protection : ±70V AC/DC (for 15 seconds)* *Power Supply Protection : ±20V DC*	sets	4
113	Tachometer Range (RPM) Photo mode :10 to 99,999 Contact mode : 0.5 to 20,000 Accuracy 0.05% rdg +1 digit Surface Speed 0.2 to 6560ft/min 0.05 to 1999.9m/min	set	5
114	Stroboscope *Display 5 digits (0 to 99999) LCD display.* *Flash adjust 60 to 32,000 RPM/FPM* *Resolution 0.1 RPM < 1,000 RPM.* *Accuracy ± (0.05 % + 1d)* *Flash tube Xenon lamp*	set	2
115	Gauss meter *Features:* *• LCD (1999 count) display of Electromagnetic Field (EMF) level in milliGauss or microTesla* *• Accurate measurements to 4% over a measuring range of 0.1 to 199.9mGauss (0.01 to 19.99µTesla)* *• ELF frequency bandwidth of 30 to 300Hz Single axis - sampling 2.5 times per second* *• Complete with 9V battery* *Range 0 to 199.9mG (milligauss), 0 to 19.99µTesla* *Frequency Bandwidth 30 to 300 Hz (ELF frequency range)* *Accuracy ±(4% + 3digits) at 50-60 Hz* *Number of Axes Single axis*	set	3

116	Anemometer *A waterproof pocket sized Thermo-Anemometer for Air Velocity, Temperature and Wind-chill measurements. Simultaneously display Air Velocity and Temperature or Wind-chill on the LCD screen.* *Features:* *Display Air Velocity and either Relative Humidity, Dew Point, Temperature or Windchill* *Selectable averaging function of 5, 10, or 13 second intervals* *Measurement* *m/s (meters per second): Range 0.5 to 28m/s, Accuracy: ± (3%rdg + 0.2m/s)* *Temperature: 0 to 122°F (-18 to 50°C), Accuracy: ±1.8°F/±1°C* *Relative Humidity: 10% to 95%, Accuracy: ± 4%* *Dew Point: 32°F to 122°F, Accuracy: ± 2%*	set	2
117	**Galvanometer** *Pointer Type* Sensitive Range: -30-0-30µA Accuracy: ≤5%	Set	5
118	Auto transformer (2, 5, 10 A) primary 220 VAC, secondary variable	Set	3
119	**Data plug termination tool** *Crimper, RJ45, RJ11 Non-Ratcheted* *Suitable for 8P8C/RJ45, 6P2C/6P4C/6P6C/ RJ11 Modular plugs*	set	2
120	**Fiber optics connectors** *Each set consists of below :* *i) LC Connector simplex type with 5 mtrs wire* *ii) LC Connector Duplex type with 5 mtrs wire* *iii) SC Connector simplex type with 5 mtrs wire* *iv) SC Connector Duplex type with 5 mtrs wire* *v) ST Connector simplex type with 5 mtrs wire* *vi) ST Connector Duplex type with 5 mtrs wire* *vii) FC Connector simplex type with 5 mtrs wire* viii) *FC Connector Duplex type with 5 mtrs wire*	Set	6
121	**Fiber optic terminated leads** PCS (plastic coated silica), 200 mm 200 µm core dia, terminated with 9 mm SMA connector at both ends, 800 nm 880 nm wave length	set	6
122	**Auto trim termination tool** For fibre optics	set	2
123	**IDC terminal professional tool** 9-1/2" IDC/FRC Crimping tool is used for crimping IDC cables to easily crimp your cable in the right manner. Should be made from high quality material. used for IDC connector. Should have crimping distance from 6mm to 27.5mm.	set	2
124	540 tone generator and inductive speaker probe *Features:* • *Portable battery operated device* • *tracing and continuity checking of telecom and Datacom cables* • *external terminals for butt-set connection* • *led lamp provides visual indication of correct wire* • *volume adjustment knob*	set	1
125	Telephone cordage Telephone cable each bundle should be 100 m. This will be normal telephone cable RJ11.	set	2

