

PLEASE READ CAREFULLY

- ❖ Participating bidders are required to submit bids according to instructions mentioned in bidding documents. These bids should meet the requirements / criteria illustrated in bidding documents along with fulfillment of other terms and conditions of tenders.

- ❖ According to PPRA rule 31 no bidder is allowed to alter or modify his bids after the bids have been opened. Moreover, as per rule 36 (vi) no amendment in the technical proposal is permitted during technical evaluation. Therefore in the light of prevailing Govt procedures, requests for amendments in quotations and clarifications leading to change of substance of bid after opening of bids cannot be accepted and bids not conforming to tender requirements are liable to be rejected.

- ❖ Participating bidders are therefore requested to read the bidding documents thoroughly and submit their quotes accordingly without any condition in conformance to all tender requirements including DP, Bid validity, provisioning of original quotation from foreign principal, 10% BG confirmation etc for consideration of bid. Bid found non-conforming to tender requirements is liable to be rejected on tender opening date.

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**GOVERNMENT OF PAKISTAN
MINISTRY OF DEFENCE PRODUCTION
PAKISTAN AERONAUTICAL COMPLEX BOARD KAMRA**

**INVITATION TO TENDER AND GENERAL INSTRUCTIONS TO BIDDERS
(SINGLE STAGE TWO ENVELOPE BASIS)
(C I F)**

Tender No [PACB/751/13082018/1138/P-2](#)
Directorate of Central Procurement
Pakistan Aeronautical Complex Board
Kamra Distt. Attock
Tel: +92-51-9099-2534, 2244
Fax: +92-57-9317491
Email: adcp@pac.org.pk

30 December, 2020

To,

PPRA & PAC Websites

Dear Sir,

1. I invite you to tender for supply of store / services details in the attached **Schedule to Tender** (Form PACB -002A)

2. **CONDITION GOVERNING CONTRACTS** The "Contract" made as a result of this Tender Inquiry shall mean the agreement entered in to between the parties i.e. the "Purchaser" and the "Seller" on PACB Contract Form (PACB – 003) in accordance with the law of contract Act, 1872 and those contained in PAC purchase procedures and other special conditions that may be added to given contract for the supply of PAC stores specified therein.

3. **DELIVERY OF TENDER (SINGLE STAGE TWO ENVELOPE BASIS)**

(a) **Technical Offer** It shall contain all relevant specifications along with essential literature / brochure in duplicate in a separate envelope and clearly marked with "**Technical Offer without prices**", tender number and date of opening.

(b) **Commercial Offer** It shall indicate prices quoted in figures as well as in words and clearly marked on face of a separate envelope "**Commercial Offer with prices**", tender number and date of opening.

(c) Both the "**Envelops**" of Technical and Commercial offers should be enclosed in one cover, properly sealed and bear the address of Directorate of Central Procurement (DCP) PACB Kamra with tender number and opening date. **Bid Security shall be sealed in an envelope separate from technical and financial bids.**

4. FORM PACB - 002A & PACB - 002B Form **PACB - 002A & PACB - 002B (Annexure D & E)** duly filled-in are to be returned with the offer duly signed by the authorized signatory person of bidding firm.

5. SINGLE / MULTIPLE OFFERS Only one offer can be made in relevant currency for same item. Multiple rates, if quoted, will be rejected. Multiple quotation against the tender will also be rejected.

6. DATE & TIME FOR RECEIPT OF TENDER The tender must reach DCP PACB Kamra by the date and time specified in the **Schedule to Tender** (PACB – 002A attached). Tenders received after the prescribed date and time will **NOT** be entertained. The appointed time will, however fall on next working day in case of closed / forced holiday. Telegraphed / Faxed / Telexed bids will be rejected unless specifically asked for. Tender can also be sent through courier however you are required to intimate this office (DCP) regarding dispatch of quotation through courier giving details of the courier through fax so that courier service may be tracked to ensure your participation in the Tender. In case tender is despatched by courier then same should reach DCP, PAC Board at least 01 day prior to tender opening date. You or your representative may also attend the proceeding (Name / Designation of attendees' along with copy of CNIC will be required 03 days prior to tender opening date for arranging their entry).

7. DELIVERY PERIOD Stores are required of within minimum possible delivery period but **not later than 14 months after signing of the contract**. Offers with minimum delivery period are likely to be preferred. However, delivery period is to be factual as no extension will be subsequently granted except under unavoidable circumstances beyond control of SELLER or under Force Majeure for which intimation with full justification / evidences is to be dispatched well in advance for consideration.

8. RIGHTS RESERVED PAC Board Kamra reserves the right to accept or reject any tender and to annul the tendering process and reject all tenders at any time prior to contract award as per rule 33 of PPRA rules 2004 without thereby incurring any liability to the affected Bidder. Moreover, past performance of the firms may also be considered.

9. ADDITION AND DELETION OF STORE The purchaser has the right to increase or decrease the quantity of any item and cancellation of the contract partially or fully without any financial repercussion on either side without assigning any reason within 30 days of signing the contract. Such information will be passed on to the supplier / seller through the fastest means e.g. telephone, telegram or fax etc.

10. VALIDITY OF QUOTATION The quotation must be valid up to **30-06-2021**.

11. TECHNICAL LITERATURE, SPECIFICATIONS AND INTERCHANGEABILITY

Offers are to be submitted in duplicate supported by brochures and technical literature in original. Offers must conform to tender specifications. A certificate of complete interchangeability must be endorsed on the quotation for all substitute or in-lieu items, otherwise the same are likely to be rejected. A copy of relevant page of publication must be attached to prove correctness of offered / interchangeable / in-lieu item. Prices of master, substitute and in-lieu items must be quoted separately. **For any query regarding technical issues, firms may contact Tel Ext 051-9099-5283, 5290 or Directorate of Proc & Stores, AMF PAC Kamra District Attock Email: amflog@pac.org.pk**

12. DEVIATION FROM SPECIFICATIONS Stores received at consignee, if found not conforming to the contract specifications will be rejected and replacement in accordance with contractual specifications against rejected stores would be provided to consignee as per delivery schedule laid down in the contract. The replacement will be provided without any additional cost. In case stores are rejected after delivery schedule of the contract, replacement is to be provided at the earliest or by the date advised by Directorate of Central Procurement PAC Board.

13. PACKING Stores must be dispatched in standard trade packing unless otherwise specified to protect them against any damage. Any loss/damage caused due to poor packing will be recovered from the Supplier. In case items are shipped through sea, packing shall be sea worthy.

14. RESTRICTION OF EXPORT / IMPORT LICENSE Offer subject to restriction of Import / Export License will not be entertained.

15. APPLICATION OF OFFICIAL SECRET ACT 1923 All matters connected with this inquiry and subsequent actions arising thereafter fall within the scope of the Pakistan Official Secret Act 1923 which forbid providing contractual information to un-authorized / un-concerned person / organization. It is therefore, requested to ensure complete secrecy regarding documents and stores concerned with the inquiry to limit the number of employees having accesses to this information.

16. QUOTING OF PRICES Prices are to be quoted as follows: -

- (a) CIP price of the stores (Line Item Wise).
- (b) Percentage of agent commission (on Ex-Factory price). Agent commission is to be exclusive of quoted price. Principal must indicate if agent commission is not applicable. If there is no indication of agent commission in principal's Performa invoice, agent commission will neither be given by the principal nor by the Buyer.
- (c) The prices must be stated for each item separately both in figures and words. Additional information if any must be linked with entries on the Schedule to Tender (Form **PACB – 002A**)
- (d) Original quotation from the foreign manufacturer / supplier / principal must be attached in support of the quoted price. Principal is to endorse following certificate on the original quotation:-

“Certified that stores offered are factory new and from latest production and prices quoted are not more than the international market prices and also not more than those being charged from other buyers “.
- (e) Shelf / installation life of each item (if applicable) is to be mentioned separately.
- (f) Certificate as per attached Annex “A” duly signed by the principal and agent must be attached with quotation.

17. PROVISION OF OEM CERTIFICATE Certificate of OEM for certified vendors or Agency Agreement must be attached with quotation.

- 18. DISQUALIFICATION** Offers are liable to be rejected if: -
- (a) There is deviation from any instruction described in this invitation to tender.
 - (b) Offers are found conditional or incomplete in any respect.
 - (c) Multiple quotations against the tender.
 - (d) Multiple rates are quoted against one item.
 - (e) Manufacturer relevant brochure is not attached (in case of equipment or major assemblies of equipment).
 - (f) **Annexure “A”, Form PACB-002A (Annexure “D”) and PACB-002B (Annexure “E”)** duly filled – in and signed by the Bidders are not received with the offer.
 - (g) Offer received later than appointed date and time.
 - (h) Tender specification if not conforming to the offer. In case of equipment/ major assemblies manufacturer’s brochures shows specifications different from those given in tender.
 - (j) Offer subject to restriction of Export License.
 - (k) Over writing / erasing in prices.
 - (l) Change in prices by the supplier after opening of commercial offers unless asked by Directorate of Central Procurement PAC Board.
 - (m) Validity of offer is not quoted as required in IT or made subject to confirmation later.
 - (n) Offers not accompanied with prescribed tender / Challan fee of Rs. 200/-.
 - (p) Bid Security not provided.
 - (q) **Performa Invoice of Principal / Principal Invoice**, in duplicate clearly indicating whether prices quoted are inclusive of the agent commission, is not enclosed.
 - (r) Agency agreement of agent with Principal / OEM and link between Principal and OEM is not provided.
 - (s) The validity of agency agreement has expired.
 - (t) Offer without certification of OEM.
 - (u) If OEM and principal name, contact details (Ph No, Fax No, Email etc) and complete address is not mentioned.
 - (v) Offer with Prior sale condition.

19. PAYMENT Payment of 80% may be allowed on dispatch of stores through Letter of Credit and remaining 20% on issuance of Certificate Receipt Voucher (CRVs) by Consignee. 10% Performance Bank Guarantee is to be submitted at the time of signing of contract.

20. SEQUENCE OF QUOTATION Quotation must be prepared according to the item serial no sequence of Schedule to Tender (Form **PACB-002A**).

21. WARRANTY / GUARANTEE OF STORE Warranty / guarantee for a period of **one year** be applicable for stores commencing from acceptance of store at consignee.

22. COUNTRY OF ORIGIN AND MODE OF SHIPMENT Following details must be provided in your offer / quotation and Performa invoice: -

(a) Country of origin, place of manufacture of store and beneficiary should be mentioned.

(b) Name of port connecting PIAC aircraft / PNSC ship where from the store will be shipped. The firm may like to ensure the availability of PIA flight or PNSC operation from the port of shipment before signing the contract.

23. FAX QUOTATION Fax / Email quotations will not be accepted except when specifically called for under emergency / urgency, however, Fax / Email quotation, if received will only be considered subject to condition that original Performa invoice for each quotation is received within 7 days of Tender Inquiry opening or as advised by procurement agency. In case original quotation is not received within specified time, the offer will be excluded from the competition without any notice to bidder.

24. LC CHARGES Payment will be made through irrevocable and non-transferable Letter of Credit. LC opening / advising confirmation and additional charges will be borne by the beneficiary / supplier as per prevailing Bank rates. LC charges within Pakistan will be borne by the purchaser. Charges outside Pakistan are to borne by the seller. Any additional charges incurred due to request of supplier will be borne by the supplier.

25. QUALITY INSPECTION Items supplied are liable to be inspected by the quality inspectors of to the respective factory of PAC before acceptance.

26. SUBMISSION OF CERTIFICATE The certificate as per attached Annexure "A" is to be submitted along with offer / quotation.

27. TENDER OPENING Technical offer i.e. without prices will be opened on the date and time mentioned at Annex "C" of tender in the presence of bidders" representatives who choose to attend. The bidders" representatives who are present shall sign a tender opening register / form evidencing their attendance. However, time and date for opening of Commercial offers of all those firms whose technical offers are accepted will be intimated later. Commercial offers of firms, which are not technically accepted will be returned to the firms un-opened. Representative of Foreign Liaison Office will not be allowed to attend Tender Opening unless it is registered with Pakistan Aeronautical Complex Kamra. No unauthorized person will be allowed to attend the tender opening.

