

Purchase Contract

(hereafter the “Contract”)

1. CONTRACTUAL PARTIES

1.1 Fyzikální ústav AV ČR, v. v. i.,

with seat: Na Slovance 1999/2, 182 21 Praha 8,
represented by: Prof. Jan Řídký, DrSc. – Director,
Registered in the register of public research institutions of the Ministry of Education, Youth and Sports
of the Czech Republic.

Bank: [REDACTED]

Account No.: [REDACTED]

ID No.: 68378271

Tax ID No.: CZ68378271

(hereinafter the “Buyer”)

and

1.2 aixACCT Systems GmbH,

with seat: Talbotstrasse 25, 52068 Aachen, Germany,
represented by: Dr. Ing. Stephan Tiedke, President,
registered in Aachen, Germany.

Bank: [REDACTED]

Account No.: IBAN [REDACTED]

ID No.: HRB7900 Local Court, Aachen

Tax ID No.: DE812882210

(hereinafter the “Seller”),

(the Buyer and the Seller are hereinafter jointly referred to as the “Parties” and each of them
individually as a “Party”).

2. FUNDAMENTAL PROVISIONS

- 2.1 The Buyer is a public research institution whose primary activity is scientific research in the area of physics, especially elementary particles physics, condensed systems, plasma and optics.
- 2.2 The Buyer wishes to acquire the subject of performance hereof (a measurement complex for piezoelectric and ferroelectric thin films) in order to investigate the electromechanical responses and strains and their correlation with electrical polarization in thin and ultrathin films of multifunctional materials.
- 2.3 The Seller was selected as the winner of a public tendering procedure announced by the Buyer in accordance with Act No. 134/2016 Coll., on awarding of Public Contracts, as amended (hereinafter the “**Act**”), for the public contract called “**Measurement complex for piezoelectric and ferroelectric thin films**” (hereinafter the “**Tendering Procedure**”).
- 2.4 The documentation necessary for the execution of the subject of performance hereof consist of
- 2.4.1 Technical specifications of the subject of performance hereof attached as **Annex No. 1** hereto.
- 2.4.2 The Seller’s bid submitted within the Tendering Procedure in its parts which describe the subject of performance in technical detail (hereinafter the “**Sellers’s Bid**”); the Sellers’s Bid forms form **Annex No. 2** to this Contract and an integral part hereof.
- In the event of a conflict between the Contract’s Annexes the technical specification / requirement of the higher level / quality shall prevail.
- 2.5 The Seller declares that it has all the professional prerequisites required for the supply of the subject of performance under this Contract, is authorised to supply the subject of performance and there exist no obstacles on the part of the Seller that would prevent the Seller from supplying the subject of this Contract to the Buyer.
- 2.6 The Seller acknowledges that the Buyer considers the Seller’s participation in the Procedure, provided that the Seller complies with all qualification requirements, as the confirmation of the fact that the Seller is capable, within the meaning of Section 5(1) of the Act No. 89/2012 Coll., the Civil Code, as amended (hereinafter the “**Civil Code**”) of providing performance under the Contract with such knowledge, diligence and care that is associated and expected of the Seller’s profession, and that the Seller’s potential performance lacking such professional care would give rise to corresponding liability on the Seller’s part. The Seller is prohibited from misusing its qualities as the expert or its economic position in order to create or exploit dependency of the weaker Party or to establish an unjustified imbalance in the mutual rights and obligation of the Parties.
- 2.7 The Seller acknowledges that the Buyer is not in connection to the subject of this Contract an entrepreneur and also that the subject of this Contract is not related to any business activities of the Buyer.
- 2.8 The Seller acknowledges that the production and delivery of the subject of performance within the specified time and of the specified quality, as shown in Annexes No. 1 and 2 of this Contract (including the delivery and invoicing), is essential for the Buyer. If the Seller fails to meet contractual requirements, it may incur damage of the Buyer.
- 2.9 The Seller declares that he accepts the “risk of changed circumstances” within the meaning of Section 1765(2) of the Civil Code.