126	Connection tools *Crimper, RJ45, RJ11 Non-Ratcheted* *Suitable for 8P8C/RJ45, 6P2C/6P4C/6P6C/ RJ11 Modular plugs*	Set	2
127	Hand termination tools *Termination kits consist of below listed bill of material* *Multi-network cable tester* *Punch down tool with 110/66 blades* *Modular crimping tool* *UTP/STP cable stripper* *4-position 4 contact flat stranded (50pcs/bag)* *8-position 8 contact round stranded (25pcs/bag)* *RJ-45 protection cap. (20pcs/bag)* *Carrying zipper bag*	set	2
128	Fiber optic tool kit (basic kit) *This should Consists of below listed bill of material* • PVC Electrical Tape, Cleaning Solvent, Fiber Stripper, Connector Cleaner, kevlar Scissors, Jacket Stripper, Buffer Tube Stripper, Round Cable Slitter, 6" Side Cutting Pliers, (50) Foam Swabs, Cleaning Tissue • Utility Knife, Tweezers,Needle Nose Pliers, Piano Wire • Fiber Optic Wipes • 4 Bit Screwdriver • Black Marker • Safety Glasses • (5) Fusion Splice Sleeve 60mm • Black Work Mat • Fiber Disposal Unit • Ruler • Fabric Tape Measure • 1/2" Nut Driver • (3) Economy Tie Labels • Rugged Carry Case • Shrink Tube Kit •	set	2
129	Fiber optic tool kit (universal kit) • PVC Electrical Tape, Cleaning Solvent, Fiber Stripper, Connector Cleaner, kevlar Scissors, Jacket Stripper, Buffer Tube Stripper, Round Cable Slitter, 6" Side Cutting Pliers, (50) Foam Swabs, Cleaning Tissue • Utility Knife, Tweezers,Needle Nose Pliers, Piano Wire • Fiber Optic Wipes • 4 Bit Screwdriver • Black Marker • Safety Glasses • (5) Fusion Splice Sleeve 60mm • Black Work Mat • Fiber Disposal Unit • Ruler • Fabric Tape Measure • 1/2" Nut Driver • (3) Economy Tie Labels • Rugged Carry Case • Shrink Tube Kit • *Universal crimp tool, Rubber polish pad glass polish plate,* *(5) syringes,Universal polish puck, (5) 0.3µm Polish Film Sheet (5) 1um Polish Film Sheet ,(5) 5um Polish Film Sheet , Universal Microscope*	set	2
130	Fiber optic light source Features: • High Sensitivity, multi output power • Multi wavelengths • Automatic Power-off, Low battery alarm • LCD Display Wavelength: 1310/1550nm Output power: -5 dbm±0.5db Output tone: 270,1Khz,2khz Spectral width: ≤ 5 nm Output Stability: ±0.05dB/15min; ±0.1dB/8h Optical Identifying Distance: 5km; 10km Display: LCD Optical Interface: FC, SC, ST Power Supply: Battery Operated	Set	2
131	Fiber optic power meter *Features:* • *Handheld, complete function, easy operation* • *Applicable for optical installation, maintenance, communication, CATV, etc.* • *Wide dynamic range, up to 10dBm* • *Multi display units: nW, uW, mW, dBm, dB*	Set	2

