



PURCHASE CONTRACT

This purchase contract ("**Contract**") was concluded pursuant to Sec. 2079 *et seq.* of the Act No. 89/2012 Coll., Civil Code ("**Civil Code**"), on the day, month and year stated below by and between:

(1) **Institute of Physics of the Czech Academy of Sciences, public research institution**

with its registered office at: Na Slovance 2, Praha 8, PSČ: 182 21

registration No.: 68378271

enrolled in the Register of public research institutions kept by MEYS

represented by: RNDr. Michael Prouza, PhD. – director

("Client"); and

(2) **ATEKO a.s.**

with its registered office at: Resslova 956/13, 500 02 Hradec Králové

registration No.: 60108991

enrolled in the commercial register kept by Krajský soud Hradec Králové, item B 1035

represented by: Ing. Kryštof Kolářek, vicechairman of the board

Ing. Tomáš Nosek, member of the board

("Supplier").

(The Client and the Supplier are hereinafter jointly referred to as "**Parties**" and individually as "**Party**".)

WHEREAS

- (A) The Client is a public contracting authority and the beneficiary of grants from the Ministry of Education, Youth and Sports of the Czech Republic for different projects aimed on building and further development of international research laser facility ELI Beamlines ("**Projects**"), within the Operational Programme Research, Development and Education (hereinafter the "**Operational Program**").
- (B) For the successful realization of the Projects, it is necessary to purchase the Object of Purchase (as defined below) in accordance with the Act No. 134/2016 Coll., on public procurement, as amended, and with binding rules of the Operational Program.
- (C) The Supplier's bid for the public contract titled "Cooling System based on Brayton cycle TP20_121," whose purpose was to procure the Object of Purchase (hereinafter the "**Bid**" and "**Public Contract**"), was selected by the Client as the most suitable one.

IT WAS AGREED AS FOLLOWS:



1. **BASIC PROVISIONS**

- 1.1 Under this Contract, the Supplier shall design, manufacture, deliver, install, integrate and verify a cooling system based on Brayton cycle as the system is specified and under the conditions set forth herein, mainly in Annex 1 (Technical Specification – RSD) to this Contract (“Object of Purchase”), and shall transfer to the Client ownership right to the Object of Purchase. The Client shall take over the Object of Purchase and shall pay the Supplier the Purchase Price (as defined below).
- 1.2 If for the fulfilment of the requirements of the Client under this Contract or for the proper operation of the Object of Purchase are necessary other deliveries and activities not expressly mentioned in this Contract, the Supplier shall procure such deliveries or shall carry out such activities at its own expense without any effect on the Purchase Price.
- 1.3 The Object of Purchase and its components and parts shall be delivered new (i.e. not remanufactured).

2. **PARTIES’ DUTIES**

- 2.1 The Supplier shall ensure that the Object of Purchase complies with all technical specifications and performance requirements stipulated in this Contract. The Supplier is responsible that the Object of Purchase and/or its subsystems meet valid safety, technical and quality Czech and EU standards.
- 2.2 During the performance of this Contract, the Supplier proceeds independently, unless hereunder stated otherwise. If the Supplier receives instructions from the Client, the Supplier shall follow such instructions unless those are in contradiction to the applicable law or to this Contract. If the Supplier finds out or should have found out by exercising professional care that the instructions are inappropriate or contradicting valid law, Czech or EU standards or are in contradiction to this Contract, then the Supplier must notify the Client.
- 2.3 If the Client reserves an approval of any technical solution of the Supplier under this Contract, such approval cannot be refused without substantiated technical reasons.
- 2.4 Where this Contract requires the Supplier to submit any document or fact for Client’s assessment or approval, the Client shall provide its statement within 10 days.

The Client shall enable (including provision of all reasonably expectable cooperation) that the Supplier can start installation of the Object of Purchase within 30 days after delivery of the Object of Purchase to the ELI Beamlines site.

Should the Client not meet the deadlines of this Art. 2.4 hereof, the delivery deadline according to Art. 7.2 hereof extends by the number of days of the delay of the Client.

- 2.5 Where a duty of the Supplier under this Contract is based on the best efforts basis, the Supplier shall execute efforts to reach such requirement/ specification corresponding to the due professional care and to the status of the Supplier as highly experienced and properly skilled professional in the given technical field. If the requirement/ specification



based on the best effort basis is not met by the Supplier, the Supplier shall describe and document the level of efforts executed.