- 2.10 The Contractual Parties declare that they shall maintain confidentiality with respect to all facts and information, which they learn in connection herewith and / or during performance hereunder, and whose disclosure could cause damage to either Party. Confidentiality provisions do not prejudice obligations on the part of the Buyer arising from valid legislation.

3. SUBJECT-MATTER OF THE CONTRACT

- 3.1 The subject of this Contract is the obligation on the part of the Seller to deliver and transfer into the Buyer's ownership:

the **Measurement complex for piezoelectric and ferroelectric thin films** (hereafter the "**Equipment**")

and the Buyer undertakes to take delivery of the Equipment and to pay to the Seller the agreed upon price.

- 3.2 The following activities form an integral part of the performance to be provided by the Seller:

- 3.2.1 Transport of the Equipment incl. all accessories specified in Annexes 1 and 2 of the Contract to the site, un-packaging and control thereof,
- 3.2.2 Installation of the Equipment including connection to installation infrastructure at the site,
- 3.2.3 Verification of the Equipment's proper functionality and adjustment at the site,
- 3.2.4 Delivery of instructions and operating and repair manuals Equipment in Czech or English language to the Buyer, in electronic and hardcopy (printed) versions,
- 3.2.5 Training of operators at the site,
- 3.2.6 Free-of-charge warranty service including service inspections,
- 3.2.7 Provision of technical support in the form of consultations.

- 3.3 The subject of performance (Equipment) is specified in detail in Annexes No. 1 and No. 2 hereto.

- 3.4 The Seller shall be liable for the Equipment and related services to be in full compliance with this Contract, its Annexes, the submitted bid and all valid legal regulation, technical and quality standards and that the Buyer will be able to use the Equipment for the defined purpose. In case of any conflict between applicable standards it is understood that the more strict standard or its part shall always apply.

- 3.5 The delivered Equipment and all its parts and accessories must be brand new and unused.

4. PERFORMANCE PERIOD

- 4.1 The Seller undertakes to deliver the Equipment to the address specified in Section 7.1 hereof within 24 weeks of the conclusion hereof.
- 4.2 The performance period shall be extended for a period during which the Seller could not perform due to obstacles on the part of the Buyer.

5. PURCHASE PRICE, INVOICING, PAYMENTS

- 5.1 The purchase price is based on the Seller's submitted bid and amount to 205.000,00 € (in words:

twohundredfivethousand) excluding VAT (hereinafter the **"Price"**). VAT shall be paid by the Buyer and settled in accordance with the valid Czech regulation.

- 5.2 The Price represents the maximum binding offer by the Seller and includes any and all performance provided by the Seller in connection with meeting the Buyer's requirements for the proper and complete delivery of the Equipment hereunder, as well as all costs that the Seller may incur in connection with the delivery, installation and handover, and including all other costs of expenses that may arise in connection with creation of an intellectual property creation and its protection.
- 5.3 The Parties agreed that the Seller shall be entitled to invoice the Price as follows:
- 5.3.1 The advance payment corresponding to 30 % of the total Price in the amount of 61.500,00 € excl. VAT after the conclusion hereof.
- 5.3.2 The Price will be invoiced after the handover protocol (hereinafter the **"Handover Protocol"**) in accordance with Section 9.4 will have been signed between the Parties. The Handover Protocol shall be attached to this invoice. This invoice shall be issued and delivered to the Buyer on the day of signing of the Handover Protocol.
- 5.3.3 In case the Buyer accepted the Equipment with any minor defect or unfinished work, the Seller shall be entitled to invoice up to 90 % of the total Price in the amount of 184.500,00 € excl. VAT after Handover Protocol in accordance with Section 9.4 will have been signed between the Parties. The remainder of the Price shall the Seller be entitled to invoice after removal / remedy of minor defects or unfinished work. The Handover Protocol or the Buyer's confirmation of removal of minor defects or unfinished work shall be attached to these invoices.
- 5.4 Invoices issued by the Seller hereunder shall contain all the requirements stipulated by Act No. 235/2004 Coll., on Value Added Tax, as amended, and the Contract number.
- 5.5 The Buyer prefers electronic invoicing, with the invoices being delivered to efaktury@fzu.cz. All issued invoices shall comply with any international treaties prohibiting double taxation, if applicable.
- 5.6 Invoices shall be payable within thirty (30) days of the date of their delivery to the Buyer. Payment of the invoiced amount means the date of its remittance to the Seller's account.
- 5.7 If an invoice is not issued in conformity with the payment terms stipulated by the Contract or if it does not comply with the requirements stipulated by law, the Buyer shall be entitled to return the invoice to the Seller as incomplete, or incorrectly issued, for correction or issue of a new invoice, as appropriate, within five (5) business days of the date of its delivery to the Buyer. In such a case, the Buyer shall not be in delay with the payment of the Price or part thereof and the Seller shall issue a corrected invoice with a new and identical maturity period commencing on the date of delivery of the corrected or newly issued invoice to the Buyer.
- 5.8 The Buyer shall be entitled to unilaterally set off against any receivables claimed by the Seller any of its payment due to:
- 5.8.1 damages caused by the Seller,
- 5.8.2 contractual penalties and other sanctions.
- 5.9 The Seller shall not be entitled to set off any of its receivables against any part of the Buyer's receivable hereunder.