	• *Low Battery power alarming* *Detector: InGaAS* *Wavelength: 800~1625nm* *Working Wavelength: 850, 1300, 1310, 1490, 1550, 1625nm* *Measurement Accuracy: ±5%* *Optical Interface: FC, ST, SC* *Resolution: dBm:0.01dBm W: (0.1~1) %*		
132	Wilcom fiber identifier *Optical Fiber Identifier allows you to detect traffic and measure signals anywhere on single mode fibers without having to disconnect them.* *This should also let you check for signal presence before rerouting or maintenance, perform continuity tests and verify cable labeling* *Application: Standard* *Relative Core Power Reading (dB): +5 to -40* *Insertion Loss: <0.6 / <3.0* *Detector Sensitivity (dBm, 1550 nm): -40* *Fiber Type: Single mode, 8-10µm core, 250 µm clear Acrylate coating* *Spectral Response (nm): 850 to 1700* *Optical Test Tone Detection: 270 Hz, 1kHz and 2kHz* *Minimum Fiber Slack: 0.75" (19mm)* *Power: One 9V Alkaline Battery*	set	2
133	Fiber optic stripping kit 3 Hole Jacket Stripper-1 No Thermal ribbon stripper-1 No Fibre optic stripper (125 µmm)-1 No Dual Hole fibre optic Stripper (250µmm and 900 µmm)-1 No Tri-Hole Fiber Optic Stripper (250/900 µmm &3 µmm)-1 No 5 In one Fibre optic stripper-1 No	Set	2
134	Fiber optics stripping tool Dual Hole fibre optic Stripper (250µmm and 900 µmm)-1 No Tri-Hole Fiber Optic Stripper (250/900 µmm &3 µmm)-1 No	Set	2
135	Fiber optic talk set *Fiber Optic talk Set is widely applicable for the construction and maintenance of optical cable, optical fiber communication, and optical fiber CATV, etc., especially communication under tough environment* *Key Features* • *High quality voice communication, sound volume adjustable* • *Full duplex* • *Large dynamic range, up to 33dB* • *Long-short communication distance switchover* • *Automatic storage sound volume while power-off* • *Low sound volume alarm* • *Small volume, light weight, and portability* *Communication Mode: Full duplex communication* *Wavelength: 1310nm, 1550nm* *Modulation System: Analogue & digital hybrid mode* *Dynamic Range: ≥33dB* *Transmission Distance: 100 kM*	set	1

136	Test telephone *Features* *• Luminescent (glow-in-the-dark) keypad* *• Can be used safely on a DSL enabled line* *• High Impedance Monitor for monitoring line without disrupting existing traffic* *• Over voltage and over current protection* *• Tone and Pulse dialing for versatility on old and new phone lines* *• Polarity test with LED indicator* *• 10 number speed dial* *• Adjustable volume control plus mute* *• Line powered, no battery needed* *• Headset (included) for hands free operation* *• RJ11 socket* *Telephone Test Set with Small Croc Clips*	set	2
137	Optical tachometer range 30 ~ 50,000 rpm Range (RPM) Photo mode :10 to 99,999 Contact mode : 0.5 to 20,000 Accuracy 0.05% rdg +1 digit Surface Speed 0.2 to 6560ft/min 0.05 to 1999.9m/min	set	2
138	Digital frequency counter with accessories 5 Hz 1300 MHz *Channel: Dual, 12 Digit/s Frequency Resolution* Display : LCD/TFT	set	2
139	3 meter SM patch cord	Nos	15
140	FC/PC D-Mount SM adapter coupling	set	6
141	Fusion holder for ultra sleeve *60mm Splice Protection Sleeves (1pcket=100Nos)*	Set	12
142	Magna focuser magnifier *The headband magnifier is an ideal tool for detailed tasks, from inspection work to general work. The multi-coated acrylic lenses, 4 magnification levels and dual LED illumination. This should be hands free magnifier, simple and easy to use, with an LED light with tilt or swivel.*	Nos	4
143	Heat shrink tube RED 3/16 inch-	feet	30
144	Heat shrink tube GREEN 3/16 inch	feet	30
145	High precision optical fiber cleaver, hand held *Material (Applicable Fiber): Silica Optical Fiber* *Cladding Diameter: 125µm* *Fiber count: upto 12* *Blade life: Typical 50,000 fibers* *Power supply: Battery Operated*	set	1
146	Replacement blades for optical fiber cleaver *For use with high precision optical fiber cleaver*	set	3