28. BID SECURITY The Bid Security@ 5% of quote (not exceeding 0.150 M) will be deposited by all firms. Bid Security will be deposited in favour of **CMA (DP) Rawalpindi** in the form of CDR / Pay order / Demand draft only at the time of tender opening (with technical quotation), in a separate envelope. Bid Security will be returned to all firms except three commercially lowest bidding firms on finalization of commercial quotes. Whereas Bid Security to the 2nd and 3rd commercially lowest bidders will be returned on signing of the contract. Bid Security of the contract concluding firm will be returned on submission of bank guarantee and on receipt of performance bank guarantee acceptance certificate from CMA. Quotations once submitted cannot be withdrawn (Partially/Fully) during validity of the quotation. Firms not complying with the said instructions would be liable for disciplinary action beside forfeiture of the earnest money.

Note: - No Quote will be accepted without Bid Security which will be as per IT clause 28. However, Bid Security must be provided in shape of CDR/ Pay order / Demand draft only otherwise your quotation will be rejected.

Firm's stamp and case No must be marked on back of bid security.

29. END USER CERTIFICATE (EUC) EUC if required at any stage may be mentioned in the quotation.

30. CHECKING OF STORE Store will be checked at consignee in the presence of representative of Supplier if he arrives within 15 days after initiation of letter.

31. WITHDRAWAL OF OFFER: If the firm withdraws its offer or backs out from providing items won by the firm within validity period at any stage of contract finalization, the Competent Authority may place such firm under Embargo for a period of six months, which may extend up to one year / forfeit the earnest money.

32. TREASURY CHALLAN Offer must be accompanied with a challan form of Rs 200/- (obtainable from State Bank of Pakistan / Government Treasury) and debit able to **Major Head C02501-20, Main Head 12, Sub Head 'A' Miscellaneous (Code Head 1/845/30)**. Only one offer can be made for same item on one Challan. Multiple offer / rates, if quoted will be rejected.

33. DOCUMENTS REQUIRED Following information's / copies of document must be provided with Tender: -

- (a) Proof of appearance on Active tax payer list of FBR.
- (b) Photo copies of valid registration and indexation of foreign principal with PACB / DGDP applicable to the store / equipment offered.
- (c) A copy of letter showing firm's financial capability. Bank statement for last 01 year and other details to ascertain financial capability of firm.
- (d) Copies of audited accounts of the company for the last two accounting years that are prepared in accordance with the International Accounting Standards (IAS).
- (e) Photo copies of General Index number (GID), National Tax number (NTN), Sales Tax registration certificate. Foreign firms are required to provide copy of the

company's valid Tax Compliance certificate issued by Revenue Authority of the domiciled country, valid as at the tender closing date.

(f) List and evidence of certification from recognized international bodies like ISO.

(g) List of major clients and references (complete with names of contact persons, address and telephone numbers) of which the company has supplied similar items in the last 05 years. Number of years in the business or dealing in similar items may also be mentioned.

(h) Firm / Supplier name, complete address, contact numbers, and email addresses.

(j) Undertaking that their firm and their proprietors have not been in litigation / blacklisted by any Govt / Semi-Govt / Autonomous body.

(k) Any other document if required during procurement proceedings according to Rule 17 of PPRA rules 2004.

Note: Security clearance of firm is mandatory before participation in tender. Firms having applied for security clearance or those intend to apply for security clearance soon after tender date can also participate in tender after submission of following additional documents. However, firm will be required to apply for security clearance immediately after tender submission.

(l) In case of foreign supplier photocopy of resident card, passport or equivalent identification card of person signing the tender is to be provided along with 02 passport size photographs.

(m) Local agents / firms have to submit the copy of CNIC and 02 passport size photographs of person signing tender.

(n) Letter of authorisation from the OEM confirming that the bidder is authorized to deal with the item quoted.

34. FORCE MAJEURE "Force Majeure" means any event, act / or other circumstances not being an event, act or circumstances, under the control of the Purchaser or of the Seller. The Seller will notify the Purchaser in writing of any such event within 15 days by Fax/Telex/Telegram of its commencement, which is relied upon by the Seller for its failure to comply with its obligation. The Purchaser have the right to conduct investigations to satisfy itself about the genuineness of the "Force Majeure" event Non-availability of raw material for the manufacture of stores, or of export permit for the export of the contracted stores from the country of its origin, not constitute "Force Majeure".

35. ARBITRATION All matters of dispute or difference, except regarding rejection of stores / Services by the inspector and or cancellation of the contract by the Purchaser arising out of this contract between the parties hereto, settlement of which is not specifically provided in this contract, shall be settled by mutual agreement, failing which they shall refer for Arbitration to a final settlement by an Arbitration Tribunal, in Pakistan. The dispute shall

be referred for adjudication to two arbitrators one to be nominated by each party, who before entering upon the reference shall appoint an umpire by mutual agreement, and if they do not agree a judge of the Superior Court of Pakistan will be requested to appoint the umpire. The arbitration proceedings shall be held in Pakistan and under Pakistan Law & Arbitration Act, 1940. Arbitration award will be firm and final and un-challengeable in any court of law. The award shall be unspoken.

36. LITIGATION In case of any dispute only Court of Jurisdiction at Attock Pakistan will have the Jurisdiction to decide the matter.

37. RISK PURCHASE In the event of failure on the part of the Seller to comply with the contractual obligations, the contract is liable to be cancelled at his risk and expense in accordance with General Condition Governing Contracts.

38. TERMINATION OF CONTRACT The purchaser shall be entitled to terminate this contract for default on the part of supplier. If the supplier becomes bankrupt, or have a receiving order made against him, or compound with his creditors, or being a corporation commences to be wound up, not being a member's voluntary winding up for the purpose of reconstitution or amalgamation, or carries on its business under a receiver for the benefit of its creditors. In case the Purchaser elects to terminate this Contract, the Purchaser shall give notice in writing to the Supplier to make good the default. Should the Supplier fail to initiate proceedings in order to comply with the notice within 15 days from the date of serving of such notice, the Purchaser may forthwith terminate this contract by notice in writing to the Supplier without prejudice to any rights which may have occurred there under to either PARTY prior to such termination. Termination of the Contract shall be without prejudice to any right of arbitration under the contract hereafter. Moreover, the purchaser has the right to increase or decrease the quantity of any item and cancellation of the contract partially or fully without any financial repercussion on either side without assigning any reason within 30 days of signing the contract. Such information will be passed on to the supplier / seller through the fastest means e.g. telephone, telegram or fax etc.

If the supplier delays delivery of any Equipment to be supplied to the Purchaser under this Contract for more than 21(twenty one) days from the time specified for delivery, there of or, 15 days for any extension of subsequent delays then the purchaser reserve the right to terminate this contract without prior notice to the supplier and purchase from elsewhere (other firm or country) stores not delivered, at the risk and expense of the supplier. However, intimation to such a cancellation would be affected by registered letter sent to be supplier and without need to legal or judicial or other formalities. In addition, the purchaser will have the right to recover any loss or damage or payment made to the supplier.

Upon termination the Supplier shall refund all such payments for which goods and/or services have not been delivered or rendered. The Supplier shall refund the amount due with interest at 1% above the Libor rate.

39. SECURITY DEPOSIT / BANK GUARANTEE To ensure timely and correct supply of stores / services, the firm shall furnish an unconditional bank guarantee (BG) from a scheduled bank of Pakistan for an amount up to 10% of the contract value on a judicial stamp paper of the value of (Rs 100.00) as per prescribed format in the currency same as of contract. The bank guarantee shall be endorsed in favour of CMA (DP) Rawalpindi who

is the accounts officer specified in the contract. CMA (DP) Rawalpindi have the like power of seeking encashment at site of the bank guarantee as if the same has been demanded by the purchaser himself. The bank guarantee shall be submitted by the supplier at the time of Contract signing and will remain valid for up to 60 days after completion of warranty period and remain in force till one year beyond date given in the contract. If period of contract is extended, the supplier shall arrange the extension of bank guarantee within 30 days after the original period to keep its validity always one year ahead of the extended period.

40. LATE DELIVERY If the Supplier fails to deliver any or all of the Goods by the Date(s) of delivery or perform the Related Services within the period specified in the Contract, the Purchaser may take following actions: -

- (a) Cancel the contract, and/or.
- (b) To purchase from elsewhere stores not delivered, at the risk and expense of the Supplier and without notice to him, or
- (c) To recover liquidated damages when the Competent Purchase Officer is satisfied that the failure to supply the stores / services within the scheduled delivery period has been for reasons within the control of the Supplier, and/or if the Government has suffered loss for reasons of belated delivery. These liquidated damages, if imposed, will be recovered at the rate of up to 2% but not less than 1% (depending on the merit of the case as decided by Competent Purchase Officer) of the value of stores / service supplied late per month or a part of a month for the period exceeding the original delivery period, subject to the provision that the total liquidated damages thus imposed will not exceed 10% of the total value of the stores / services delivered late.
- (d) The purchaser's decision under this clause shall NOT be subjected to arbitration.

41. AUTHORITY TO SIGN DOCUMENTS Tender must be accompanied by Letter of Authorization to sign the Tender on behalf of the Bidder. Bidder must prove that the person who signs this Tender is fully authorized to bind his establishment / company. Such proof shall be in the form of clear official documents fully legalized by designated authorities in respective countries.

42. PRIOR INTIMATION REGARDING SUBMISSION OF QUOTATION To avoid misplacement of the quotations, all firms are required to intimate this office regarding dispatch of their quotation through courier giving details of the courier through telephone / fax, so that courier service may be tracked to ensure your participation in the competition.

43. BID DISCOUNT The bidder may offer unconditional discount, in percentage of their quoted price or bids, before opening of the financial proposal. The discounted bid price shall be considered as original bid for evaluation being an integral part of the bid. No offer of discount shall be considered after the bids are opened.

44. BIDDING CLARIFICATIONS TO TENDER In case any clarification is required regarding tender, firm may contact on following address however, queries in regards to the tender shall only be entertained till one week prior to the deadline for submission of tenders.

Technical Clarification: Directorate of Proc & Stores, AMF PAC Kamra District Attock Tel Ext 051-9099-5283 Email: amflog@pac.org.pk.

Bidding / Contracting Procedure: Directorate of Central Procurement PAC Board Kamra Tel No 051-9099-2534 Email: adcp@pac.org.pk.

Yours sincerely,

(SOBIA RAUF MALIK)
Squadron Leader
Asstt Dir Central Proc
PAC Board Kamra
Tel: 051-90992543

Annexure "A"

CERTIFICATE

TENDER / CONTRACT No **PACB/751/13082018/1138/P-2**

It is certified that no person, firm, cooperation, subsidiary or entity in Pakistan or elsewhere shall directly receive any rebate, bonus commission, gift or favour in cash or kind other than commission allowed to M/s (FULL NAME TITLE OF THE COMPANY WITH ADDRESS) against contract No _____ dated_____. In case if it is discovered that contents of this certificate have been infringed / violated by the supplier the purchaser will have the right to cancel the contract and / or impose a penalty equal to 25% of the contract value.

AGENT-

Seal & Signature

PRINCIPAL

Seal & Signature

COUNTERSIGNATURE

Director Central Procurement

Seal & Signature

QUESTIONNAIRE TO BE FILLED IN BY BIDDER

Firm is required to provide confirmation of following points and in case of any change, same is to be highlighted in remarks column.