3. **CLIENT'S CONFIDENTIAL INFORMATION**

- 3.1 For the purposes of detailed design and manufacture of the Object of Purchase, the Client may provide the Contractor with conceptual drawings, 3D model, schemes and other materials related to the Object of Purchase, which are of confidential nature and which will be labelled as "Confidential and Proprietary" ("**Client's Confidential Information**"). The Supplier acknowledges that the Client's Confidential Information is of proprietary and confidential nature and that such information might be protected under laws that cover industrial or other intellectual property and that disclosure of such information may cause damage or other harm to the Client and/or to third persons. The Supplier may use the Client's Confidential Information only for the purposes of the fulfilment of this Contract, i.e. for the manufacture and delivery of the Object of Purchase for the Client.
- 3.2 The Supplier must ensure that Client's Confidential Information will be accessed only by persons (e.g. employees and/or subcontractors) that need such access for the fulfilment of this Contract. The Supplier shall take all reasonable steps to ensure that the Client's Confidential Information will not be accessed by any third party and/or by any unauthorized person.
- 3.3 Should the Supplier breach any of his duties stipulated in this Article 3, the Client is entitled to charge him with contractual penalty in the amount of 4 000 EUR for each case of such breach.

4. **STUDY, DESIGN AND MANUFACTURE OF THE OBJECT OF PURCHASE**

- 4.1 The Supplier shall elaborate a technical study of the Object of Purchase compliant with the requirements of this Contract. Any deviations from the Description of the proposed device (Object of Purchase) included in the Bid of the Supplier submitted for the Public Contract shall be explained in the study and approved by the Client.

The study shall provide a detailed technical description of the entire proposed Object of Purchase including a detailed schematic diagram of the cooling circuit (intended number of turbo circulators, heat exchangers, filters, probes, etc.). The ability of the Object of Purchase to reach the requested parameters at MLA (specified in Annex 1 hereto, REQ-030588/A) must be supported by an analysis of the calculated flow, pressure, temperature of the Helium in the MLA and the cooling capacity at the MLA. The electrical power consumption shall also be calculated. To understand the behavior of the system for future use, the same evaluation shall be done for a flow rate of 200 g/s and MLA pressure drop specified in Annex 1 hereto, REQ-030594/A. The study shall also outline the Supplier's plan to ensure high cleanliness in the primary loop. The final dimensions of the Object of Purchase should be given in the study.

- 4.2 The study shall be submitted to the Client for approval prior to proceeding to elaboration of the production (manufacture) drawings/ documents. If the Client suggests



modifications to the study (to the design of the Object of Purchase), the Supplier shall incorporate such modifications or shall explain in writing their technical incorrectness or inappropriateness. By proposing the modifications or by approval of the study the Client assumes no responsibility for non-compliance of the Object of Purchase with this Contract.

4.3 The final Object of Purchase must comply with the study. Any later modifications of the already approved study by the Supplier are subject to the prior written approval of the Client.

5. LICENCE OF THE SUPPLIER

5.1 If any part of the Object of Purchase forms an object protected by intellectual property rights laws and/or forms related know-how, the Supplier grants to the Client a right to use such part of the Object of Purchase, including related documentation ("**Supplier's Proprietary Information**") in the original or modified version ("**Licence**") for the purposes listed in Art. 5.3.

5.2 The License is granted:

- a) royalty free worldwide;
- b) for the period of validity of the rights to each of the licensed intellectual property objects, which applies adequately to the related know-how.

5.3 The Licence comprises the right to use the Object of Purchase for research and development activities within operation of the International Laser Research Facility ELI Beamlines including necessary modifications to the Object of Purchase including software and limited handover of necessary documentation upon signature of a non-disclosure agreement to third parties for the purposes of operation, servicing and further development of the Object of Purchase.

5.4 This granted License also includes the Supplier's permission to the Client to modify and/or alter and/or otherwise change any part of the Supplier's Proprietary Information; either by itself or with assistance of any third party. This permission shall apply *mutatis mutandis* to the Client's entitlement to combine and/or merge any part of the Supplier's Proprietary Information with any other work; either by itself or with assistance of any third party.