6. OWNERSHIP TITLE

- 6.1 The ownership right to the Equipment shall pass to the Buyer by handover. Handover shall be understood as delivery and acceptance of the Equipment duly confirmed by Parties on the Handover Protocol.

7. PLACE OF DELIVERY OF THE EQUIPMENT

- 7.1 The place of delivery of the Equipment shall be the premises of the Department 21 of the Fyzikální ústav AV ČR, v.v.i., at Na Slovance 1999/2, Praha 8, Czech Republic, Division of Optics, room No. 327.

8. COOPERATION OF THE PARTIES

- 8.1 The Seller undertakes to notify the Buyer of any obstacles on its part, which may negatively influence proper and timely delivery of the Equipment.
- 8.2 The Parties wish to deviate from provisions of Section 2126 of the Civil Code and agree that the Seller shall not be authorized to use institutes established therein.

9. DELIVERY, INSTALLATION, HANDOVER AND ACCEPTANCE

- 9.1 The Seller shall transport the Equipment at its own cost to the place of handover. If the shipment is intact, the Buyer shall issue delivery note for the Seller.
- 9.2 The Seller shall perform and document the installation of the Equipment and launch experimental test in order to verify whether the Equipment is functional and meets the technical requirements of Annexes No. 1 and 2 hereof.
- 9.3 Handover procedure includes handover of any and all technical documentation pertaining to the Equipment, user manuals and certificate of compliance of the Equipment and all its parts and accessories with approved standards.
- 9.4 The handover procedure shall be completed by handover of the Equipment confirmed by the Handover Protocol containing specifications of all performed tests. The Handover Protocol shall contain the following mandatory information:
- 9.4.1 Information about the Seller, the Buyer and any subcontractors,
 - 9.4.2 Description of the Equipment including description of all components and serial numbers,
 - 9.4.3 Description of performed tests including achieved parameters,
 - 9.4.4 Confirmation of conducted training of operators,
 - 9.4.5 List of technical documentation including the manuals,
 - 9.4.6 Eventually reservation of the Buyer regarding minor defects and unfinished work including the manner and deadline for their removal,
 - 9.4.7 Date of signature of the Equipment Handover Protocol.
- 9.5 Handover of the Equipment does not release the Seller from liability for damage caused by product defects.

- 9.6 The Buyer shall not be obliged to accept the Equipment, which would show defects or unfinished work and which would otherwise not form a barrier, on their own or in connection with other defects, to using the Equipment. In this case, the Buyer shall issue a record containing the reason for its refusal to accept the Equipment.
- 9.7 Should the Buyer not exercise its right not to accept the Equipment with defects or unfinished work, the Seller and the Buyer shall list these defects or unfinished work in the Handover Protocol, including the manner and deadline for their removal. Should the Parties not be able to agree in the Handover Protocol on the deadline for removal of the defects, it shall be understood that any defects shall be removed / rectified within 48 hours from the handover and acceptance of the Equipment.