S.No	Description	Yes / No	Remarks
1.	Whether stores offered conform to the specification and confirmation to this effect has been made in the quotation given in Form PACB – 002A .		
2.	Whether deviation from the demanded specification is attached with Form PACB – 002A .		
3.	Whether complete quotation has been submitted in duplicate.		
4.	Whether the prices are exclusive of taxes/duties if so whether taxes/duties have been shown separately.		
5.	Whether Form PACB–002A & 002B duly filled in and signed by the Bidder have been returned in herewith.		
6.	Whether original invoice Performa from principal has been enclosed herewith.		
7.	Whether copy of valid registration / business authorization of firm have been enclosed herewith.		
8.	Whether tender fee challan amounting to Rs 200/- has been enclosed herewith.		
9.	Whether details of financial capability (Bank Statement etc.) and financial load of contracts outstanding against your firm have been provided.		
10.	It is confirmed that no Taxes / Duties & Dues payable to Pakistan Govt are outstanding at the part of vendor / firm.		
11.	Copy of NTN, sales tax certificate OR Equivalent Tax compliance Certificate (for foreign firms) has been attached.		
12.	It is confirmed that firm and their proprietors have not been in litigation / blacklisted by any Govt./Semi-Govt / Autonomous body		
13.	Valid, original agency agreement has been attached with quotation.		
14.	Unit Price has been provided against same unit of issue as mentioned in IT. In case of change in unit of issue, price has been converted as per ITs unit of issue in a separate column along with conversion formula		
15.	Specimen of End User Certificate has been attached (If required)		
16.	Country of origin and port of shipment have been mentioned.		
17.	All requisite documents as per Para 33 of Invitation to tender have been attached.		
18.	10% PBG will be provided at the time of signing of contract		
19.	Warranty / Guarantee will be provided for required period		
20.	Letter of Authorization to sign Tender Documents on behalf of firm has been attached.		
21.	Incoterm is as per IT .i.e. CIF		
22.	Offer is without any condition		
23.	All terms and conditions mentioned in IT are acceptable		

Dated: _____

(Signature of Bidder & Stamp)


SCHEDULE OF STORESTender Inquiry No: - [PACB/751/13082018/1138/P-2](#)

TENDER SUBMISSION TIME: - Before 0930 Hrs on opening date

TIME & DATE OF OPENING [1000 Hrs on 15 January, 2021](#)**No further extension in opening date will be granted except extreme circumstances.****PROCUREMENT OF LARGE C-SCAN UT TESTER****(AS PER DETAILS APPENDED BELOW)**

S No	Part No	Noun	Specifications	U/I	Qty
1	1B/AMF-24	Large C-Scan UT Tester	As per following details	EA	01

SNO	AMF Requirements
1	System Purpose and Requirement
1.1	Basic Requirement
1.1.1	The inspection system is to be mainly used for inspection of composite parts by ultrasonic technique, should be able to work in Pulse-echo, Through Transmission and Phased Array TTU inspection modes. Detection sensitivity requirement of TTU System are as below:
1.1.2	(a) Carbon Fiber Laminate: (i) Thickness 1-40mm. (ii) Should detect ϕ 3mm defect and quantify porosity when detecting porous, layering, unstuck and mixture etc.
1.1.3	(b) Carbon Fiber Laminated Board / Carbon Fiber Laminated Board Cementing Structure: (i) Thickness of laminated board cementing component element: 1-40mm. (ii) Should detect ϕ 3mm defect when detecting unstuck defect between laminated boards, layering defect inside laminated board.
1.1.4	(c) Carbon Fiber Or Glass Fiber Board / Nomex Honeycomb Sandwich Structure: (i) Thickness of board: 1-10mm. Height of Nomex honeycomb: 3-125mm. It is to be mainly used for detecting unstuck defect between board and honeycomb, layering defect inside board. (ii) Should detect ϕ 6mm defect of cementing between board and honeycomb, ϕ 3mm layering defect inside board.

1.1.5	<p>(d) Carbon Fiber Or Glass Fiber Board / Foaming Structure:</p> <p>(i) Thickness of Carbon fiber or glass board / foaming structure: 0-20mm. (ii) Should detect $\phi 6\text{mm}$ defect in cementing face between board and foam. Above mentioned test samples will be provided by Customer.</p> <p>Precondition For the detection of a bonding defect between honeycomb and skin, it is required that the defect size is at least of the size of the key-size $\Delta 1$ of the honeycomb (See the definition in the drawing). Machine OEM to present proof of inspect-ability of various types of foam for which customer will provide required samples.</p> 
1.1.6	<p>The system shall be equipped with at least 13 motion axes. Adopt vertical structure (Y-axis on Z-axis). The scan system shall be consisting of two mechanical arms, consisting of X, Y, Z, A4, A5, A6 axes on each arm. The system is also consisting of Water Circulation System, Ultrasonic Detection System and Software, Probe Holding Device and Movement Control Software, Electric System and Computer Hardware, Safety Protection Device etc.</p>
1.1.7	<p>The detection system is to be dual-Squitter detection system (perform one channel for single element probe TTU, dual channel for double frequency probes TTU & PE). The detection system shall also be equipped with PA of 128 channels for PA TTU & PE testing through WAPA.</p>
2.1	<p>Coupling Method: Squitter coupling.</p>
2.1.1	<p>Detection Modes: Through Transmission, Pulse Echo Using Single Channel and Phased Array Squitter's.</p>
2.1.2	<p>Power Supply: 380V $\pm 10\%$, 50Hz AC; Temperature 5~45°C, Humidity < 90%. The equipment is required for normal running under above- mentioned environment. The life time of system will be shortened if operating above 35 °C, Suggested Operation Temperature Range is 5 ~ 35 °C.</p> <p>Other Requirement as below No Condensation Pressurized Air: 6 bar (90 psi), Dry and oil free, Filtered compressed air. AMBIENT TEMPERATURE SPECIFICATIONS: OEM to provide machine operating / installation / commissioning ambient requirements.</p>
2.1.3	<p>Product and Services shall be in full compliance with International Standard Organization (ISO) and International Electrical Committee (IEC) standards.</p>
2.1.4	<p>The measuring units for all parts and components and instruments should be of international system of units (SI).</p>
2.1.5	<p>The equipment is to be of high reliability to guarantee 72 hours continuous, stable and reliable running.</p>
2.2	<p>Functional Requirement</p>
2.2.1	<p>All motion control parameters can be set by the computer. Besides, system is to be equipped with a hand-held panel, which can be brought to everywhere inside the working area. Meanwhile, system is to be equipped with tablet PC (without wireless LAN, Bluetooth function). Scan parameters like shape parameters of every axis, scan area, scan track etc., must be able to be set by tablet PC in order to observe motion control parameters and UT electronics status. Comparison with monitor mounted in Z-axis, tablet PC must be used more flexible and able to be brought to anywhere inside the working area with no dead zone. If seller cannot find cabled tablet PC without wireless and Bluetooth hardware, seller will provide two hand held panels and install a monitor on index tower for UT signal observation.</p>
2.2.2	<p>TTU method and PE method must be able to detect flat part, single curved shape (2.5D) and complex curved shape (3D) part.</p>

2.2.3	Phased array TTU method must be able to detect flat part, single curved shape with curvature greater than 125 mm. Phased array TTU method should be mature and reliable.												
2.2.4	System equipped with air nozzle must be able to blow away splashing water drop in order to prevent destroying inhere water column coupling. There should be no signal interference on ultrasonic C-Scan drawing caused by splashing water drop. Equipped with air pressure adjustment valve.												
2.2.5	Inspection software Should have below functions: After defining a certain area on the C-Scan drawing, adopt different scan parameters and ultrasonic parameters to rescan the area and get new C-Scan drawing and save A-scanning waveform.												
2.2.6	System must have Re-Scan Function from breaking point :No data loss when the system is interrupted. The mechanical system should start scan from interrupted position (interrupted line) directly after system recovery.												
2.2.7	The system must have Authorization control for two levels. Operators must be able to only call and not revise parameters set by technicians, such as parts scan track etc.												
2.2.8	Scan image files of parts detection must have ability to be changed to the standard JPEG, MBP or TIFF format.												
2.2.9	For various complex parts shapes, provide rapid & flexible scan track creating method. For example, CATIA data import, input movement range and laser teach-in, etc.												
2.2.10	Able to label comments for defect on C-scan drawing. The user must have ability to add and revise comment label and make notes according to the need.												
2.2.11	C-scan image must be able to display real defect shape. Effects like jagged edges must be compensated by software. This compensation should have no significant influence to defect sizing and position evaluation.												
2.2.12	Remote technical support, fault diagnosis, maintenance service and control.												
2.2.13	Able to automatically give alarm and dispose from control software for wrong motion of mechanical system, water supply system and electric system etc.												
2.2.14	The system must be equipped with emergency stop device in different positions (such as console, manual operator, protection fence). Ability to monitor equipment running area by infrared and stop equipment running in time.												
2.2.15	The system must be equipped with anti-collision device (Anti-collision ring) to avoid collision between probe, manipulator and parts caused by operation errors. Once anti-collision device touching any part or other objects, the system emergency stop should be started immediately.												
2.2.16	Probes must have ability to be changed conveniently and quickly. The connector of probe cable should be covered in a small box to avoid signal attenuation caused by incoming water during hanging the probes.												
2.2.17	The water supply system should be equipped with function of overflow, filter, sterilize, water pressure adjustment (rough adjustment and fine adjustment)etc. Additional drainage valve and channel shall be equipped to have waste water not discharged through water tank but directly from the discharge pump to drainage.												
2.2.18	Long lifetime: Guarantee stable system performance and no change of accuracy within 10 years with proper maintenance.												
2.3	Technical Specification Of Mechanical Scan &Detection System												
2.3.1	Max, scan working area should be no less than: 13m x 2.5m x 4.5m. Vibration control during any axis moving, accelerating and decelerating is required. Mechanical system must have gantry system.												
2.3.2	All parts and components that contact water should be made of corrosion resistant material. All connectors that contact water should be performed with strict sealing treatment.												
2.3.3	Technical specifications of mechanical system												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Axis</th> <th style="text-align: left;">Stroke</th> <th style="text-align: left;">Vmax</th> <th style="text-align: left;">Position Accuracy</th> <th style="text-align: left;">Repeat Accuracy</th> <th style="text-align: left;">Min.Step</th> </tr> </thead> <tbody> <tr> <td>X (X1, X2)</td> <td>13,000mm</td> <td>1000mm/s</td> <td>±0.2mm/overall ± 0.1 mm/m</td> <td>≤±0.1mm</td> <td>0.1mm</td> </tr> </tbody> </table>	Axis	Stroke	Vmax	Position Accuracy	Repeat Accuracy	Min.Step	X (X1, X2)	13,000mm	1000mm/s	±0.2mm/overall ± 0.1 mm/m	≤±0.1mm	0.1mm
Axis	Stroke	Vmax	Position Accuracy	Repeat Accuracy	Min.Step								
X (X1, X2)	13,000mm	1000mm/s	±0.2mm/overall ± 0.1 mm/m	≤±0.1mm	0.1mm								

	Y1, Y2	2,500mm	300mm/s	±0.2mm/overall ± 0.1 mm/m	≤±0.1mm	0.1mm
	Z1, Z2	4,500mm	300mm/s	±0.2mm/overall ± 0.1 mm/m	≤±0.1mm	0.1mm
	S1, S2	±480mm	150mm/s	±0.2mm/overall	≤±0.1mm	0.1mm
	A41, A42	180°	30°/s	±0.5mm/overall	≤±0.02°	0.1°
	A51,A52	110°	30°/s	±0.5mm/overall	≤±0.02°	0.1°
	A61,A62	180°	30°/s	±0.5mm/overall	≤±0.02°	0.1°
2.3.4	The machine accuracy must be compensated by software, the straightness of X1 and X2 will be ±0.2 mm in whole length and the straightness of Y1, Y2, Z1 and Z2 will be ±0.1mm in whole length. The detailed compensation method should be provided to the customer.					
2.3.5	The manufacturer should provide metering qualification report for all mechanical technical specifications before the equipment leaving factory. The final acceptance should be performed by using laser measuring system to measure by the metering department from the user and the seller together.					
2.3.6	Probes Centering status must be adjusted by hardware and compensated by software. Compensation method should be provided to the user					
2.4	Technical Specification Ultrasonic System					
2.4.1	Ultrasonic detection equipment should be tested according to ASTM E317 or AITM6-0013 and phased array module according to AITM 6-0016, and provide certificate of qualification. The ultrasonic system should be with through transmission, pulse echo and phased array detection mode. Conventional ultrasonic should perform both dual channel and double frequency detection. Phased array supports TTU inspection method.					
2.4.2	Horizontal Linearity: Error ≤±1% in the range of 0~100%					
2.4.3	Vertical Linearity: Error ≤±3% in the range of 5~95%					
2.4.4	Dynamic Range: 120dB, gain adjustment 120 dB					
2.4.5	Frequency Range: 0.25 MHz ~25 MHz					
2.4.6	PRF (Pulse Repetition Frequency): 1~20KHz					
2.4.7	Resolution : ½ dB or 10ns (Time of Flight) Min Gain Adjustment: at least 0.1dB; within range of the working frequency. Error ≤±1dB per 12 dB					
2.4.8	Quantity and Resolution of Gate: At least 4 gates (one interface wave gate, two flaw gates and one back echo following gate), the resolution of gate 1000ms/20ns.					
2.4.9	Finish scan and detection in one time for laminated board structure with different thickness, honeycomb sandwich structure with complex step, area embedded foam glue by TCG function					
2.4.10	The system should have high power pulse (only used to CV TTU) to increase penetrability and improve SNR. When adopt high energy incitation pulse generator, the electric noise level is less than 20% of full screen and the rest gain is more than 60dB.					
2.4.11	Internet cable connects ultrasonic part with PC, for digital transmission, guarantee stable interactive method and the lowest noise when transmit data under industry environment.					
2.4.12	Sampling Frequency of Each CV Channel: 100MHZ. Sampling accuracy of each channel: 24 bits wave amplitude.					