5.5 The Client is entitled to transfer/ assign the License on any third party if the ownership or operation of International Laser Research Facility ELI Beamlines shall pass on such third party. The Client shall inform the Supplier within undue delay thereabout. The Client is entitled to grant wholly or partially the License to any third party (sublicense) if the right to use the Object of Purchase is granted to such third party.

5.6 The Client is not required to use the Licence, unless the maintaining of the right depends on the exercise thereof.

5.7 The Supplier hereby represents and warrants to the Client that:



- a) is entitled to use and enforce all intellectual property rights to the Supplier's Proprietary Information, in order to be ensured that the Client may use the Supplier's Proprietary Information properly and without any interference; and
 - b) is entitled to grant the License to the Client in the extent specified in this Contract.
- 5.8 If the Licence is endangered or infringed, the Client shall inform the Supplier accordingly without undue delay after ascertaining this fact. The Supplier shall provide the Client with cooperation to ensure the legal protection of the Licence. It is hereby explicitly agreed that the Supplier shall give the Client consent to enforce the industrial property rights and/or related know-how rights covered by the License.

6. MONITORING AND VERIFICATION

- 6.1 The Supplier undertakes to enable the Client exercising inspections of the performance of this Contract. For this purpose, the Supplier shall provide to the Client all information regarding the status of the design and manufacture of the Object of Purchase at the request of the Client, anytime during performance of this Contract.
- 6.2 The Supplier shall provide to the Client all cooperation, assistance and information that the Client needs for the purposes of full evaluation of the status of the design or manufacture of the Object of Purchase.
- 6.3 If the Client, especially during an inspection, ascertains any breach of the Supplier's duties under this Contract, the Client shall notify in written the Supplier of such breaches. The Supplier has to respond to such notification and suggest, in an appropriate detail, remedying the deficiencies, within fourteen (14) calendar days, unless the Parties agree otherwise.
- 6.4 The Supplier shall elaborate and submit to the Client together with the technical study (Art. 4.1 above) a Quality and Verification Plan (hereinafter the "**Quality Plan**") addressing all technical requirements stipulated by this Contract. The Quality Plan shall list all tests and verification activities to be carried out both in the premises of the Supplier (on-shop tests) and of the Client (ELI Beamlines). By approval of the Client, the Quality Plan becomes binding for the Supplier. Any further modifications can be made only in writing approved by both Parties. The Supplier shall invite the Client at least 10 calendar days in advance to participate in all relevant activities of the Quality Plan.

On-shop tests shall prove also the following: the motors should be shown to operate with the required power for system operation according to the technical study.

Tests in ELI Beamlines shall include also the following Project Completion Test: Demonstration of cooling to 120K with a He flow of 160 g/s and continuous operation at 120K +/- 0.5 for 6 hours (flow and temperature measured immediately before the head) with periodic diode pumping of laser medium with 2kW average optical power.



7. THE PLACE AND TIME OF DELIVERY

- 7.1 The place of delivery shall be the International Research Laser Facility ELI-Beamlines located at Za Radnicí 835, Dolní Břežany (district Prague-west), ZIP 252 41, the Czech Republic (hereinafter also “**ELI Beamlines**” or “**ELI Beamlines site**”).
- 7.2 The Supplier shall complete the performance under this Contract, i.e. complete the Object of Purchase including all related activities (mainly installation, integration and verification) and requested documentation, within **16 months** from conclusion hereof.
- 7.3 The Supplier shall within one month from conclusion of this Contract elaborate a tentative time schedule of the complete performance under this Contract. The schedule shall capture all substantial activities needed to complete the delivery hereunder duly and in time, mainly elaboration of the technical study and of the Quality plan, procurement of needed material and major components, own production and on-shop testing, delivery, installation, integration and verification (including testing in ELI Beamlines). The schedule must be detailed enough to prove the feasibility of the time plan of the Supplier.

The Supplier shall perform this Contract in compliance with the time schedule. Any delay in comparison with the time schedule longer than one month must be reported by the Supplier together with explanation what has caused the delay and what measures are to be taken to remove the delay.