10. TECHNICAL ASSISTANCE - CONSULTATIONS

- 10.1 The Seller shall be obliged to provide to the Buyer free-of-charge consultations and technical assistance relating to the subject of performance hereof during the entire term of the warranty period. The Seller undertakes to provide to the Buyer consultations and technical assistance relating to the subject of performance hereof also after the warranty period expires.

11. REPRESENTATIVES, NOTICES:

- 11.1 The Seller authorized the following representatives to communicate with the Buyer in all matters relating to the Equipment delivery:

e-mail: [REDACTED]

tel. [REDACTED]

- 11.2 The Buyer authorized the following representatives to communicate with the Seller:

e-mail: [REDACTED]

tel. [REDACTED]

- 11.3 All notifications to be made between the Parties hereunder must be made out in writing and delivered to the other Party by hand (with confirmed receipt) or by registered post (to the Buyer's or Seller's address), or in some other form of registered post or electronic delivery incorporating electronic signature (qualified certificate) to [REDACTED] in case of the Buyer and to [REDACTED] in case of the Seller.

- 11.4 In all technical and expert matters (discussions on the Equipment testing and demonstration, notification of the need to provide warranty or post-warranty service etc.) electronic communication between technical representatives of the Parties will be acceptable using e-mail addresses defined in Sections 11.1 and 11.2.

12. TERMINATION

- 12.1 This Contract may be terminated early by agreement of the Parties or withdrawal from the Contract on the grounds stipulated by law or in the Contract.

- 12.2 The Buyer is entitled to withdraw from the Contract without any penalty from Seller in any of the following events:

12.2.1 The Seller fails to meet the deadline pursuant to Section 4.1 hereof.

12.2.2 Technical parameters or other conditions required in the technical specification defined in Annex No. 1 and 2 hereto and in the relevant valid technical standards will not be achieved by the Equipment at handover,

12.2.3 Facts emerge bearing evidence that the Seller will not be able to deliver and handover the Equipment.

12.2.4 The Seller will not meet the qualification criteria within the Tendering Procedure.

12.3 The Seller is entitled to withdraw from the Contract in the event of the Buyer being in default with the payment for more than 2 months with the exception of the cases when the Buyer refused invoice due to defect on the delivered Equipment or due to breach of the Contract by the Seller.

12.4 Withdrawal from the Contract becomes effective on the day the written notification to that effect is delivered to the other Party. The Party which had received performance from the other Party prior to such withdrawal shall duly return such performance.

13. INSURANCE

13.1 The Seller undertakes to insure the Equipment against all risks, in the amount of the Price of the Equipment for the entire period commencing when transport of the Equipment starts until duly handed over to the Buyer. In case of breach of this obligation, the Seller shall be liable to the Buyer for any damage that may arise.

13.2 The Seller is liable for the damage that he has caused. The Seller is also liable for damage caused by third parties undertaken to carry out performance or its part under this Contract.

14. WARRANTY TERMS

14.1 The Seller shall provide warranty for the quality of the Equipment for a period of 12 months. The warranty term shall commence on the day following the date of signing of the confirmation of removal of minor defects or unfinished work or on the day following the date of signing of the Handover Protocol pursuant to Section 9.4 hereof in case the Equipment was handed over without any minor defects or unfinished work. The warranty does not cover consumable things.

14.2 The Seller undertakes to provide free-of-charge service and regular service inspections in the extent defined by the manufacturer for the entire warranty term hereunder including repairs, supply of spare parts and transport and costs associated with employing a service technician.

14.3 Should the Buyer discover a defect, he shall notify the Seller to rectify such defect using the email address [REDACTED]. The Seller shall be obliged to respond to the notice of defect within 24 hours from notification and to send a technician for its remedy within 7 working days from notification.

14.4 The Seller shall be obliged to rectify any claimed defects on-site within 14 working days from receipt of the Buyer's notification. In cases of unusual defects, the Seller shall be obliged to rectify the defect in the period corresponding to the nature of the defect and to define the deadline for the handover of the rectified Equipment.

14.5 Any and all costs associated with defect rectification / repair including transport and travel expenses shall be always borne by the Seller.

14.6 The repaired Equipment shall be handed over by the Seller to the Buyer on the basis of a protocol

confirming removal of the defect (hereinafter the “**Repair Protocol**”) containing confirmations of both Parties that the Equipment was duly repaired and is defect-free.