2.4.13	<p>Provide probes as below table and the qualification certificates as per ASTM E1065 or AITM6-0013 & 0016.</p> <p>Single element probes:</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Remarks</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td>0.50MHz</td> <td>Flat</td> <td>4</td> </tr> <tr> <td>1.00MHz</td> <td>Flat</td> <td>4</td> </tr> <tr> <td>5.00MHz</td> <td>Flat</td> <td>4</td> </tr> </tbody> </table> <p>Dual element probes:</p> <table border="1"> <tbody> <tr> <td>1 & 5MHz</td> <td>Flat</td> <td>4</td> </tr> </tbody> </table> <p>All probes split 50:50 between Base machine and Spare parts package. For the spares package, a prolonged calibration interval of 2 years is to be included.</p>	Frequency	Remarks	Quantity	0.50MHz	Flat	4	1.00MHz	Flat	4	5.00MHz	Flat	4	1 & 5MHz	Flat	4
Frequency	Remarks	Quantity														
0.50MHz	Flat	4														
1.00MHz	Flat	4														
5.00MHz	Flat	4														
1 & 5MHz	Flat	4														
2.4.14	Provide 8 pairs of nozzle as per following specification respectively: ϕ 6mm, ϕ 8mm & ϕ 10mm.															
2.4.15	Provide 4 phase array probes, each with 64 elements, for flat and curved part inspection with PA TTU method. The probes should be provided with the qualification certification as per AITM6-0016. PA probes : 2 for base machine, 2 in spare package. Recalibration is to be included in spare pack, same as for CV.															
2.4.16	The manufacturer should provide 4 pairs of nozzle according to the provided phased array probes.															
2.4.17	Single nozzle and double frequency through transmission detection. Adopt one nozzle and special double frequency probe to detect part (Frequency of center element is 5MHZ and Frequency of circumferential element of probe is 1 MHZ). Each frequency imaging independently.															
2.5	Requirement of Motion Control System															
2.5.1	Mechanical scanning system should be operated stably and adjusted continuously with good scanning and inspecting repeatability, and should keep identical to the inspection images accuracy on display. All electric system in running control should not interfere acquisition of ultrasonic detection signal and cause distortion for analysis of detection result. (When the system in on-line running, disable noise suppression function, use the probe with 1 MHz frequency. The maximum noise level should not be large than 10% of full screen when gain of ultrasonic flaw detector is 90dB in empty scan).															
2.5.2	Under the condition of keeping two probe acoustic beams in the same axial line and performing plane scan and detection in the whole area, the maximum deviation of ultrasonic signal amplitude caused by mechanical system accuracy shall not exceed 2dB (no- load). Using ϕ 6mm nozzle, 5MHz probe, water path is 50mm, 98% data maximum variation should not exceed 2dB.															
2.5.3	Probe Angle Calibration and Centering Function: When using TTU method, the detection system should be able to perform automatic multi-axis linkage detection according to order. Keep 2 probes acoustic beam are in one axial line when perform scan at any position in set scanned area (scan and detection of complex curved surface). The axial line should be perpendicular to curved surface section (or parallel to normal of curved surface). The maximum deviation of ultrasonic signal amplitude caused by axial line misalignment should not exceed \pm 2dB. (no-load) (Using ϕ 6mm nozzle, 5MHz probe, water path is 50mm, 98% data max, variation should not exceed \pm 2dB).															
2.5.4	The system must be able to realize multi-axis linkage motion control in different degrees of freedom direction and perform multi-axis linkage scan and detection. Random select TTU mode and PE mode be able to perform T-T mode and P-E mode simultaneously.															
2.5.5	System should be able to detect complex curved surfaces, cone and various thickness parts. Guarantee probe nozzle automatically follow curved surface and keep fixed sound path according to curvature of parts surface. Realize detection of various thickness parts. The main control software should be able to control each axis moving by manual and position each axis by using incremental mode or absolute mode in															

	special control window.
2.5.6	Ability to acquire contour curved parts by various methods according to parts shape. Perform tracking scan and detection according to acquired contour curve of parts (The single arm and two arms should be able to be adjusted and controlled freely and independently).The control software should have various teaching modes, such as manual laser teach-in mode, CATIA input mode and programming mode (For standard shape part, input scanned area coordinate directly). Adopt three-point calibration for parts with same shape, and repeat existing scan plan by only inputting three points. The existing systems should be also improved for this three-point calibration method. Once the first point is confirmed in manual mode, the system should be able to auto-evaluate if the rest two points are correct or suitable. Above requirement is to meet acquiring and programming of motion track parameters of complex curved surface parts, in order to appropriate for any structure parts.
2.5.7	Ability to perform smooth process for contour curve of profiling modeling through software, able to set the level of smooth process.
2.5.8	System index direction should be related to scanning line, able to set index (step) direction through software, apart from indexing along X-axis and Z-axis, indeed (step) direction can move along with specified direction.
2.5.9	Ability to extend profile model around which get from teaching model, and form extended profile model. Software should be able to set the size and direction of extended scan, and display extended profile model and original teaching profile model respectively for operator making comparison.
2.5.10	Software should be able to show relative position in 3D mode between profile model and the equipment. After profile model is located, its position should be consistent with its actual spatial position.
2.5.11	Ability to edit the point, line and plane of teaching profile model or extended profile model through installed software.
2.5.12	Ability to check and edit the vector of all points in testing profile model and to change incident angle of probe by changing vector direction of each point.
2.5.13	In system software, it must be able to set the thickness of each area in profile mode, equipment is able to auto-change water path according to pre-set thicknesses during the transition between different thickness areas, equipment must be able to change water path gradually.
2.5.14	Teach in mode: all axis should be able to perform motion control synchronously,
2.5.15	System should acquire parts surface scan track by using laser sensor or other methods. Ability to determine normal direction and acoustic beam axial line direction of corresponding points from acquired parts shape parameter. Conveniently recall scan tracks and ultrasonic detection parameters, which meets re-scan and re-checking requirement for the same part.
2.5.16	After finishing the whole scan, the system should do preliminary evaluation and measurement of defect based on acceptance standard. For defect selected for evaluation by operator, the system should automatically locate defect and mark defect outline on the surface of parts.
2.5.17	The detection for part with different structure and different thickness should be finished in one time. Keep consistent water distance. After scan, finish evaluation of different structure and different thickness area by adjusting palette.
2.5.18	Operation panel: Selection system of inputting scan parameters, speed, range, index (step), angle, and scanning axes. Failure diagnosis for the system and equipment state, and provide system failure indication information.
2.5.19	System should display whole scan process time.
2.5.20	Equipped with digital camera system which should be able to monitor probe position. Monitoring system should be displayed in one LCD with split screen and the video be stored.

2.5.21	Equipped with Handheld Panel: The operator should be able to perform all-around manual motion control by integrated keyboard of handheld control panel. The control panel should be equipped with display screens to display current position, error and status information etc.
2.5.22	System must be equipped with the latest numerical control system, preferably SINUMERIK 840D control system and whole set SIEMENS servo motor.
2.6	Requirement of Computer Hardware System
2.6.1	Main performance not less than below requirement: CPU Not less than Intel 15-4590 (quad Core 3.3 GHz, 6MB second level cache) Memory : 16 GB NEXX DDR SDRAM HDD : Dual HDD, not less than 1TB each. CD-ROM : No writer function, No infrared, Bluetooth, wireless LAN function.
2.6.2	Monitor : 20" LCD Graphics Card : Separate graphics card (1GB memory)
2.6.3	System should be equipped with UPS, dual LCD displays mouse and keyboard. The system should be able to communicate with buyer's server via Ethernet network (for example: Data backup purpose)
2.6.4	System should have sufficient output / input ports: Transmit data with ultrasonic detection system, mechanical system and control system. At least reserve 2 USB ports for detection data transfer.
2.6.5	A4 printer HP laser jet (A4) without wireless LAN and Bluetooth functions, 2 sets of spare toner cartridges.
2.6.6	Provide one dedicated PC for data storage and one mobile hard disk no less than 16TB. Require a dedicated PC to connect with system PC for exchanging the data.
2.7	Requirement of Image Process System
2.7.1	Real-time display and record A-scan display simultaneously during data acquisition.
2.7.2	Read, display and print time domain wave shape of C-Scan recording spot.
2.7.3	Real-time record and display C-scan image. According to detection request, should adjust display and print image based on any ratio / dimension. Should select a certain area to analyze and process, such as defect quantifying statistic (defect area percentage, defect size and depth) etc.
2.7.4	When scan interval is too large, should be able to perform smooth process for data. Calculate average gain value in appointed area and mark it on appointed position.
2.7.5	Perform quantifying and positioning analysis for defect. Should select gray scale or color to display image. Able to automatically perform quantifying statistic and image enhancement analysis for different color area.
2.7.6	For color (or gray) palette in C-scan image, should be able to check the corresponding values of each color (or gray).
2.7.7	Automatically record various detection parameters setting of ultrasonic instrument corresponding to ultrasonic C-scan document according to the need.
2.7.8	System should have TCG function, which can automatically perform sensitivity compensation according to thickness variation of parts (TCG).
2.7.9	Should be able to perform data acquisition and evaluation synchronously
2.7.10	Real-time display A and C-scan. Get instant B-scan image by post processing stored A-scan data. Have 3D display function.
2.7.11	C-scan Display
(1)	Generated C display images should automatically attach scale
(2)	Accurate measurement of defect size, distance, amplitude (dB) of specific position in the C-Scan image.
(3)	Equipped with picture process function, such as defect distance measuring, area calculation, wave shape amplitude statistic etc. Able to calculate the area of dispersed flaw of specified amplitude (dB)
(4)	Zoom function (For whole picture, defect area)
(5)	To display dimension of image pro rata, shown on the printed report.