B12.3 Central Control Building DCS Workshop			
147	**B12.3.1 WORKBENCHES IN THE DCS WORKSHOP** Workbench with a vertical top section for the installation of the instrumentslisted below shall be provided. The dimensions of the workbenches shall be at least as specified for the mechanical workbenches and shall be suitable for a logical distribution of instruments on the vertical section and for the loose distribution of test instruments and tested devices on the horizontal surface. The instrument board console shall be composed of sheet steel with a minimum thickness of 2.5 mm and shall be totally closed. Connections to the installed instruments shall be fixed at the front of the instrument board for prompt access. Earthing arrangement for the Workbench and for measurements shall be provided. The workbenches shall be equipped with drawers.	Nos	6
	DC power supply laboratory-type unit with controlled and adjustable current and voltage output 0 - 50 V, 0 - 25 A - 2Pcs		
	DC power supply unit with adjustable and controlled voltage output: 220 V, approximately 1 kW - 2Pcs		
	AC power supply unit with adjustable current and voltage output: for 0 - 240 V, 0 - 10 A - 2Pcs		
	Stabilized power supply unit 230V DC/1500 VA Ferro resonant type or similar static type with sinusoidal waveform, the voltage adjustable between 5%. -2 sets		
	24 V DC relays with 2 sets of switch-over contacts with front banana sockets for the supply and for contacts -2 sets		
	Timer relay(s) each with front banana sockets for contacts and with front adjusting knob (s). The time shall be adjustable between-2 sets		
	0.5 sec. - 30 sec.-2 sets		
	10 sec. - 5 min-2 sets		
	1 min. - 1 hr-2 sets		
	Power supply sockets for normal AC – 4 pcs		
	Power supply sockets for stabilized AC-4 Pcs		
	Six (6) workbenches with lamps shall be provided. Approximate Dimension is 2000mm(L)X1485mm(H)X900(D)		

ANNEXURE-1

BHEL EVALUATION REPORT FOR SUB-VENDOR NO.

(Information marked with asterisk (*) is mandatory)

(APPLICABLE FOR SERVICE/ WORK CONTRACTS)

PACKAGE & PROJECT * : 2x660MW MAITREE STPP BANGALADESH

EQUIPMENT / ITEM* : LAB ITEMS(ELECTRICAL)

CATEGORY (A, DR, N, acc. Vol I-B)* JUSTIFICATION (wrt EPC Contract)*: *'Main vendor Will propose vendors During Detailed engineering'*

GENERAL INFORMATION

1. **PROPOSED SUB-SUPPLIER'S NAME**

   WORKSHOP ADDRESS*

2. **CONTACT PERSON* :**

   TELEPHONE (LAND LINE/MOB.) :

   FAX :

   E-MAIL* :

3. **BRIEF SPEC. OF EQUIPMENT * ITEM / MODEL / TYPE / RANGE / CAPACITY:** LAB ITEMS (ELECTRICAL)

4. **REFERENCE LIST (LIST OF PROJECTS THE EPC HAS PERFORMED TOGETHER WITH THE PROPOSED SUB-SUPPLIER FOR THE PROPOSED SERVICES/ WORKS)***

CUSTOMER/ LOCATION WITH ADDRESS AND CONTACT PERSON	Proposed Works / Services	DATE OF COMPLETION	NO. OF YRS. IN OPERATION	PERFORMANCE FEEDBACK

5. **COMPLIANCE WITH RESPECT TO TECHNICAL SPECIFICATION**

   BHEL CONFIRMS THAT THE PROPOSED SUB SUPPLIER IS IN COMPLIANCE WITH RESPECT TO CONTRACT TECHNICAL SPECIFICATION AND HAS UNDERGONE SUCCESSFUL INTERNAL APPROVAL PROCESS FOR THE PROPOSED SERVICE / WORK CONTRACT INCLUDING PROVENNESS REQUIREMENT.

6. **CONCLUSION**

   BHEL CONFIRMS THAT SUB-SUPPLIER FULFILLS ALL REQUIREMENTS AS REQUESTED BY MFS AND IS DEEMED AS CAPABLE FOR ENVISAGED TASK.

Name Designation Signature Date

ANNEXURE-2

SUB-VENDOR QUESTIONNAIRE

(Information marked with asterisk (*) is mandatory)

(APPLICABLE FOR SERVICE/ WORK CONTRACTS)

FICHTNER

Name of the proposed SERVICES/ WORKS * : Supply of lab items(Electrical)

1. **Name of Proposed Sub-Vendor *:** _____

Website *: _____

2. **Address of Regd. Office *:**

Details of contact person *:
Name_____

Mobile no._____

Desig._____
E-mail:

- **Country of Head Office ***

- **Field of activities ***

3. **Address of Works***

Details of contact person:
Name_____

Mobile no._____

Desig._____
E-mail:

4. **Branch / Liaison office in Dhaka***

Details of contact person:
Name_____

Mobile no._____

Desig._____
E-mail:

5. **Annual Turnover * & Profit in past three years *:**

#	Annual Turnover in Mn USD	Profit After tax in Mn USD
2017-2018		
2016-2017		
2015-2016		

6. **Present & Peak Manpower Handled Status*:**

Division Status	Permanent Manpower			Peak Manpower		Remarks
	Graduate		Diploma	Number	Project	
	Technical	Non-Technical				

a) **Enclose organization chart of the proposed works (Y / N)**

b) **Enclose Organization chart of QA / QC Deptt. (Y / N)**

c) **Enclose List of Qualified Welders with process etc. (Y / N)**

d) **Enclose List of Qualified NDT personnel with area (Y / N)**

7. **Approval/ Certificates by National/ International standards/ accredited agency applicable for the proposed services/ works**

8. **Furnish Experience list of the proposed services/ works ***

9. **Enclose End User's operational feedback certificate for the proposed services/ works *.**

10. **Enclose list of equipment & machinery specific to the proposed services/ works*.**

This should include name of equipment, capacity, year of manufacturing & nos. etc.:

11. **Enclose list of Site Infrastructure & Services Available ***

11. Quality management*

11.1 General

11.1.1 Work Instruction for different processes available. (Y / N)
if yes, furnish list.

11.1.2 Records generated during inspection maintained & available for review? (Y / N)

11.1.3 Statistical quality control techniques used? (Y/N)
If yes please furnish details.

11.1.4 ISO certificate for the works available? (Y/ N)
If yes, enclose copy of the certificate.

11.1.5 Quality & HSE Manual for the works available (Y / N)
If yes, enclose copy of the manual.

11.2 Corrective action

11.2.1 Specifically confirm whether System for identifying & disposition of Non Conformity in the process / product is available (Y / N)

11.2.2 Specifically confirm whether System for Customer complains & their satisfactory disposal is available. (Y / N)

11.3 Documentation Control

11.3.1 Procedure available for documentation control (Y / N)

11.4 Control of Inspection, measuring & testing equipment.

11.4.1 Procedure for calibration of testing & measuring instrument available. (Y / N)

12. Certification of sub-vendor *

I CERTIFY THAT THE INFORMATION SUPPLIED HEREIN (INCLUDING ALL PAGES ATTACHED) IS CORRECT.

SEAL

M/S.

Name

SIGNATURE

DESIGNATION

MOBILE NO

EMAIL

PLACE

DATE

13. Certification by Main Supplier *:

ABOVE INFORMATION HAVE BEEN VERIFIED AND FOUND IN ORDER TO COMPLY WITH TECHNICAL SPECIFICATION AS PER EPC-CONTRACT.

SEAL

M/S.

Name

SIGNATURE

DESIGNATION

MOBILE NO

EMAIL

PLACE

DATE

NOTE:

1. COLUMN SHALL NOT BE LEFT UNFILLED. IN CASE OF NOT APPLICABLE / NOT AVAILABLE, THE SAME SHALL BE INDICTED IN THE PROVIDED SPACE.
2. IN CASE PROVIDED SPACE IS NOT ADEQUATE, INFORMATION SHALL BE PROVIDED AS AN ATTACHMENT.
3. PRODUCT CATALOGUE FOR THE PROPOSED EQUIPMENT / ITEM / PROCESS, IF AVAILABLE, SHALL BE ENCLOSED