- 14.7 The repaired portion of the Equipment shall be subject to a new warranty term in accordance with Section 14.1, which commences to run on the day following the date when the Repair Protocol was executed.
- 14.8 Should the Equipment suffer from defects which make it demonstrably unusable for a period exceeding 60 days (defect period) during any six (or less) consecutive months during the warranty term, the Seller shall be obliged to rectify such defect by delivering new defect-free Equipment in accordance with Section 2106(1)(a) of the Civil Code within 60 days from the date the Seller was called upon to deliver the new Equipment. The Equipment is demonstrably unusable, when the technical parameters or other conditions required in the technical specification defined in Annex No. 1 and 2 hereto and in the relevant valid technical standards are not met.

15. CONTRACTUAL PENALTIES

- 15.1 The Buyer shall have the right to a penalty in the amount of 0.1 % of the Price for each commenced day of delay with the performance pursuant to Section 4.1 hereof.
- 15.2 The Buyer shall have the right to a penalty in the amount of 0.1 % of the Price for each commenced day of delay with rectifying of claimed defects.
- 15.3 The Buyer shall be entitled to claim a contractual penalty against the Seller in the amount of 30 % of the Price, in case he will subsequently take advantage of the opportunity to withdraw from the Contract pursuant to Section 12.2.1 and 12.2.2.
- 15.4 In case of default in payment of any due receivables (monetary debt) under the Contract, the defaulting Buyer or Seller (the debtor) shall be obliged to pay a contractual penalty at the statutory rate for each commenced day of delay with the payment.
- 15.5 Contractual penalties are payable within 30 days of notification demanding payment thereof.
- 15.6 Payment of the contractual penalty does not prejudice the rights of the Parties to claim damages; the Parties exclude use of Section 2050 of the Civil Code.

16. DISPUTES

- 16.1 Any and all disputes arising out of this Contract or the legal relationships connected with the Contract shall be resolved by the Parties by mutual negotiations. In the event that any dispute cannot be resolved by negotiations within sixty (60) days, the dispute shall be resolved by the competent court in the Czech Republic based on application of any of the Parties; the court having jurisdiction will be the court where the seat of the Buyer is located. Disputes shall be resolved exclusively by the law of the Czech Republic.

17. FINAL PROVISIONS

- 17.1 This Contract represents the entire agreement between the Buyer and the Seller. The relationships between the Parties not regulated in this Contract shall be governed by the Civil Code.
- 17.2 In the event that any of the provisions of this Contract shall later be shown or determined to be invalid, ineffective or unenforceable, then such invalidity, ineffectiveness or unenforceability shall not cause invalidity, ineffectiveness or unenforceability of the Contract as a whole. In such event the Parties

undertake without undue delay to subsequently clarify any such provision or replace after mutual agreement such invalid, ineffective or unenforceable provision of the Contract by a new provision, that in the extent permitted by the laws and regulations of the Czech Republic, relates as closely as possible to the intentions of the Parties to the Contract at the time of creation hereof.

- 17.3 This Contract becomes valid and effective as of the day of its conclusion by the authorised persons of both Parties.
- 17.4 This Contract may be changed or supplemented solely by means of numbered amendments in writing, furnished with the details of time and place and signed by duly authorised representatives of the Parties. The Parties expressly reject, within the bounds of Section 564 of the Civil Code, modifications to the Contract in any other manner.
- 17.5 This Contract is drawn up in three (3) counterparts, each of which is deemed to be the original. The Seller shall receive two (2) counterparts, the Buyer shall receive one (1) counterpart.
- 17.6 The Parties expressly agree that the Contract as a whole, including all attachments and data on the Parties, subject of the Contract, numerical designation of this Contract, the Price and the date of the Contract conclusion, will be published in accordance with Act No. 340/2015 Coll. on special conditions for the effectiveness of some contracts, publication of these contracts and Contract Register, as amended (hereinafter the "**CRA**"). The Parties hereby declare that all information contained in the Contract and its Annexes are not considered trade secrets under § 504 of the Civil Code and grant permission for their use and disclosure without setting any additional conditions.
- 17.7 The Parties agree that the Buyer shall ensure the publication of the Contract in the Contract Register in accordance with CRA.
- 17.8 The following Annexes form an integral part of the Contract:
- Annex No. 1: Technical specification on the subject of performance
- Annex No. 2: Seller's bid in respect of part which technically describes the device
- 17.9 The Parties, manifesting their consent with the entire contents of this Contract, attach their signature hereunder.