Should the Supplier not report the delay or its causes in line with the paragraph above or should the Supplier not present measures to remove the delay or should the Supplier be more than 3 months behind the schedule and not taking reasonably available measures to remove or minimize the delay, such situation shall be considered a substantial breach of this Contract under Art. 13.1.a) hereof.

8. PRICE AND PAYMENT TERMS

- 8.1 The total purchase price for the Object of Purchase is **15 668 000 Czech Crowns (CZK)** without value added tax (“**VAT**”)(“**Purchase Price**”). The Purchase Price represents the Supplier’s binding maximum price. VAT shall be paid on top of all payments made hereunder according to valid legislation.
- 8.2 The Purchase Price cannot be exceeded.
- 8.3 The Purchase Price includes all costs and expenses of the Supplier related to the performance of this Contract. The Purchase Price includes especially all expenses related to the design, manufacture, assembly, delivery, installation, integration and verification of the Object of Purchase or its parts, costs of the Licence, insurance, warranty service and any other costs and expenses connected with the performance of this Contract.
- 8.4 The Purchase Price may be changed only in accordance with the Act No. 134/2016 Coll., on public procurement, as amended.
- 8.5 The Supplier is entitled to invoice the Purchase Price in the following instalments:



- a) 20% of the Purchase Price upon approval of the technical study of the Object of Purchase and of the Quality Plan by the Client,
 - b) 50% of the Purchase Price upon finalization of on-shop tests in accordance with the Quality Plan,
 - c) 20% of the Purchase Price upon delivery and installation of the Object of Purchase in the ELI Beamlines centre,
 - d) 10% of the Purchase Price upon final acceptance of the Object of Purchase by the Client.
- 8.6 If the Supplier performs the subject-matter hereof duly in line herewith without substantial breaches of the Contract and if there are no obvious reasons for doubts on continuing of due performance hereof by the Supplier taking into account the overall approach of the Supplier to the Contract performance (presented particularly by due preparation for performance of activities that are to come) and if it might ease further performance hereof by the Supplier, the Client reserves the right fully on its discretion to provide the Supplier with the Purchase Price partial instalments (payments) or any parts of them sooner than scheduled hereunder or in higher amount than stipulated herein (i.e. any payments might be increased with proportional decreasing of future payments). If the conditions stipulated above are met, the Client is entitled to modify the payment schedule anyhow in favour of the Supplier and to provide it with any prepayment.
- 8.7 The Purchase Price (individual instalments) shall be paid on the basis of tax documents – invoices, to the account of the Supplier designated in the invoice. The Supplier is entitled to issue any invoice no sooner than on the moment any deliverable is duly completed and the completion confirmed by the Client.
- 8.8 The Client shall execute payments on the basis of duly issued invoices within 30 days from their receipt. If the Supplier stipulates any shorter due period in an invoice such different due period shall not be deemed relevant and the due period stipulated herein prevails. Any invoice shall be considered to be paid for on the day when the invoiced amount is deducted from the Client's account on behalf of the Supplier's account.
- The invoices shall be sent to the Client solely in the electronic form to the address efaktury@fzu.cz
- 8.9 The invoice issued by the Supplier as a tax document must contain all information required by the applicable laws of the Czech Republic. Invoices issued by the Supplier in accordance with this Contract shall contain in particular following information:
- a) name and registered office of the Client,
 - b) tax identification number of the Client,
 - c) name and registered office of the Supplier,
 - d) tax identification number of the Supplier,
 - e) registration number of the tax document,



- f) Quantity (extent) and nature of performance supplied or services rendered (including the reference to this Contract),
- g) the date of issue of the tax document,
- h) the date of the supply of goods or services or the date of the payment on account, whichever comes sooner, in so far as they differ from the date of issue of the tax document – invoice,
- i) due date,
- j) the price,
- k) registration number of this Contract, which the Client shall communicate to the Supplier based on Supplier's request before the issuance of the invoice,
- l) a declaration that the invoiced performance was provided for the purposes of the "Advanced Research Using High Intensity Laser Produced Photons and Particles" project, reg. No. CZ.02.1.01/0.0/0.0/16_019/0000789 or any other project in accordance with instructions provided by the Buyer in advance,

and must comply with the double tax avoidance agreements, if applicable.

- 8.10 Should the invoice not contain the above mentioned information, the Client is entitled to return it to the Supplier during its maturity period and this shall not be considered as a default. The new maturity period shall begin from the receipt of the supplemented or corrected invoice to the Client.