ANNEXURE-3

BILL OF MATERIALS

Sl No.	Description of Item		Qty	Po No's of Similar items Supplied to NTPC Projects or other projects (Attach Relevant PO Copies)
	B12.2.7 Mechanical Tool Store for workshop			
1	Instrument mechanic's and electronics tool kit, Bach in accordance with DIN or equivalent standard complete	set	10	
	B12.2.8 Electrical Workshop			
2	Digital data acquisition recorder with integrated printer	Nos	2	
3	Digital transient recorder with integrated PC	Nos	1	
4	Set 24 volts DC source; as per latest technology	Nos	1	
	B12.2.9 INSTRUMENT AND PNEUMATIC WORKSHOP			
5	B12.2.9.1 INSTRUMENT WORK BENCHES	Nos	1	
	B12.2.9.3 Loose Equipment For Instrument and pneumatic Workshop			
6	Soldering iron sets with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench	Nos	9	
7	Stationary solder remover with vacuum pump, pipes, tips, etc. for each workbench	Nos	9	
8	Standard rotatable vice, mounted on each of the regular workbenches	Nos	1	
9	Storage metal cabinets for electronic equipment with shelves, shelters, boxes, etc. min. dimensions (W x D x H) 0.8 x 1.8 x 0.6 m	Nos	1	
10	Heavy duty chairs for the workbenches	Nos	1	
11	Light sources/ lamps adapted to the workbenches	Nos	1	
12	RTD Simulator / Tester for different types of RTDs	Nos	12	
13	Standard Th/C, mV calibrator precision source / Thermocouple/ RTD simulation equipment (mV, ohm) for different types of thermocouples	Nos	12	
14	Direct temperature indicating meter suitable for direct measurement of different types of thermocouples and resistance thermometers with additional hand-held thermo probes for temperature measurements from -20 to + 600 deg C	Nos	12	
15	Standard pH Tester	Nos	12	
16	Multi-Function Process Calibrator Handheld &Bench type (12 Nos Hand held & 12 Nos bech type)	set	1	
17	Loop Calibrator	Nos	12	
18	Voltage / Current / temperature Reference generator	Nos	12	
19	Intrinsic safe Multifunction Calibrator DRUK TRX II IS	Nos	12	
20	Portable Hand-Held Tacho-Meters	Nos	8	
21	Double channel digital storage oscilloscope (DSO) minimum bandwidth 0-100 MHz (-3 dB), 2 channels with memory for 4 waves, with RS 232 (or similar) interface, cable and user program for PC with one set of measuring heads		6	
22	Conductivity Meter	Nos	12	
23	Electronic Stethoscope	Nos	12	
24	General Purpose Vibration Meters	Nos	8	
~~25~~	~~Hand Held IR thermometers~~	~~Nos~~		

26	Set of precision resistance decades, 10 boxes, covering ranges from 0.1 ohm to 10 k Ohm	set	8	
27	Portable electronic chart recorder- with variable speed setting, Accuracy +0.5%, with switchable input ranges 0-20 mA, 0-10V, 0- 10 mV, 0-50 mV, RTD thermocouple, communication at least RS232/485 sampling time 10 mS or better, 6 channels.	Nos	4	
28	230 V AC Extension cables Length 50 m with multiple sockets and switch	Nos	20	
29	Measuring cables of different lengths and color, complete with banana plugs	Nos	30	
30	Portable sound level (dBA) meter	Nos	4	
31	Stop watch		4	
32	rechargeable torches complete with batteries/ battery charger	Nos	25	
33	Whiteboard (wall fixed) with 3 sets of pens in different colors and eraser	Nos	2	
34	230/12V lighting transformer with hand lamps	sets	6	
35	Megger C/w test leads, carrying case, high voltage probe, battery cells, measuring range 0 to 10 MOhm	Nos	5	
36	HART communicator	set	15	
	B12.2.10 Electronic and communication workshop			
37	B12.2.10.1 Electronic Workbenches	Nos	6	
	B12.2.10.2 Loose Equipment for Electronic and communication Workshop			
38	Different purpose soldering station also usable for SMD technology with AC power supply, galvanic separation, temperature stabilized tips sets, holders, etc. for each workbench	Nos	6	
39	Stationary de-soldering station with vacuum pump, pipes, tips, etc. for each workbench usable for SMD technology too.	Nos	6	
40	Standard rotatable vice mounted on each of the regular workbenches	Nos	6	
41	Storage metal cabinets for electronic equipment with shelves, shelters, boxes, etc. min. dimensions (W x D x H) 0.8 x 1.8 x 0.6 m	Nos	6	
42	Heavy duty chairs for the workbenches	Nos	6	
43	Light sources/ lamps adapted to the workbenches	Nos	6	
44	Variable transformer (variac), single phase, 230 V +10%/1000 VA	sets	6	
45	Variable transformer (variac), three phase, 400V + 10%/5000 VA	sets	6	
46	Current and voltage sources 0 - 20 mA 0 - 10V accuracy ± 0.3%	sets	4	
47	Variable DC power supply laboratory-type unit with controlled and adjustable current and voltage output: 0 - ±50 V, 0 - 25 A 0 300 V, 0 100 mA	Nos	12	
48	General purpose amplifier Suitable as pre-amplifier to rise level of a signal or as buffer Shall provide stable 20 and 40 dB gain over a wide frequency range with fast rise time	Nos	4	
49	Pulse/function generator range 1 Hz to 20 MHz with digital display	Nos	6	