(6)	Palette: color table setting, with at least 256 kinds of color and gray scale display. The color bar shall be with two parameter-setting modes (dB and percentage of amplitude). The color can be set in 1% of screen height resolution and group selected color in one combination.
(7)	Automatically finish preliminary evaluation of products according to detection sensitivity.
(8)	Comment Function: add graph label and description for C- scan image based on request.
2.7.12	Set instrument parameter and detection parameter by the computer.
2.7.13	Power on self-checking function. Prompt for fault or in good condition.
2.7.14	Create ultrasonic detection report based on detection report template provided by the user. The content of report includes: date, time, parts drawing number and name, instrument, equipment, probe diameter, numbering defect, mark defect area and distance, coordinate and position of defect, C-scan image zoom print ratio.
2.7.15	Auto-save data function for data safety, provide detection data backup PC. These two PC can mirrored in real-time to realize inspection data real-time backup.
2.7.16	Background printing of C-scan image
2.7.17	Database management for detection data. Manage ultrasonic detection record of detected parts based on parts drawing number and serial number. Flexibly inquiry and recall detection record.
2.7.18	After SAT, the supplier should provide one free upgrade for system software, if any software version upgrade.
2.8	Technical Requirement of Water Supply System
2.8.1	Water tank equipped is not less than 2m ³ .
2.8.2	Equipped with automatic regulator of water pressure and water level.
2.8.3	Equipped with multiple filter, de-foaming and current stabilizer.
2.8.4	The water supply system should have UV treatment function.
2.8.5	Water Pipe: Remaining service life for more than 5 years with sufficient rigidity and flexibility, standard interface, easily for change and clean, transparence (Convenient for observing stream flow and whether having air bubble or impurity or not). Media piping should be marked color coded or with text label to describe media content and direction of media flow
2.8.6	Additional drainage valve and channel will be equipped to have waste water not discharged through water tank
2.8.7	The water provided by customer should be met as below requirement: Water : Inlet to fill normal water in the immersion tank of the system Quality of water : Industrial water with PH 7-8, pressure of 2-4 bar Solid particles : <20 microns Hardness : 7°dH, 1.3 moll/l
3	Scope of Supply
3.1	Basic Ultrasonic Testing Machine
	The price must include the described basic testing machine, pre-acceptance test and comprehensive training in Germany. The scope of supply of the delivery is as follow. If nothing different is mentioned it is one piece "pcs" per item.
	Mechanical System.
	Water Supply System and PLC.
	Dome Cameras- 02 Pieces
	Ultrasonic Probes Holder
	TTU Squitter, 1 Pair
	PA Wide Area Squitter, 1 Pair
	Ultrasonic electronics, cables and interfaces
	UTxx-V72.45 (4 pieces)
	UTxx V74.35 (2 pieces)
	PA 4 (2 pieces)
	PA connection box (2 pieces)

Main frame with 13 slots (2 pieces)				
Air conditioned mini cabinet (2 pieces)				
High power pulser unit (1 piece)				
1 Piece of Operator Computer with Software				
1 Piece of Evaluation Computer with Software				
Second Operation Station as a Wired Tablet Type PC				
1 Piece Cavity extender 600 mm (including one mini nozzle and one mini probe)				
1 Piece of Laser Teach Pin				
1 Piece of Defect Marker to be Installed as Laser Teach Pin (Provide color & Type Of The Pen In Eko Meeting)				
1 piece of RhinoCeros CAD Conversion software License				
1 piece data filter for CATIA 5 (to be selected) licensed for a 5 year operation / use				
Two Sided Light Barrier Safety System				
A4 Printer: HP laser jet (A4). 2 sets of spare toner cartridges with wireless LAN and Bluetooth function				
Calibration Tools Package				
Main Accessories (Part of Main package)				
The probes must be ordered in the required frequencies for the fixed package price. The scope of supply of the delivery is as follow. If nothing different is mentioned it is one piece "pcs" per item.				
Probe Single Element (6 Pieces) along with certificates				
S NO	Frequency (MHz)	Qty	Comments	
1	0.5	2	Non-Focus	
2	1.0	2	Non-Focus	
3	5.0	2	Non-Focus	
	Total	6 (Pieces)		
Probe Dual Frequency(2 Pairs) along with certificates				
S NO	Frequency (MHz)	Qty	Comments	
1	1.0 & 5.0	2 Pairs	Non-Focus	
PA Probes for PA TTU (2 Pieces) along with certificates				
S NO	Usage	Element	Qty	Scan Width
1.	PA Squitter	N/A	1 Pair	N/A
2.	PA TTU	At least 64	2 Pieces	Up to 15mm depending on the curve situation and required minimal defect of the inspected piece
Nozzle Front for PA Wide Area Squitter(8 Pieces)				
Nozzle Front (48 Pieces)				
Φ 6 mm	16 pieces			
Φ 8 mm	16 pieces			
Φ10mm	16 pieces			
Nozzle back parts	4 Pieces			
3.2	Spare Parts Package (Part of Main package)			
3.2.1	Spare Part	Specifications	Qty	
	Filter Cartridge	Water supply station	1 Box (10 Pieces)	
	UV Bulb	Water supply station	1 Piece	
	Power Supply 24VDC, 1A	Mini PS100	1 Piece	
	Temperature Sensor, PT100	PT100, 4wire, 90.2150,5x17mm	1 Piece	
	Cable	9 pol, SUB-D	1 Piece	
	Single Element Transducer, 5MHz	05F54X76M59	1 Piece	

3.2.2	Additional Spare Package			
	Probe Single Element (6 Pieces) along with certificates			
	S NO	Frequency (MHz)	Qty	Comments
	1	0.5	2	Non-Focus
	2	1.0	2	Non-Focus
	3	5.0	2	Non-Focus
		Total	6 (Pieces)	
3.2.3	Probe Dual Frequency(2 Pairs) along with certificates			
	S NO	Frequency (MHz)	Qty	Comments
	1	1.0 & 5.0	2 Pairs	Non-Focus
3.2.4	PA Probes for PA TTU (2 Pieces) along with certificates			
	S NO	Usage	Element	Qty
	1.	PA Squitter	N/A	1 Pair
	2.	PA TTU	At least 64	2 Pieces
				Scan Width
				N/A
				Up to 15mm depending on the curve situation and required minimal defect of the inspected piece
3.2.5	UTxx-V72.45 (4 pieces) along with certificates			
3.2.6	UTxx V74.35 (2 pieces) along with certificates			
3.2.7	All other essential spares (Recommended by OEM) for continuous and smooth operation of equipment			
4	Documents			
4.1	The documentation of supply is delivered according to the requirements. All documents will be furnished in English. In total 3 sets are provided the documentation contains at least:			
4.2	System description of the testing machine Operating manual for the UT system and the NUSCAN software NUSCAN operating manual for the mechanical system including controller and water supply system Block diagrams of the mechanical parts Block diagram of the ultrasonic system Maintenance instruction safety advice			
4.3	Test Report of UT Electronics and Probes Certification of for transducers and electronics Conventional UT electronics and probes will be tested to ASTM E317, En12668, AITM6-0013 and ASTM E1065 PA UT electronics and probes will be tested to AITM6-0016 Qualification certificate of the system Qualification certificate of the software Mechanics accuracy adjustment methods description Mechanics accuracy test report Regular Calibration methods description of system overall performance Complete sets CD of system control and imaging software and software installation manual shall be provided. (Easily to re-install when there are malfunctions in the hard disc or the system)			
4.4	Note: The documentation of furnished components is delivered in paper and on a digital medium. Documentation of external supplied parts such as computer and printer is delivered as it comes in the original version and language.			
5	Installation , Acceptance and Training			
5.1	The seller should dispatch personnel to buyer site for installation within 30 days after receiving notification from the buyer. Installation and commissioning period is expected within 3 month. The seller should provide installation and commissioning plan and schedule before installation.			

5.2	Factory Acceptance Test (FAT)
5.2.1	<p>Perform Factory Acceptance Test (Pre-acceptance) based on ex-work inspection standard and inspection standard agreed by both parties. About three Test samples (as mentioned above) will be provided by buyer for its inspection and qualification of entire equipment / facilities, however; standard test samples (From OEM) will also be inspected and qualified. All test samples (Arranged by buyer & OEM) should meet all the requirements during FAT & SAT.</p> <p>Acceptance standard shall follow the technical agreement.</p> <p>After the manufacturing, commissioning and testing, the seller shall arrange at least 6 buyer's operators for minimum 15 working days to have Factory Acceptance Test (Pre-acceptance), operation & maintenance training on OEM / manufacture's site.</p>
5.2.1.1	<p>In the pre-acceptance, demonstration for every function and detection for test piece provided by the user shall be performed. Detection capability of the system should fulfill all requirement of the tendering document. Shape and size of test piece shall be defined in the technical agreement. Meanwhile, check test report of mechanical accuracy. Shipment can be effected only with the signature of both parties after the pre-acceptance as qualified.</p>
5.2.2	Final Acceptance
	<p>The final acceptance will be performed after installation at the Buyers plant. The acceptance test procedure corresponds to the pre-acceptance will be performed after installation at the Buyers plant. The acceptance test procedure corresponds to the pre-acceptance and will be defined within 6 month after contract signing. The acceptance test at the buyers site shall start immediately after installation and not later then one day after the Seller has notified its readiness for the acceptance tests. Test Result should fulfil all performance data stipulated in this agreement, then both parties confirm passing final acceptance test. In case a warranty case leads to system stop of more then 5 consequential days the defined warranty period will be extended accordingly up to a maximum of 6 months additionally to the defined warranty period.</p>
5.2.3	<p>After installation and commissioning completed, the final acceptance shall be performed by OEM rep in the presence of user. Test mechanical accuracy, ultrasonic flaw detector performance, software function etc. based on tendering document. Meanwhile, 4 actual parts inspection shall be performed. The parts are provided by buyer. The cost shall be borne by the manufacturer.</p>
5.3	Training
5.3.1	<p>After the equipment arriving at the user's site, the manufacturer should be responsible for equipment installation, commissioning and inspection at the user's site. Technical training for not less than 20 working days to operators and maintainers from the user shall be provided. Before training, detailed training schedule and training material should be provided to user.</p>
5.3.2	<p>This training includes all necessary operator functions for operation and maintenance concerning hardware, software and mechanics. Our assumption is that the buyers personnel is actively participating in the commissioning work and receive the majority of its training parallel to the commissioning work and preparation of the SAT, it is required that the Buyers personnel is qualified appropriately (e.g. according to UT level 2 (EN 473, ASNT or equivalent) as a minimum / computer literate and family with Microsoft products) and that it is sufficiently capable of the English language. The trained personal has to operate or supervise the delivery and has to be available both, during pre-acceptance and final acceptance.</p>
6	Supplier Lists
(i)	<p>This chapter lists the most important suppliers work with in order to given an indication on the quality level. Department on the final solution the suppliers may vary. We do not guarantee that the system includes equipment from all listed suppliers.</p>
6.1	Components
	As per Appendix "A"
6.1.2	Supplier List -Mechanics
	As per Appendix "B"

6.2	NUSCAN
6.2.1	Ultrasonic Hardware and Software
(i)	Data acquisition and evaluation hardware
	<p>The NUScan Acquisition and evaluation software can be operated on a standard desktop PC.</p> <p>The supplied IT (information technology) hardware comes with all required software and licenses installed.</p> <p>The following Information Technology (IT) Hardware and Software is supplied as standard.</p>
(ii)	Hardware
	<p>Component Description</p> <p>Computer RSC i5.4570S GE Huerth, custom made in Germany (Desktop or rack mount)</p> <p>Motherboard DFI SD631-Q170</p> <p>Processor Intel® CPU i5 7600 PC 1151</p> <p>Memory 16 GB DDR4 (4x4GB)</p> <p>Video Card VGA Matrox Millennium M9120, 512MB PCIeX16</p> <p>Hard Drives 1&2 WD 2TB Gold 24/7 fan cooled</p> <p>DVD Drive DVD +/-R RW LG GH24NS90</p> <p>Network Interface PCIe 1000 Mbit, I350 Dual</p> <p>Power Supply ANTEC 380Watt ATX Active PFC, Full Range 80+, 100-240Volt CE, UL Cert.</p> <p>Input Devices HP USB Keyboard US and HP USB Optical Mouse</p> <p>Display 2 x 24" on HP Display Port To DVI-D Adapter.</p>
(iii)	Software
	<p>Software+B302 Description</p> <p>OS Microsoft Windows 10 64bit</p> <p>Microsoft Office 2019 Professional</p> <p>UTxx Ultrasonic instrument control (GE proprietary application)</p> <p>Nuscan UT Acquisition & Evaluation (GE proprietary application)</p> <p>IDL Application environment</p> <p>Lab View Runtime for UTxx</p> <p>SQL Server Database</p> <p>GIT Version management, Source tree</p> <p>Accon AGLink PLC control</p> <p>OPC PLC Communication, API</p> <p>WinCC flexible 2008 Runtime, Operating the PLC via PC</p> <p>Step 7 PLC programming</p> <p>Crystal Report 4.6 Generating PDF files</p> <p>Team Viewer 9 Remote access for maintenance and support</p> <p>Acronis 12 Backup and Recovery</p> <p>WinRAR File compression tool (optional)</p> <p>SnagIt 11 Capturing screenshots, video and audio (optional)</p> <p>Rhinoceros 5.0 Generating scan geometrics out of CAD data.</p> <p>Optionally, a rugged Tablet PC is available to allow remote viewing of the operator PC from the machine space. This is useful for adjusting transducers in the squitter nozzles or during geometry teaching. The Tablet PC is connected by network cable to a socket close to the UT tools.</p>
6.2.2	Data acquisition and evaluation Software