In Prague on 3. 1. 2017

In Aachen, Germany on December 19th, 2016

For the Buyer:

For the Seller:

prof. Jan Řídký, DrSc.
Director

Dr. Ing. Stephan Tiedke
President aixACCT Systems

Annex No. 1**Technical specification on the subject of performance**

Description and minimum specification of the Equipment as defined by the Buyer	Description and specification of the Equipment offered by the Seller	Complies YES/NO
The Equipment ensures interferometric measurements of effective piezoelectric coefficient and electric-field induced strain in thin films and membranes.	The system uses a double laser interferometer for thin films and a single beam laser for membrane measurements. Both using same optical lens system	YES
The Equipment ensures simultaneous measurements of electro/mechanical and ferroelectric characteristics of the thin/film /membrane samples.	System applies voltage (large or small signal) and measures current and displacement response simultaneously.	YES
Double-beam interferometer system should be used for cancelling out substrate bending for thin/film samples on solid substrates.	This is ensured by measuring from top and bottom side	YES
Single-beam interferometer system should be used for electromechanical characterization of membranes.	Single beam laser system offers a large measurement range up to 2mm. Resolution in smallest range is 0.3 nm. This ensures high accuracy and repeatability.	YES
Minimum size of working area of the sample: 0.1 mm to maximum of 25 mm	Laser spot is in the range of 50µm which ensures the measurement of 100µm electrodes	YES
Resolution for detected mechanical displacement should be at least 1 pm	This can be proofed by small signal measurement on x-cut quartz	YES
Damping of vibrations and acoustic noise should be ensured for cancelling out external mechanical noise.	The system is equipped with acoustic damping chamber and active vibration damping system	YES
Movable X-Y stage with at least 4 electrical probes should enable accurate positioning and electrical contacting the samples.	Manual X-V positioning system is installed. The positioning system is equipped with three clamps to fix the sample and two electrical probes for contacting. The temperature stage has even four probes.	YES
Ferroelectric characterization of thin films should include measurements of static and dynamic polarization, capacitance, leakage current, fatigue, retention, and nonlinearity.	All measurement types are included in the software	YES
DC biasing voltage: 0-25 V	With amplifier up to 25V	YES
AC voltage: 1 mV – 25 V, frequency: 1 Hz – 150 kHz	Max. Hysteresis frequency: 5kHz Max. Fatigue frequency: 250kHz Voltages up to 25V	YES
Temperature range: -100oC - +300oC (stability better than 1 °C)	Temperature stage allows automated measurements within the desired temperature range	YES

Data acquisition and processing is computer-controlled using software compatible with Windows system	The TF2000 is an industrial PC running Windows7 and control the complete setup by our measurement software	YES
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Annex No. 2**The Seller's bid in the extent it describes technical parameters of the Equipment**

Fyzikální ústav AV CR, v.v.i.
 Na Slovance 1999/2, 182 21 Praha 8
 Prof. Jan Rídký, DrSc., Director


Quote CZ20161212_IP_aixDBLI 12.12.2016

Public Contract name: "Measurement complex for piezoelectric and ferroelectric thin films"

Dear Prof. Jan Rídký,

Please find enclosed the quotation for Measurement complex for piezoelectric and ferroelectric thin films :

Code	Description	Qty.	Pric.e
aixDBLI_1	<p>Double-Beam Laser Interferometer for 1inch wafer</p> <p>delivered with</p> <ul style="list-style-type: none"> • Vibration damping optical table • Chamber for acoustic vibration damping and thermal isolation • Optical components (all necessary lenses, wave plates, beam splitters, mirrors, etc. and optical mounts) • Intensity stabilized laser • Piezo mirror with amplifier and controller • Photo detector and preamplifier • Manual 2-axis stage for 1 inch wafer • One camera for positioning • 2 Positioner probes for sample contacting • 19" rack for electrical components with monitor • TF Analyzer 2000E measurement system and FE probe head (details listed below) with motor control • Power Management Unit • Piezo software option for TF Analyzer 2000 • Lock-In software option for TF Analyzer 2000 	1	██████████