9. **ACCEPTANCE OF DELIVERABLES, HANDOVER OF INDIVIDUAL PARTS OF OBJECT OF PURCHASE, ACCEPTANCE OF COMPLETE OBJECT OF PURCHASE**

- 9.1 The Client shall not be obliged to verify the correctness of all calculations and/or technical solution details during the course of the acceptance of the deliverables provided by the Supplier hereunder. Acceptance of the individual deliverables does not release the Supplier from his liability for the technical compliance and completeness of the entire Object of Purchase.

- 9.2 The completed and verified Object of Purchase shall be taken over on the basis of an acceptance protocol (hereinafter the "**Acceptance Protocol**"), which shall contain at least the following information:

- a) identification of the Supplier;
- b) statement of the Client on acceptance of the Object of Purchase; and
- c) date of the signature.

- 9.3 In case of deficiencies (i.e. defects and backlogs) of the completed Object of Purchase, e.g. the Supplier does not hand over to the Client all documents required hereunder, or if the Object of Purchase is not fully compliant with this Contract, the Client is entitled to refuse the acceptance of the Object of Purchase. Whenever technically possible the Supplier shall remedy the deficiencies within ten (10) working days, unless Parties agree



otherwise (particularly due to the fact that period of 10 working days is technically impossible); however these periods do not imply that the Supplier is not in delay with completion of the performance hereunder. The Client is entitled at his discretion (but not obliged) to accept the Object of Purchase despite the above mentioned deficiencies, in particular if such deficiencies do not prevent the Client from the proper operation of the Object of Purchase. In such a case, the Parties shall list the deficiencies in the Acceptance Protocol, including the manner and the date of their removal (remedy). If the Parties do not reach agreement in the protocol regarding the date of the removal, the Supplier shall remove the deficiencies within ten (10) working days. Until the remedy of the deficiencies, the Client shall be entitled to postpone the corresponding payment.

- 9.4 Should it be necessary to modify any part of the already accepted deliverable in order to meet any requirement stipulated herein, the Supplier undertakes to perform such modifications and accepts that the costs related thereto are included in the Purchase Price.

10. **THE OWNERSHIP RIGHT**

The ownership right to the Object of Purchase shall pass to the Client upon its acceptance confirmed by the signature of the Acceptance Protocol by both Parties.

11. **WARRANTY**

- 11.1 The Supplier provides a warranty of quality (guarantee of quality) of the Object of Purchase for the period of 24 months from execution of the Acceptance Protocol or for the period of 36 months from the delivery of the Object of Purchase to the ELI Beamlines site, whichever comes first. If on a warranty list or other document submitted by the Supplier the warranty period is of longer duration, then this longer warranty period shall have priority over the period stated in this Contract.
- 11.2 If the Acceptance Protocol lists any defects, the 24-month warranty period shall begin on the day on which the last defect was removed.
- 11.3 The Supplier shall remove defects for which it is responsible according hereto that occur during the warranty period free of charge and within the terms stipulated in this Contract. The Supplier shall bear all the expenses (e.g. travelling, accommodation expenses and price of equipment rental or purchase) related to the removal of the defects.
- 11.4 If the Client ascertains a defect of the Object of Purchase during the warranty period, the Client shall notify such defect without undue delay to the Supplier. Defects may be notified on the last day of warranty period, at the latest.
- 11.5 The Client notifies defects in writing via e-mail. The Supplier shall accept notifications of defects on the following e-mail address: ateko@ateko.cz followed by phone notice to the phone number **602 150 737** (Ing. Plašil). The Supplier shall confirm receipt of the notification within two working days. If the receipt of the email notification is confirmed by the Supplier before the phone notice, the phone notice is not needed.