	<p>NuScan is the core software within the Scanning system providing overall control of the data-acquisition and the evaluation tools to analyze the inspection data. The complete NuScan data acquisition and evaluation software is written in IDL (Interactive Data Language, IDL, from Research Systems, Inc.), and supplied in source code. This may be particularly convenient for research labs, with open requirements for future development needs. (GE waives any and all liability associated with direct or indirect damage raised by customer modifications to this code).</p> <p>For acquisition and evaluation of the data the software NuScan is used, which provides, among others, the features as described below. Additional required customer specific software modules might be quoted on request.</p> <p>Inside this software package the complete set-up of any scan is performed as well as the according scans conducted. Both amplitude and time-of-flight C-scans can be produced which are displayed in real time while scanning, window and full screen display modes are selectable. Up to three amplitudes and three time of flight data can be acquired simultaneously. Print out of color images is possible in letter or legal format.</p> <p>The complete user interface is multi-language capable. Many different languages are presently available, such as English, French, German, Spanish and Italian.</p>
<p>6.2.3</p>	<p>Units</p> <p>The complete machine including control system is designed to work in inch or metric as basic unit. On the NUscan software the system can be switched from metric to inch units by a flag.</p>
<p>6.2.4</p>	<p><u>Definition of scanning (Teach in)</u></p> <p>Before a C-scan can be performed, the computer got to learn the geometry of the specimen. Three possibilities exist for this:</p> <ul style="list-style-type: none"> A. Built-in graphical editor with 3D functions B. Teaching of part surface C. Import of post processed CAD data D. Rhino post processing unit for CAD data <p>The system provides a special geometry editor of the software. For plane parts the geometry is just drawn as a top view. For simply curved surfaces the geometry may be drawn as a cross section through the part or front and rear end of the part in the graphical editor. Parts with variable cross section are drawn as several sections through the part surface.</p>
<p>6.2.5</p>	<p>The geometry may alternatively be taught in by using the scanning system itself in manual mode as teach-in device. This teach-in procedure is performed point wise step by step manually, using a mechanical pointer or a laser distance sensor. or optionally a laser distance sensor.</p> <p>The surface data can alternatively be read in from a simple ASCII file with sorted surface point data. More detailed information is available on request.</p> <p>The window for the selection of a CATIA file will be displayed on the screen if CATIA has been selected as scan direction in the Scan Set-up menu and [Geometry] has been called.</p>
<p>6.2.6</p>	<p>CATIA V5 Pre-ProcessorThe optional Rhino package allows importing various CAD data formats including CATIA V5 and others, thus providing the capability of pre-processing the CAD data to generate and extract machine scan path files. This requires the Rhino base software, the Rhino Data Kit option, and the proprietary BHGE Rhino plug in for scan path generation. The applicable file import filter also needs to be installed.</p>

6.2.7	<p>NUScan Features Part Orientation and Referencing The geometry of the inspected part is treated completely independent of its actual position in the scan envelope. The current part position is taught to the system by just pointing at two or three previously selected reference points on the part (3-point correction). The software then calculates automatically where to position the probes for optimum through transmission. Therefore the geometry teach in has to be performed only once for each type of geometry.</p>
6.2.8	<p>Storage of acquired data During each measurement all acquired data is stored on the hard disk immediately at the end of each scan line. After or during the inspection this data can be analyzed on the same computer in parallel with the scanning process. As an option, the evaluation can be performed remotely on a different computer that is linked to the acquisition computer via network. All data can also be stored on the host via network or optionally on the DVD-Media.</p>
6.3	<p>Interruption of scanning</p>
6.3.1	<p>The scanning may be interrupted at any time and resumed later on. All previously acquired data is retained and does not need to be acquired again, no matter whether the interruption has been commanded by the operator or was due to some kind of incurred failure (e.g. power fail or emergency stop). This feature is especially helpful when a scan has not been completed by the end of a shift. Additionally, an unfinished scan can be interrupted at any scan line. It can then be restarted at any previously finished line and will overwrite the following lines.</p>
(i)	<p>Batch scans With the batch scan feature, several independent scan set-ups can be performed one after the other without operator intervention. Therefore, several parts in different places on the scanning area can be examined without any operator present, for example during a night shift.</p>
(ii)	<p>Serial Scan With the serial scan feature, a series of flat parts is inspected along the X-axis in one scan and separated into single part related data files. This enables the user to scan a grid of small parts in parallel, which may reduce changeover time per part. This feature is applied with one UT setup only and requires the parts to be flat. Opposed to the Batch scan feature, the Serial Scan scans all parts installed in a row simultaneously, hence reducing the number of index steps and acceleration ramps.</p>
(iii)	<p>Local Rescan It is possible to rescan parts of the scan area a second time. For each rescan, all parameters (resolution, speed, UT-parameters) can be readjusted to optimize the scan result. It also is possible to use different UT tools for the rescan. This is useful in case a defect has been found in a fast coarse-resolution scan and its dimensions must be detected precisely in a high-resolution scan. The rescan image can be displayed integrated into the original scan image.</p>
6.3.2	<p>NuScan Software Overview</p>
	<p>NuScan is the operator interface to analyze the inspection results. Previously acquired data can be evaluated and printed out during the inspection of another part. Features of the NuScan data acquisition and analysis software are:</p> <ul style="list-style-type: none"> o Manual teach-in of part geometries using a mechanical or laser teach pin, teach-in from the control-PC or direct translation from CATIA cad models o Preview simulation of scan o Batch scan (multiple individual scans in one scan procedure) o Serial Scan (multiple parts scanned within the same setup in line to obtain higher throughput) o Standard Gate evaluation o Full RF capture (Scan speed to be respected) o ALOK Phased Array data acquisition
6.3.3	<p>Data Evaluation</p>
	<p>After acquisition, various ways of presentation and evaluation of scan data are</p>

supported, such as:

- C-Scan image, Amplitude and Time of flight
- ALOK data representation
- ALOK- B-Scan representation
- Data export to TIF, BMP, JPG formats with selectable compression
- Evaluation tools:
- 3D representation of scanned surface
- Echo-dynamic cross sections along the axes,
- Filtering, (smoothing, median, edge enhancement etc.).
- Histogram evaluation in logarithmic or linear scale
- Data conversion from time-of-flight to depth and from amplitude to attenuation
- User adjustable color-pallet
- Histogram in linear or logarithmic scale
- Display of max. min, mean, standard deviation, histogram of the display area
- Zooming user scalable
- Zooming in real time "magnification glass"
- Defect sizing
- Various data filtering functions including FFT, averaging, median and edge enhancement,
- Scan line alignment
- Data file mathematics (difference, sum and linear scaling)
- Porosity evaluation (customer specific adaptation possible)
- Data conversion from amplitude to attenuation; linear to logarithmic; time of flight to depth and vice versa
- Master image processing: Processing of scanned data in comparison with a previously defined master image in order to increase reliability and accuracy of the visual evaluation of results. Structural indications are discriminated from defect indications and therefore automated inspection highly improved
- File mathematics: Sum, difference, average, linear scaling of data files
- Point + click positioning of the UT tools with reference C scan
- Marking function: paints mark on part at position selected in the c-scan image
- Amplitude alignment between adjacent channels

Report Generator

- Enclosing a defect with a set of vectors using the mouse automatically performs defect area calculations. The result in mm² is displayed.
- Defect distance calculation by marking adjacent defects
- Statistical defect characteristics retrieved from the image (defect area percentage, defect size, depth, peak and average amplitude,)
- Automated defect recognition system by minimum defect size and minimum amplitude deviation (High/low threshold, OK-band).
- Automated defect detection, segmentation of found defects, automated defect statistics report
- Documentation of all relevant inspection parameters
- Various statistics such as total value of measured data, mean value and standard deviation
- Inspection results report transferred into an SQL data base
- Optional: Automatic verification of SNR on a sample plate
- Optional: Porosity evaluation according to Boeing BAC

Various options allow for many useful printing features including ISO A4, letter and legal size printing, printing in different scales, among which is a 1:1 scale to allow for a flaw hard copy in natural size. Free definition of color tables, scaling, distance-, amplitude- and time of flight presentation, B and C-scan representation and echo dynamics is possible.

Note: Inspection data generated by the NuScan system is compliant with and compatible to the TESTIA NDT-KIT and ULTIS composite analysis software packages.

6.3.4 SNR evaluation per Boeing BAC5980

(i)	<p>Signal-to-noise-ratio (SNR) is a quantity used to define how well a certain defect is detected by the ultrasonic system. Codes such as BAC5980 require that a defect is detected at an SNR better than e.g. 2.5:1. NuScan includes an SNR evaluation feature which can be used to easily calculate the SNR of a defect with known size in a reference plate. The user selects one reference area to calculate the noise level and defect search areas for each defect. Also, the known defect size of the reference defects is entered. Then NuScan calculates the detection threshold for each defect, displays where it found it (to reassure that the defect has been found) and calculates its SNR.</p>
(ii)	<p>Porosity evaluation can be done using porosity-thickness-attenuation-curves acquired on a set of reference samples. As prerequisite, attenuation values have to be acquired on reference parts with certain known thicknesses and porosity content levels. From these, attenuation thresholds for intermediate thicknesses and porosity content levels are calculated and applied to detect areas with porosity content higher than the value set by the user. Different sets of porosity curves for different materials are stored in Excel files and can be selected easily.</p> <p>In the example below, one nominally porosity free reference area is marked to find the attenuation of non-porous material. (The user may also enter the attenuation manually if the reference piece is not in the scan.) A second area is marked as search area in which porosity is to be found. NuScan uses the porosity attenuation curves to calculate the attenuations for the thickness of the part in that area and the critical porosity levels and marks the porous parts of the search area in red for both levels. Also, a report indicating the size of the porous areas can be printed.</p>
6.3.5	<p><u>Additional processing capabilities</u> Due to the open nature of the IDL software platform used for the acquisition and evaluation software, the user is free to amend any desired functionalities to the software in his own responsibility.</p>
(i)	<p>Teach Tools For teaching purposes, a contact teach tool, and a non-contact laser based teach tool will be available. The mechanical teach pin is superior to quickly taking reference positions of a part in the scanning volume, even if the reference position does not contain physical material, such as the middle of a hole. The pin is spring loaded, in order to avoid damage to the part.</p> <p>The advantage of the laser teach tool over the contact teach tool is that the laser teach tool uses a laser distance sensor to detect the distance from the tool tip to the part's surface. Thereby it is not necessary to approach the surface of the part exactly, so the teaching process is more accurate and faster.</p> <p>When the users finds a defect in the C-scan image, the marking device can be used to paint a mark on the part under inspection to identify the location of the defect.</p>
6.4	<p><u>ALOK Data Acquisition</u></p>
6.4.1	<p>This acquisition mode is available in all PE applications, single channel as well as PA. Optionally on selection by the operator ALOK data acquisition can be accomplished for pre-processed A-Scan acquisition. Hereby the acquired A-scan data are reduced in the UTxx DSP processing unit to a maximum number of 64 pairs of amplitude and time of flight vectors above a certain present noise level. These vectors could give extended information about the received signals from the actual A-scan.</p> <p>The amount of data in comparison to A-Scan acquisition is drastically reduced by more than 98% by still keeping the mandatory information of the signal. The ALOK acquisition is especially helpful for Pulse echo applications with varying wall thicknesses, skin with bonded stringer feet or different materials (i.e. copper mesh / CFRP). Different Set-up possibilities are selectable in software such as first echo, highest, 1st to 8th echo in the signal.</p>
6.4.2	<p>"Full Waveform Capture" If required, complete A-Scan acquisition (waveform capture) can be performed. The full waveform capture can also be accomplished for the phased array system. The speed depends on the material thickness, number of virtual probes used and resolution of time of flight, and is in a range of 50 to 200 mm/sec. A detailed calculation of achievable scanning speed can be provided on request.</p>