50	Digital hand held and bench type multimeters for AC/DC, frequency, ohms, diode tests, etc., 4 - ½ digit, wide bandwidth with auto-ranging. (To be used for calibration DC AC Capacity 0 - 200 µF ± 1 % + 3 digits lowest range 5 nF Ranges 0 - 1000 V ± 0.5% + 2 digits at 60 Hz lowest range 400 mV 0 - 10 A ± 1.0 % + 2 digits lowest range 40 mA 0 - 20 kHz ± 0.005% + 1 digit lowest range 200 HzRanges 0 - 1000 V ± 0.05% + 1 digit lowest range 400 mV 0 4000 µA ± 1.0 % + 2 digits lowest range 400 µA 0 - 10 A ± 0.2 % + 2 digits lowest range 40 mApurposes) Resistance 0 - 50 Mohm ± 0.2% + 1 digit lowest range 250 ohms **(4 1/2 Digit Portable -8 Nos and 4 1/2 Digit Bech type -8 Nos)**	sets	1	
51	Digital hand-held and bench type multimeters 3-1/2 digit display, for DC/AC voltage and current measurements, resistance, capacitance and frequency measurements, continuity checking, etc. with temperature probe **(3 1/2 Digit Portable -8 Nos and 3 1/2 Digit Bech type -8 Nos)**	Set	1	
52	Frequency meter/timer/counter 8 digit display frequency 0 - 100 MHz period 10 us - 105 s ratio 0.1 Hz-100 Hz	Nos	4	
53	Universal Counter	Nos	4	
54	Electronic DC Load Simulator 100 W / 50 V	Nos	4	
55	Precision current / voltage calibrator Including mV & mA	Nos	4	
56	Multi frequency Load Current Resistance meter resolution 5 1/2 digit, 0.1% basic accuracy, with auto ranging	Nos	42	
57	Set of precision resistance decades covering ranges from 0.1 ohm to 100 kohm	Set	6	
58	Set of precision capacitance decades covering ranges from 1 pF to 10,000 µF	Set	6	
59	Set of precision inductance decades covering ranges from 1 µH to 100 H	set	6	
60	Portable electronic chart recorder with variable speed setting, accuracy ± 0.5%, with switchable input ranges 0 - 20 mA, 0 - 10 V, 0 - 10 mV, 0 - 50 mV, RTD, thermocouple; communication at least RS232/ 485	Nos	4	
61	Digital/ Analog double channel digital storage oscilloscopes (DSO), minimum bandwidth 0-100 MHz (-3 dB), 2 channels with memory for 4 waves, with RS 232 (or similar) interface, cable and user program for PC with one set of measuring heads	Nos	4	
62	Hand-held Graphical Display Meter (DSO-meter) with big size display for waveform representation (industrial frequencies). Further features: 2 pcs Storage capacity for at least 8 curves Max. sampling rate at least 20 MS/s Band with 100 kHz Horizontal time base from 5 µs/div, auto trigger 10"LCD at least RS 232 (or similar) interface, cable and user program for PC Additional DMM operation (Digital MultiMeter)	Nos	6	
~~63~~	~~Logic Analyzer~~	~~Nos~~		
64	Digital / analog IC tester	Nos	6	
65	PIC programmer	Nos	4	
66	EPROM, E2PROM, Flash programmer / copier	Nos	4	
67	UV EPROM eraser	Nos	4	
68	Clip-on Ammeter AC	Nos	6	