- 11.6 In the notification, the Client shall describe the defect and the manner of removal of the defect. The Client has the right to:
- a) ask for the removal of the defect by the delivery of a replacement individual part of the Object of Purchase,
 - b) ask for the removal of the defect by repair, or
 - c) ask for the adequate reduction of the Purchase Price, particularly in case of irremovable defects.
- 11.7 The Supplier shall remove the defect within 21 calendar days from its notification, unless Parties agree otherwise. The Client shall agree an extended deadline for defect removal with the Supplier if the Supplier submits evidence (e.g. subcontractors bid etc.) that removal of the defect within 21 calendar days is impossible for objective reasons (i.e. independent of the will of the Supplier), or if technical nature of the defect makes the removal within 21 calendar days impossible.
- 11.8 The Supplier shall remove the defect within terms stipulated in this Contract even if the notification of the defect is in his opinion unjustified. In such a case the Supplier is entitled to ask for reimbursement of the costs of removal of the defect. If Parties disagree on whether the notification of the defect is justified or not, the Client shall secure an expert opinion. If the expert considers the notification to be justified, then the Supplier shall return the reimbursement amount paid to him in accordance with the second sentence of this paragraph.
- 11.9 Parties shall sign a protocol on the removal of the defect, which shall contain the description of the defect and the confirmation that the defect was removed. The warranty period shall be extended in case of defects preventing the Client from use of the Object of Purchase for intended use by the period of time that elapses between the notification of the defect and its removal.
- 11.10 In case that the Supplier does not remove the defect within the stipulated or mutually agreed term or if the Supplier refuses to remove the defect, then the Client is entitled to remove the defect at his own costs and the Supplier shall reimburse these costs within 30 days after the Client's request to do so. In such a case the existing warranty remains intact.
12. **PENALTIES**
- 12.1 If the Supplier is in delay with meeting the deadline for completion of the performance under this Contract stipulated in Art. 7.2 hereof, the Supplier shall pay to the Client a contractual penalty in the amount of 0.02% of the Purchase Price (excl. VAT) for every even incomplete day of delay.
- 12.2 If the Supplier is in delay with removal of a defect of the Object of Purchase preventing the Client from proper operation of the Object of Purchase, the Supplier shall pay to the Client a contractual penalty in the amount of 0,02% of the Purchase Price (excl. VAT) for every even incomplete day of delay. In case of defects that do not prevent the Client from



proper operation of the Object of Purchase the contractual penalty shall amount to 0.005% of the Purchase Price (excl. VAT) for every even incomplete day of delay.

- 12.3 The Supplier shall pay any of the contractual penalties charged under this Contract within thirty (30) days from the day, on which the Client enumerated its claim for the contractual penalty. The payment of contractual penalties shall not affect the right of the Client to damages in the extent in which such damages exceed the contractual penalty, thus the Client shall be entitled to claim the exceeding damages.
- 12.4 Total amount of the contractual penalty for delay with meeting the deadline for completion of the performance under this Contract according to Art. 12.1 hereof shall not exceed 5% of the Purchase Price (excl. VAT).
- 12.5 Contractual penalties stipulated in Art. 12.1 and 12.2 above do not apply if the delay on the side of the Supplier is caused by documented impacts of the covid_19 pandemic on the Supplier that could not have been reasonably foreseen and which can be overcome only with unreasonable additional effort or costs. Every such impact must be documented by the Supplier, mainly the cause, when it occurred and how long it lasted.
- 12.6 The Client is entitled to unilaterally set off claims arising from the contractual penalties against the claim (even not yet due) of the Supplier for the payment of the Purchase Price.

13. **RIGHT OF WITHDRAWAL AND VIS MAJOR**

- 13.1 The Client is entitled to withdraw from this Contract without any penalties if any of the following circumstances occur:
- a) the Supplier breaches this Contract in a substantial manner;
 - b) the Supplier repeatedly fails to follow the mandatory activities listed in the Quality Plan and/or does not allow the Client to inspect the Supplier's premises for the purposes of ascertaining status of fulfilment of the Contract;
 - c) the Supplier is in delay with meeting the deadline stipulated in Art. 7.2 hereof for more than 4 months, except where the delay has been caused by the Client;
 - d) results of the on-shop testing, even after third testing attempt, do not meet the technical requirements stipulated by this Contract;
 - e) the insolvency proceeding is initiated against the Supplier; or
 - f) the Client ascertains that the Supplier provided in its Bid for the Public Contract information or documents that do not correspond to the reality and that had or could have had impact on the result of the Public Contract awarding procedure.
- 13.2 The Supplier is entitled to withdraw from this Contract in the following cases:
- a) the Client breaches this Contract in a substantial manner; or
 - b) the Client is in delay with payment of any portion of the Purchase Price for more than 3 months.