6.4.3	<p>"DYNAMIC GATE WIDTH in case of option pulse echo technique"</p> <p>In order to optimize the inspected volume in C-scanning mode, the "DYNAMIC GATE WIDTH" feature allows to not only have the gate start controlled by the interface echo (commonly known as Interface trigger), but furthermore to have the gate stop controlled by another reference echo, e.g. the back wall echo. Hence, the gate width is adjusted such that a constant far surface dead zone is maintained, irrespective of the part thickness.</p>
6.4.4	<p>Reverse Phasing Contour Adaptation (RPCA®)</p> <p>This option allows contour following inspection of radii or wavy surfaces. It is applicable to any Phased Array PE inspection setups.</p> <p>Reverse Phasing Contour Adaptation (RPCA®)</p> <p>The Reverse Phasing Contour (RPCA) feature is a GE patented inspection method. This method is applied using a linear phased array probe and the UTxx Software to first measure the time of flight variations from the ultrasonic probe to the surface of the part during a scan. Then this information is used to dynamically adjust delay laws and track the surface geometry to ensure that the sound beam from a given virtual probe impinges normal to the part surface. RPCA is especially useful for inspecting Inside and Outside radii of stringers and other shapes and is typically used with GE's Outside Radius, Inside Radius and Skin Bubbler Tools.</p> <p>This hardware feature is particularly useful for the inspection of inner and outer radii. It also helps scanning surfaces with moderate curvature or waviness.</p>
6.4.5	<p>Ultrasonic Probes - General</p> <p>Ultrasonic probes that are shipped with NuScan scanning systems, can be either conventional or Phased array type. Conventional probes feature one crystal in a probe housing. The specific ultrasonic probes required for an application are determined based on actual testing of Customer samples, the geometry of the part being tested and the throughput targets of the Customer.</p> <p>1) Single Element Probes – Ultrasonic probes with one ceramic element designed with one frequency that can be fired with a single conventional ultrasonic channel card. Single element probes typically utilize scan increments of 1 to 2mm and are used with conventional ultrasonic squitter's, or in full immersion.</p> <p>A special case of conventional probes are the Annular Probes / Dual Frequency Probes – that are single element probes mounted as a tandem pair in a combined UT squitter. An annular probe pair consists of an inside probe and an encircling outside probe. The inside and outside probes are typically designed with two different frequencies (Example: Testing sandwich material with 1 MHz for the annular ring, and 5 MHz for the center, where 1 MHz is used for testing core sections and 5 MHz is used for laminate sections of the part under inspection). This arrangement has twice the productivity of running two individual scans with single elements and requires the use of two conventional ultrasonic channel cards per tandem pair.</p> <p>2) Phased Array Probes – Phased array probes have many individual elements that are pulsed in groups as distinct virtual probes to form one coherent beam. The manner in which individual elements are pulsed in each virtual probe determines the beam size, near field, near surface resolution and many other ultrasonic factors. The main advantage of this technology is that a much larger effective scan width can be generated in a single pass. Phased Array probes may have a flat face and a straight transducer (Linear PA), or a curved face and transducer (Curved PA), specific to the application. Phased arrays have the highest productivity and are used in Wide Area Phased Array squitter's*, skin bubblers, radius and stringer tools.</p> <p>Probe sets can come in different configurations based on the application requirements (i.e. focus, size of active element, and number of element (phased array)). Results will vary based on specific application conditions.</p>

6.4.6	<p>*Wide Angle Phased Array is a GE Patented process. The selection of actually delivered probes is named and described below together with the tools. Typical common design characteristics: feature generically: “High Resolution Probe”: small elements, small virtual probes for narrow sound beams, superior defect detection and full steering and focusing capabilities “High coverage probe”: larger elements, larger virtual probes with wider footprint and coverage for superior scanning productivity 128 elements, 7-10 mm passive aperture (Elevation), 3.5 or 5 MHz nominal Frequency</p>
6.4.7	Individual element width - High Resolution Probe - 0.3mm
6.4.8	Total transducer width - High Resolution Probe - 38.4mm
6.4.9	Practical coverage width (“Big Step”) - High Resolution Probe -32mm
6.5	UTxx Ultrasonic instrument software
6.5.1	Up to 4 gates can be used for interface triggering and multiple amplitude and time of flight recording for both electronics. The gates can be freely set and can also be set overlapping.
6.5.2	<p>For pulse echo inspection the gates may be used as follows:</p> <ul style="list-style-type: none"> • The first gate is used as an interface trigger and coupling control. • The second gate is used as flaw detection gate. • The width of the flaw detection gate, i. e. the gate stop of the second gate, is controlled dynamically by the back-wall echo of the third gate • The fourth gate is used to monitor the back-wall amplitude and time of flight.
6.5.3	<p>Remote servicing The system is equipped with a remote service feature which allows our service technicians to service and operate the machine remotely, whenever needed. This is helpful, when malfunctions or any problems during acquisition or evaluation occur. This remote service is free of charge during the warranty period. Additionally, the NC system can be serviced by remote control. For this remote service feature an Internet access must be available close to the system. An available Internet connection for remote access is mandatory for the entire time of installation and commissioning as well as for the full warranty period!</p>
6.6	Key Know-How for a High Quality C-Scan inspection System
6.6.1	PATEND PHASE ARRAY WIDE AREA SQUIRTER THROUGH TRANSMISSION
(i)	The advantage of the WAPA (Wide Area Phases Array) TTU technology Is the wider scan area and the better. sensitivity due to the possibility to use adapted virtual probes. The PA technology is combined with a mechanically modified nozzle which provides a water beam of about 6mm by 30 mm in width. Water path is around 30mm.
(ii)	Provides high through out iru capability inspecting up to a 15mm wide area in a single pass
6.7	EMI SUPPRESSION SOLUTIONS
6.7.1	MI our systems are optimized for low noise creation and shielding of interferences. This Is based on following design basis:
6.7.2	The drive system (motor — cable — encoder — controller) Is selected for low noise creation and always builds a unit.
6.7.3	Generally we are using high torque special servo motors designed for smooth operation with lowest possible noise creation.
6.7.4	All cables are special shielded.
6.7.5	Cables for transducers aie double shielded.
6.7.6	Grounding design Is especially developed for low noise and reinforced compared to any manufacturing machine. Sewer recommends Buyer to provide a dedicated grounding point for the machine, with a resistance less than 1 Ohm. Seller will communicate with Buyer for detailed Installation condition preparation during design liaison meeting, and provide the foundation and layout drawing accordingly. The drawing Includes requirements and suggestions of foundation construction.

6.7.7	Electronics is positioned in a HF shielded and specifically protected housing, void dust and sprayed water.
6.7.8	Grounding is separated for all connected ground lines.
6.8	PATENT OF EQUIDISTANT DATA ACQUISITION ON 3D SURFACE
6.8.1	For scans of 3D formed parts the machine uses an additional TA-axis to determine the stroke of the probe during one scan line. This 3D trigger system ensures the equidistant and true data acquisition even for complex curved structures and is patented by GE. The schematic diagram is as following:
6.8.2	The movements of XYZ-A-8 result into a real-time 3D curve scanning path. Via the SINUMERII(8400 NC Controllers, the scanning path is able to be converted into a linear movement. The movement drives a virtual motor (TA axis) and generates encoder pulse accordingly. The Ultrasonic instrument counts the encoder pulse and triggers data acquisition in the position of multiple scan steps, which ensure equidistant and true data acquisition on a 3D complex curved surface. This method is fully realized by hardware components which ensure a higher accuracy and a better recognized performance, regardless of huge software calculation and simulations.
6.9	CONSTANT SQUIRTER COUPLING IN TTU INSPECTION
6.9.1	A constant squitter coupling is the critical precondition for flU inspection of composite. It depends on constant water column pressure, contour following accuracy, nozzles centering accuracy and water column ballistic correction factors. An example how to verify this value of a similar system made by Seller is described as below:
6.9.2	Seller conducted the C-Scan for a profile displayed in the left window without real part loaded in the scan area; instead real part a Plexiglas plate is mounted in front of one nozzle at the point the water jets supposed to meet each other. The result is displayed as the C-Scan in the right window. According to the statistic of UT amplitudes (marked in the red circle):
6.9.3	The minimum amplitude is 53dB, while the maximum amplitude is 54dB. The result complies with the requirement "the max change in ultrasonic amplitude caused by different as of sound beam will not be more than 2 dBm.
7	WATER SPLASH REDUCTION
7.1	Physically, the system is equipped with pressed air nozzle to eliminate the sprayed water dropping into the coupling water column, which would generate unexpected noise on the C-Scan Image. Alternatively, the Nuscan software also provides a filter to reduce influence of water splashes. This feature is useful when testing in multi-channel application.
8	BALLISTIC CORRECTION
8.1	In order to maintain perpendicular incidence of the water jet to the test surface, provision is made for the gravitational effect on the water jet, i. e. the genuine parabolic shape of the water jet is taken into account when calculating squirted positions and angles. For example, a part of system formalization File for this feature:

6.1	Components:	Appendix "A"
	Control Unit	Siemens
	Signal Lamps	Siemens
	Key Switch	Siemens
	Limit Switch	Siemens, Balluff
	Inductive Switch	Siemens, IFM, Balluff or compatible type
	Light barrier, Light-curtain	Siemens
	PLC (embedded into sinumeric) PLC	Siemens S7
	NC-unit	Siemens Sinumeric 840 DSL
	Operator Panel	Siemens

	Servo Motors	Siemens 1FT6, IFK7
	Motors	Siemens (or Standard)
	Encoder	Siemens Heidenhain
	Frequency Converter	Siemens
	Safety Control Elements (Emergency Stop)	Siemens Pilz
	Electrical Pressure Switch	FESTO
	Pressure Controller	FESTO
	Level Controller	Endress + Hauser Perrel + Fuchs
	Main Switch	Siemens + Moeller
	Cables	Siemens, Papp, Helu
	Material for installation	Phonix
	Industrial Plug connection	Harting and compatible Types
	Safety Unit	Siemens
	Protective Motor Switch	Siemens
	Power Supply	Siemens
	Transformer	Siemens Eltra
	Magnetic Valve	FESTO, Borket
	Cabinets	Rittal, RAL 7035
	Air Condition For Cabinets	Rittal
	Cable Chain	IGUS
6.1.2	Supplier List-Mechanics	Appendix "B"
	Component	Manufacturer
	Pneumatic	FESTO BOSCH SMC
	Coupling	KTR Monninghoff
	Component for Water Supply	Mattig Grundfos Graf SYR Danfos Georg Fischer
	Ball Screw drive units, to	Bosch Rexroth THK Atlanta WMH Herion
	Bearing	SKF FAG INA

	Gears	Neugart alpha Vogel Stober Harmonic Drive Atlanta
	Plastics	DOTHERM Murtfeld IGUS Nolte
	Bumper	ACE
	Plastic Grid (for wet area)	Allibert slinger
	Safety Guard, Protection device	L+R ITEM MayTec Schuco

SPECIAL NOTES FOR “PROCUREMENT OF LARGE C-SCAN SYSTEM”:-

1. For establishment of Large C-Scan UT System facility, an expert of OEM is to be made available at Buyer’s site for supervision during unloading and unpacking of equipment / machine. A team of equipment OEM is also to be made available at Buyer’s site for installation, commissioning, operation, first article qualification / acceptance and training by OEM certified team. Finally, complete system is to be tested for its intended 100% capability by performing tests in accordance with the laid down standards.
2. One year warranty is to be provided after handing / taking over the equipment / machines.
3. Quotation must be submitted on **“CIF”** basis.
4. Training and certification of six Buyer’s personnel on operations, maintenance, calibration and software programming equipment / machines for a duration of 02 weeks at OEM premises. The syllabus of the training to cover operations, maintenance, calibration and software programming is to be provided before start of training and must cover all aspects to administer and operate the machine to its full capability. Factory acceptance Test (FAT) of equipment / machines will also be carried out by Buyer’s representative at OEM premises as per specification with stipulated period of additional 02 weeks, excluding 02 weeks formal training at OEM site. The equipment will only be shipped after acceptance by Buyer’s representative as per Buyer’s specification. OEM is also to forward its own proposal regarding team composition and duration of training required to operate, maintain, calibrate and program to its full capabilities.
5. Free of cost ticketing, boarding, lodging, visa processing etc. facilities for Buyer’s team during training abroad and Factory Acceptance Test (FAT) at OEM premises will be provided by the seller.
6. Training and certification of Buyer’s personnel (as per Buyer’s satisfaction / requirement) during installation, commissioning and qualification of machine / equipment at

Buyer's premises by OEM Rep is to be provided by seller. Minimum 03 weeks training should include all aspects of operation, maintenance, calibration and software programming. Training syllabus and duration would be mutually finalized during OEM training phases.