69	Clamp Meter DC	Nos	6	
~~70~~	~~Spectrum Analyzer~~	~~Nos~~		
~~71~~	~~Color Spectrometers~~	~~Nos~~		
~~72~~	~~Wave synchronizer~~	~~Nos~~		
73	Transient recorder	Nos	4	
74	High speed digital acquisition recorder	Nos	4	
~~75~~	~~Radio system analyzer~~	Nos		
76	Digital frequency meter and harmonic analyzer	Nos	4	
77	RF power meter / VSWR (voltage standing wave ratio) meter	Nos	4	
~~78~~	~~RF / Video Scanner~~	~~Nos~~		
~~79~~	~~RF calibration source~~	~~Nos~~		
~~80~~	~~Video pattern generator~~	~~Nos~~		
81	Audio / video oscillators / function generators	Nos	4	
82	230 V AC Extension cables with multiple sockets and switch	Nos	20	
83	Measuring cables of different lengths and color, complete with banana plugs	Nos	30	
84	Cable clips: Single and multiple (for IC's) cable clips hook and pin types, banana plugs, etc., as required	Nos	50	
85	Sets of SMD modules Including resistors and capacitors of different values of each type at least 20 pieces	Nos	6	
86	Hot air guns	Nos	6	
87	Stop watch	Nos	2	
88	rechargeable torches complete with batteries/ battery charger	Nos	6	
89	Earth, Megger Test Equipment	Nos	2	
90	Insulation tester	Nos	2	
91	Energy / power analyzer	Nos	2	
92	Thyristor tester	Nos	2	
93	Phase rotation tester	Nos	2	
94	Circuit continuity testers with buzzers and light indication	Nos	4	
95	Fiber optic cable tester / analyzer	Nos	2	
96	LAN / WAN tester	Nos	2	
97	Telephone test equipment	Nos	4	
98	Cable tracer / fault finder	Nos	2	
99	Video monitors for PAL, SECAM, NTSC standard	Nos	4	
100	Whiteboard (wall fixed) with 3 sets of pens in different colors and eraser	Nos	2	
101	230/12V lighting transformer with hand lamps	set	6	
102	Rechargeable flash light complete with battery and battery chargers	set	6	
103	Digital semi-conductor testers	Nos	6	
104	Different ranges soldering iron (40, 100, 150, 250, 500 W)	set	4	
105	Gas soldering iron, 300°C to 500°C	set	2	
106	De-soldering pump	set	20	
107	Heat gun, 600°C	set	10	
108	Rheostat (high watt different ranges)	set	5	
109	LCC meter bridge	**set**	**3**	
110	Universal IC programmer and tester	set	3	
111	TTL logic probe	set	4	
112	CMOS logic probe	set	4	
113	Tachometer	set	5	

114	Stroboscope	set	2	
115	Gauss meter	set	3	
116	Anemometer	set	2	
117	Galvanometer	set	5	
118	Auto transformer (2, 5, 10 A) primary 220 VAC, secondary variable	set	3	
119	Data plug termination tool		2	
120	Fiber optics connectors	set	6	
121	Fiber optic terminated leads PCS (plastic coated silica), 200 mm core dia, terminated with 9 mm SMA connector at both ends, 800 nm 880 nm wave length	set	6	
122	Auto trim termination tool	set	2	
123	IDC terminal professional tool	set	2	
124	540 tone generator and inductive speaker probe	set	1	
125	Telephone cordage	set	2	
126	Connection tools	set	2	
127	Hand termination tools	set	2	
128	Fiber optic tool kit (basic kit)	set	2	
129	Fiber optic tool kit (universal kit)	set	2	
130	Fiber optic light source	set	2	
131	Fiber optic power meter	set	2	
132	Wilcom fiber identifier	set	2	
133	Fiber optic stripping kit	set	2	
134	Fiber optics stripping tool	set	2	
135	Fiber optic talk set	set	1	
136	Test telephone	set	2	
137	Optical tachometer range 30 ~ 50,000 rpm	set	2	
138	Digital frequency counter with accessories 5 Hz 1300 MHz	set	2	
139	3 meter SM patch cord	Nos	15	
140	FC/PC D-Mount SM adapter coupling	set	6	
141	Fusion holder for ultra sleeve	set	12	
142	Magna focuser magnifier	Nos	4	
143	Heat shrink tube RED 3/16 inch	ft	30	
144	Heat shrink tube GREEN 3/16 inch	ft	30	
145	High precision optical fiber cleaver, hand held	set	1	
146	Replacement blades for optical fiber cleaver	set	3	
	B12.3 Central Control Building DCS Workshop			
147	B12.3.1 WORKBENCHES IN THE DCS WORKSHOP	Nos	6	