- 13.3 The act of withdrawal from the Contract shall become effective on the day of delivery of the notification in writing from one Party to the other with consequences of the Contract termination effective in the “ex tunc” regime, unless the Parties agree otherwise.
- 13.4 Circumstances precluding liability shall be deemed to have been constituted by such circumstances / obstacles which arose independently of the will of the obliged Party, and which prevent fulfilment of that Party’s obligation, provided that it could not be reasonably expected that the obliged Party could overcome or avert this obstacle or its consequences, and furthermore that such Party could foresee such obstacle when it entered into the respective covenants. Liability cannot be precluded by obstacles that arose only after the obliged Party was in default with fulfilment of its obligations, or which arose in connection with its economic situation. The effects precluding liability shall be limited to the period during which the obstacles causing these effects persist.
- 13.5 Should a situation occur, which a Party could reasonably consider to constitute vis major (force majeure), and which could affect fulfilment of its obligations hereunder, such Party shall immediately notify the other Party and attempt to continue in its performance hereunder in a reasonable degree. Simultaneously, such Party shall inform the other one of any and all its proposals, including alternative modes of performance, however, without the other Party’s consent, the Party shall not proceed to carry out such alternative performance. If a situation constituting vis major occurs, the deadlines imposed hereunder shall be extended by the period of the duration of the said vis major.

14. **REPRESENTATIVES OF THE PARTIES**

- 14.1 The Supplier appoints the following representative for the communication with the Client:

In technical matters:

Name: Ing. Vladislav Plašil

E-mail: vladislav.plasil@ateko.cz

Tel.: 602 150 737

- 14.2 The Client appoints the following representative for the communication with the Supplier:

In technical matters:

Name: Dr. Jonathan Tyler Green

E-mail: Tyler.Green@eli-beams.eu

15. **FINAL PROVISIONS**

- 15.1 This Contract is governed by the laws of the Czech Republic, especially by the Civil Code.
- 15.2 All disputes arising out of this Contract or out of legal relations established by this Contract shall be preferably settled by a mutual negotiation. In case that the dispute is



not settled within sixty (60) days, such dispute shall be decided by courts of the Czech Republic in the procedure initiated by one of the Parties.

- 15.3 The Supplier takes into account that the Client is not in relation to this Contract an entrepreneur, nor the subject matter of this Contract is connected with the business activities of the Client.
- 15.4 The Supplier is not entitled to set off any of its claims or his debtor's claims against the Client's claims. The Supplier is not entitled to transfer its claims against the Client that arose on the basis or in connection with this Contract on third parties. The Supplier is not entitled to transfer rights and duties from this Contract or its part on third parties.
- 15.5 All modifications and supplements of this Contract must be in writing.
- 15.6 If any of provisions of this Contract are invalid or ineffective, then such invalidity, ineffectiveness or unenforceability shall not cause the invalidity, ineffectiveness, or unenforceability hereof as a whole and the Parties are bound to change this Contract in such a way that the invalid or ineffective provision is replaced by a new provision that is valid and effective and to the maximum possible extent correspond to the original invalid or ineffective provision as well as most closely reflects the intentions of the Parties at the time of conclusion hereof, to an extent permitted by the laws and regulations of the Czech Republic.
- 15.7 If any Party breaches any duty under this Contract and knows or should have known about such breach, it shall notify it to the other Party and shall warn such Party of possible consequences of the breach.
- 15.8 Integral parts of this Contract is:
Annex 1 (Technical Specification - RSD)
- The Interface Control Document referred to in Art. 1.5 of the Technical Specification does not form part of this Contract, however, it is a binding document for the Supplier for the purposes of performing this Contract.
- In case of any discrepancy between any provisions of this Contract and any provisions of its Annex, the provisions of this Contract shall prevail.
- 15.9 This Contract shall be valid on the date of the signature of both Parties and effective on the date of its publication in the Register of contracts according to special legal regulation.