7. Items / equipment should be of Western / European Origin.
8. The provided specifications are minimum requirement. The equipment with higher specifications will also be acceptable.
9. Detailed Technical Details (OEM Technical datasheet / brochures of Equipment) are to be provided with quotation for technical evaluation.
10. Mode of shipment by Air / Sea is to be mentioned.
11. OEM packing worthy of transportation by Air / Sea & Road be carried out.
12. Receipt Inspection / Acceptance of machine / equipment as per AMF Quality Control Department standard in presence of OEM Rep.
13. Stores should be Factory new and from current production.
14. Buyer, its customers and regulatory authorities reserve the right of access to all facilities of seller firms coupled with sub-tier sellers in applicable production of stores provided to PAC / AMF under contracts concluded by PAC Board.
15. The seller will provide following documents with supplied stores at a time of delivery:-
 - (a) Quality Certificate (03 copies)
 - (b) OEM's Certificate of Conformance (03 copies)
 - (c) Preservation certificate / record (if applicable)
 - (d) Parts catalogue, Calibration procedure / frequency, technical / operational and maintenance manuals, (03 soft and hard copies).
 - (e) Electric, Pneumatic and operational diagrams of equipment (Soft & hard copies)
 - (f) Warranty certificate
 - (g) Calibration certificate traceable to OEM National standard.
 - (h) Copies of registered software for machine / equipment.
 - (j) Qualification certificate of system and software.
16. After successful installation & commissioning of system, qualification / conformance certificate of entire system / equipment by equipment OEM conforming the full specifications of system.
17. Spares / Maintenance support for minimum **Ten years** is to be ensured by seller.
18. Standard accessories / special tools must be provided by seller with the equipment / machines free of cost. List of standard accessories / special tools must be provided after one month of signing of contract and is to be finalized by both parties.
19. Free of cost spares / consumables for preventive maintenance for duration of **05** years of contracted equipment is to be provided by seller. Preliminary lists of items must be provided within one month after signing of contract (Spares / consumables of equipment

must address the failure trends of the machine during 05 years of operations). These lists would be reviewed after production of customized equipment and will be mutually agreed by both parties during training phase of Buyer's team at OEM premises.

20. Capable of remote assistance (maintenance / troubleshooting) by OEM using telemetry. The remote assistance is to be carried out free of cost on customer request for 03 years excluding warranty period.

21. Timeline of entire project (Production time, Positioning at shipping port, Installation, commissioning time etc.) should be provided by seller, within one month after signing of contract.

22. After signing of contract, an OEM expert is also to visit Buyer's site for survey and evaluation of actual site plan for establishment of facilities as soon as convenient.

23. All special equipment required for installation, commissioning & qualification is to be arranged by OEM / seller at Buyer's facility. Lists of specialist equipment (like cranes etc.) and services from Buyer for movement, installation & commissioning of machine / equipment at Buyer's Premises is to be provided by seller within 1 to 2 months after signing of contract. All type of equipment, machinery and vehicles needed for installation, positioning, off-loading of contracted store will also be arranged by seller. However, Buyer will provide all necessary support available within PAC free of cost.

24. Civil works, MEP and external services will be responsibility of Buyer. However, based on the items quoted, the details of civil works including drawings etc. required should be mentioned by seller. Details of required civil works including foundation / layout drawings etc. must be provided by seller within 1 month after signing of contract.

25. Export license / Permit of all equipment is the responsibility of seller.

26. Equipment OEM expert has to visit Buyer's facility for the endorsement of entire facility layout plan within two months after signing of contract. OEM expert is to visit again to certify civil works required for installation of machine and equipment.

27. Compressed air requirements and any other services that are required to operate the machine must be communicated by seller to Buyer within one month after signing of contract.

28. After successful completion of installation, commissioning, integration and operationalization of machine / equipment, OEM specialist shall ascertain 100% capability by using tests in accordance with applicable standards. Test report, trends and data registration of each parameter will be furnished by seller, to qualify the machine / equipment as per design parameters. Seller will have right to take back provided tool and tooling (as applicable) after successful completion of sample parts inspections, without compromising subsequent production activities at Buyer's end.

29. Seller will provide free of cost required first fill quantities of lubricants, chemical etc. Seller will also provide details of distributors / manufactures of such lubricants and chemicals.

30. Survey / evaluation of OEMs by Buyer's representative at seller's expense after opening of Letter of Credit.

31. During unloading & unpacking of all equipment / machines, Boarding and lodging of equipment OEM team will be arranged by supplier.

Additional Notes: -

1. Quotation must be submitted on '**CIF**' basis only.
2. Payment will be made as per PAC Board procedure.
3. Technical details and brochure be provided with quotation for technical evaluation.
4. Supplier is responsible for warranty / guarantee of the items for at least one year.
5. Mode of shipment by Air / Sea.
6. Inspection / acceptance of store as per AMF Quality Control Department.
7. Store should be Factory New and from current year production.
8. OEM packing worthy for transportation by road/sea/air is to be carried out.
9. PAC/AMF, its customers and regulatory authorities reserve the right of access to all facilities of supplier firms coupled with sub-tier suppliers in applicable production of stores provided to PAC / AMF under contracts concluded by PAC Board.
10. Delivery time should not exceed 14 months from date of signing of contract.
11. Date of manufacture / production of the contracted material must not be older than one year at time of shipment.
12. The supplier will provide following documents with supplied stores at the time of delivery: -
 - (a) Quality Certificate.
 - (b) Certificate of conformance.
 - (c) Preservation certificate / record (if applicable).
 - (d) Preservation as per aviation standards
 - (d) MSDS (in case of chemicals / POL items).
 - (e) Batch No and Date of manufacturing
 - (f) TDs (where applicable) specially for hardware
 - (g) Operating / application instructions (if applicable)
 - (h) Standard packing as per aviation standard
 - (j) No in-lieu items are acceptable
 - (k) Date of manufacture for Raw Material
 - (l) Matallurgical / Material Test Report (MTR) for Raw Material.

Annexure "D"

Form PACB-002A

PAKISTAN AERONAUTICAL COMPLEX BOARD KAMRA

SCHEDULE TO TENDER

1. TENDER INQUIRY NO: PACB/751/13082018/1138/P-2
2. Time and Date of opening Tender at 1000 Hrs on 15 January, 2021. No further extension in opening date will be granted except extreme circumstances

(1)	(2)	(3)	(4)	(5)	(6)
Item No	Part No. Description of stores with specifications	Unit of issue	Qty	Unit price	Total price

Grand Total _____

Signature of Bidder
(Capacity in which signing)

Annexure "E"

Form PACB - 002B

UNDER TAKING
(Fill in and Return)

To,

**Member Commercial
Pakistan Aeronautical Complex Board
Kamra Distt Attock**

Dear Sir,

I / We hereby offer to supply to PAC Board the stores detailed in the Schedule to Tender or such portion thereof as you may specify in the contract at the prices given in Form **PACB – 002A** and further agree that this offer will remain valid up to _____ and will not be withdrawn or altered in terms of rates quoted and the condition stated therein on or before this date. I/We shall be bound by your communication of acceptance to be dispatched within the prescribed time.

I / We understood the instructions to Tenders and condition of contract as laid down in Form **PACB-10** titled "**General Conditions Governing Contract**" and thoroughly examine specification / drawing and / or patterns quoted in the Schedule to Tender and am/are fully aware to the nature of the stores required and my/our offer is to supply stores strictly in accordance with the requirements.

Witness's Signature:

Name:

N.I.C No.

Address:

Date:

Signature of Bidder:

Name:

N.I.C No.

Capacity in which Signing:

Address:

Date:

Tel: Telex/Fax

SPECIAL INSTRUCTIONS

Under mentioned information must be provided along with quotation else your quotation will be rejected: -

S.No	Description / Requirement	Remarks / Attached
1.	Delivery Period	
2.	Quotation Validity (Must be 30-06-2021)	
3.	Country of Origin	
4.	Port of Shipment	
5.	Terms of Payment (As per Para 19 of IT)	
6.	BG% (Confirmation to provide 10% BG)	
7.	Warranty / Guarantee period offered by Firm	
8.	Beneficiary Details (Completed address along with contact No)	
9.	Complete Bank address and Account Details For Payment / Letter of Credit	
10.	Previous Experience (Nature of Business and No of Years in Business)	
11.	Registration Status With PAC Board	
12.	Signing Authority (Name, Designation, Contact Details)	
13.	Address of local firm along with contact No, email etc	
14.	Manufacturer and Brand Name (If applicable)	

Annexure "G"

GENERAL CONDITIONS FOR BG

(a) To ensure timely and correct supply of stores, the firm will furnish an unconditional Bank Guarantee at the time of the signing of the contract from a schedule Bank for an amount of _____ i.e. 10% of the total value of the contract (on a judicial Stamp paper of the value of Rs 100/-). The Bank Guarantee shall be endorsed in favour of CMA (DP) who is the Account Officer specified in the contract. The CMA (DP) concerned shall have the like power of seeking encashment of the Bank Guarantee as if the same has been demanded by the purchase officer himself.

(b) The Bank Guarantees will be of following types with validity and amount has mentioned in each type

(i) **Bank Guarantee against contract performance** It will be between 10% of total value of contract excluding taxes/duties and freight/handling charges etc. It shall remain in force till 60 days beyond the Delivery Period stipulated in the contract.

(ii) **Bank Guarantee against Advance/ Down Payment** It will be equal to amount paid in advance /down payment shall remain valid till 60-days beyond the Delivery Period stipulated in the contract.

(iii) **Bank Guarantee against Warranty Period** It will be for amount of 10% of contract value excluding taxes/duties and freight /handling charges, etc. Duration of BG against Warranty Clause is variable. Normally under DP-15, it is for one year for the general type of equipment/ spares. For consumable goods, the warrantee period should also expire after 6 months or when the goods are fully consumed whichever is earlier or as per terms of contract.

(c) If the supply of store is on warranty, the supplier shall be bound to extend the validity of Bank guarantee for such further reasonable period if so required by the purchase officer to cover the warranty period.

(d) If the supplier fails to provide the Bank guarantee within 30 days after signing a contract, such failure shall constitute a breach of contract and the Director purchase shall be entitled to make other arrangements at the risk and expense of the supplier if no other BG / Bid Security of the same supplier for an equal amount is held up for final release, with the purchaser against any other completed contract(s). In the event of unsatisfactory performance or of any breach of terms of the contract, Bank guarantee shall be forfeited to the Govt. at the discretion of the purchaser. On satisfactory performance of the contract, the Bank Guarantee will be returned to the supplier by CMA (DP) Rawalpindi on receipt of instruction from the purchaser i.e. Directorates of Procurements etc.

(e) In case of FOR tenders/contract it is imperative that BGs are obtained from firms/suppliers/agents through scheduled Banks of State Bank of Pakistan so as to safeguard the interest of the state.

(f) In case of CIF tenders/contracts, Bank Guarantee is to be obtained preferably from LC opening Bank of Pakistan and through supplier, LC opening Bank abroad. In case firm does not agree to the aforesaid condition, then BG should at least, be obtained from supplier's country Bank located in Pakistan or any enlisted scheduled Bank of Pakistan in favour of LC opening Bank in Pakistan or any scheduled Bank of Pakistan, and the same will be a Bank to Bank Guarantee in favour of CMA (DP) Rawalpindi.