	<ul style="list-style-type: none"> • Script Control to perform automatically a certain number of measurements based on specific parameter sets • Operational Manual (English) • Laser safety glasses • Installation and training (2 days, one engineer) <p>Using existing TF2000</p> <ul style="list-style-type: none"> • TF Analyzer 2000 E and FE probe head details • IBM PC compatible Pentium • Windows 7 (US) operating system • USB ports • DVD/CD writer • LAN connection • Measurement Software • Hysteresis and strain measurement • C(V) and d33 measurement • fatigue measurement • manual waveform editor and others • Facility requirements: • Low vibration site <p>Power supply 110/230V</p>		
Temp DBLI	<p>1 inch sample holder for temperature dependent measurements in DBLI.</p> <p>Temperature range -100°C ->300°C</p> <p>special mounting adapter for aixDBLI</p> <p>positioning stage</p> <p>Switchbox for switching between positioners of manual 1 inch system and internal positioners for 1 inch temperature system.</p> <p>Use of purge gas possible</p>	1	

Mod_SB_option	<p>Single-Beam extension for aixDBLI</p> <p>additional integrated single-beam laser- interferometer for high deflection measurements on membranes</p> <p>delivered with</p> <ul style="list-style-type: none"> • Controller • Displacement demodulator • Optical probe head single mode • Probehead is mounted in double beam interferometer unit <p>Specification</p> <p>Measurement Range: > 2 mm</p> <p>Displacement measurement resolution: 0,3 nm</p> <p>Wavelength: 632,8 nm</p> <p>Frequency Stability of the laser after warm up: 10^{-7}</p> <p>Laser warm up time: 1 min</p> <p>Displacement Velocity: 600 mm/s</p>	1	██████████
Installation	Installation and training (2 days with one engineer)	1	██████████

Subtotal in EUR	██████████
██████████	██████████
Shipping	██████████
Total	205.000,00

All positions excluding V.A.T., duties and taxes

Terms of delivery: DAP Fyzikální ústav AV ČR, v.v.i., Praha 8

Warranty: 1 year on all products

Validity: Three months

Technical parameters of the aixACCT Equipment:

TF Analyzer 2000E BASIC UNIT

Specifications:

1. CPU: PentIntel i3, min 3GHz
2. RAM: 4GB
3. HD: min. 160GB
4. USB Interface (front and rear panel)
5. Keyboard
6. Mouse + mouse pad
7. Power supply: 100-230V, 50Hz, 6A
8. complete set of cables: Power cable, 2 BNC, 2 Lemos
9. Windows 7 operating system
10. Manual (English)
11. 24/48 bit digital I/O-card
12. optional IEEE 488.2 board
13. Analog input card: maximum sample rate amounts to 20 MHz and the resolution is 16 bit at a voltage range of $\pm 10V$.
14. Four input channels for voltages from -10V to 10V (Voltage, Current, Displacement, Aux)
15. Monitor 24" color TFT with 1920x 1080 pixel resolution
16. Arbitrary waveform generator: The vertical resolution amounts to 16 bit at 10Vpp and the sample frequency is up to 2 MHz
17. Separate low noise power supplies SV, $\pm 1SV$, $\pm 30V$ for the Probe Head and additional circuit parts to handle the different Probe Heads

FE-Module enhanced and Hyster software

Specifications:

1. FE Probe Head with high voltage protection circuit
current ranges: 1A, 100mA, 10mA, 1mA, 100 μ A, 10 μ A, 1 μ A, 100nA, 10nA, 1nA, 100pA, 10pA
accuracy better 1 % 1nA to 10mA ranges, else better 5%
2. Maximum Capacitive Load: 10pF, 1nF, 1 μ F depending on the amplifier in use and the test procedure
3. Peak Output Current: 1A
4. Voltage range: $\pm 25V$ built in amplifier, up to ± 10 kV based on external high voltage amplifier
5. Hysteresis measurement (DHM), with piezo option also piezo measurement (PZM):
 - 1) Frequency range 1 mHz- up to 5kHz and any frequency in between for FE module; for high voltage amplifier, the amplifier and capacitive load will determine maximum frequency
 - 2) Number of averaged loops of Dynamic Hysteresis Measurement: 1-1000
 - 3) Arbitrary waveform for dynamic hysteresis measurement, triangle, sine wave
 - 4) Accuracy of polarization measurement: down to 10fC
 - 5) Simultaneous acquisition of displacement (PZM only), frequency range sensor dependent

6. Fatigue measurement (FM):
 - 1) Up to 300kHz, test condition 6 Vpp, 10 pF capacitive load (no acquisition)
 - 2) Number of pulses: 1 to 10
 - 3) Number of measurements performed within one decade of fatigue pulses: 1 to 10
 - 4) Type for the intermittent measurements: DHM, PM, CVM, LM, PZM
 7. Retention measurement (RM):
 - 1) Frequency/Pulse width: see PM
 - 2) Max. Retention time: 1 to 10
 - 3) Data points per Decade: 1 to 10
 8. Imprint measurement (IM):
 - 1) Frequency: see DHM
 - 2) Total time: 1 to 10
 - 3) Data points per Decade: 1 to 10
 9. Leakage measurement: IpA to 100mA
 - 1) Staircase measurement, step duration 2s - 100s
 10. Pulse measurement (PM)
 - 1) Write Pulse width down to 1 μ s (no acquisition)
 - 2) Read pulse width down to 50 μ s
 - 3) Set parameters rise time, pulse duration, fall time
 - 4) Delay of read pulse: 1 to 100s
 11. Capacitance vs. Voltage Measurement (CVM):
 - 1) Base voltage range: up to ± 25 V (less small signal)
 - 2) Frequency of small signal: 1Hz to SkHz
 - 3) Triangular bias or step bias waveform
 - 4) Lock-In data processing for increased resolution
 - 5) simultaneous acquisition of d33 with piezo option
 13. Manual Waveform Editor allows to create user defined waveforms
 14. Option:
Script control to perform automatically various measurements consecutively
 15. Data analysis software included in the main software of the whole set up
- Data Display: polarization vs. voltage P(V)
 current vs. voltage I(V)
 displacement vs. voltage
 voltage, current, polarization vs. time
 polarization, displacement vs. time
 d33, C vs. voltage
 P(V) vs. temperature
 d33 vs. temperature
 C(V) vs temperature

aixDBLI - Double Beam Laser Interferometer **for thin films**

1. Measurement Range: ± 25 nm
2. Resolution: ≤ 1 picometer
3. Wavelength: 632,8 nm

4. Frequency stabilized and amplitude stabilized laser
5. Frequency ranges:
 - 50 Hz - 5 kHz (for large signal polarization and displacement measurements)
 - 50 Hz - 5 kHz (for small signal CV and piezocoefficient d33,f measurements)
6. Sample size: up to 25 mm x 25 mm (minimum 10 mm x 10 mm) substrate size
7. DBLI Chamber: WxDxH 850x1100x1080 mm
Weight: approx.300kg

Single Beam Laser Interferometer **for Membranes**

1. Measurement Range: $\pm 0.6 \mu\text{m}$ to $\pm 2.5 \text{ mm}$
2. Spot size: approx.50 μm
3. Resolution: $\sim 0.3 \text{ nm}$
4. Frequency range 10 mHz - 150 kHz (But, maximum measurement frequency is restricted either by maximum frequency either of the TF Analyzer 2000 E or the high voltage amplifier, whichever is lower)

Specification of Temperature stage:

Stage:

Maximum Temperature: 600°C
Minimum Temperature: -196°C
Maximum heating rate: 150°C/min
Resolution: 0,1°C
Stability: <1 °C
Repeatability <1 °C
Aperture hole: 2mm
Max Sample size 12x12mm

For any further questions do not hesitate to contact us.

Yours sincerely,