EUROPEAN UNION
European Structural and Investing Funds
Operational Programme Research,
Development and Education



MINISTRY OF EDUCATION,
YOUTH AND SPORTS

IN WITNESS WHEREOF attach Parties their signatures:

Client

Signature: _____

Name: RNDr. Michael Prouza, PhD

Position: Director

Supplier

Signature: _____

Name: Ing. Kryštof Kolářek

Position: Vicechairman of the board

Signature: _____

Name: Ing. Tomáš Nosek

Position: Member of the board



EUROPEAN UNION
European Structural and Investing Funds
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Development and Education



MINISTRY OF EDUCATION,
YOUTH AND SPORTS

ANNEX 1
TECHNICAL SPECIFICATION - RSD

Confidentiality Level	<i>BL - Restricted for internal use</i>	TC ID / Revision	00275919/D
Document Status	<i>Document Released</i>	Document No.	N/A
WBS code	<i>3.2.0.0 - L2 system</i>		
PBS code	<i>RA1.L2.L2_1.PL.PL1.MPA.LH.1</i>		
Project branch	<i>Engineering & Scientific documents (E&S)</i>		
Document Type	<i>Specification (SP)</i>		

[RSD product category C]

**Cooling System based on Brayton cycle
TP20_121**



Keywords

DUHA, L2, Brayton, Cooling system, Cryogenic

	Position	Name
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Prepared by	Team Leader Scientific L2	Jonathan Tyler Green

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1. Introduction

1.1. Purpose

This Requirements Specification Document (**RSD**) lists the technical requirements and constraints for the design, manufacturing, delivery, and integration of the cooling system based on Brayton engine to the L2 laser beamline of the ELI-Beamlines facility. This cooling system will be used within the scope of the DUHA project.

1.2. Scope

This RSD contains all of the technical requirements: functional, performance and design, delivery, safety and quality requirements for the following product (tender number: TP20_121): **Cooling System based on Brayton Cycle (CSB)**.

The CSB will be a part of the high-repetition rate, high energy, multislab laser system located in the L2 laser hall. It will be used to cool 4 laser crystals in a Multislab Laser Amplifier head (**MLA**) with a nominal optical power of 600 W (12J / 50Hz), operating at a nominal temperature of 120K. This is an upgrade of the existing CSB system (cooling of the MLA with an optical power of 100W - 10J / 10Hz) within the DUHA project. The product is registered in the PBS database under the following PBS code: RA1.L2.L2_1.PL.PL1.MPA.LH.1.

This product is a **Category C** according to the ELI Beamlines RSD categories. Furthermore, all items may be subject to testing and verification upon delivery to the ELI Beamlines facility by qualified personnel. All non-conformances (if any) must be addressed by the supplier in a timely manner.

1.3. Terms, Definitions and Abbreviations

For the purpose of this document, the following abbreviations apply:

Abbreviation	Definition
ELI	Extreme Light Infrastructure
CA	Contracting Authority (Institute of Physics AV CR, v. v. i.)
RSD	Requirement Specification Document
MLA	Multislab Laser Amplifier
VIP	Vacuum Insulated Piping
CB	Cold Box
CSB	Brayton Cooling System
RPM	Revolutions Per Minute

1.4. References to standards

If this document includes references to standards or standardized/standardizing technical documents the CA allows/permits also another equal solution to be offered. If a supplier offers another equal solution the CA shall not reject its bid, once the supplier by appropriate means in the bid proves that the offered supplies, services or works meet in an equivalent manner the requirements including references to standards or technical documents.

1.5. Referenced documents

Document number	Document name
<i>RD-01</i>	<i>Interface Control Document</i>

2. Functional, Performance and Design requirements

2.1. General requirements for CSB

REQ-030585/A

CSB shall be based on the Brayton cycle, using oil-free turbomachines employing He-gas as a working medium. The system shall be water-cooled using the facility water specified in REQ-030589/A.

REQ-030586/A

In order to ensure maximum purity of the MLA coolant, the cooling system shall consist of 2 circuits.

- The primary circuit will cool the MLA with high purity helium. Requirements on purity will be specified below.
- A secondary circuit will serve as an intermediate, Helium-filled circuit between the primary circuit and facility cooling water. This is depicted in Fig. 1.

REQ-030587/A

Only facility water (REQ-030589/A) shall cool the secondary loop. Liquid nitrogen and air-cooling are not permitted.

REQ-030588/A

CSB shall meet the general requirements defined in REQ-030591/A

Only turbomachines shall be allowed to ensure gas compression and expansion.

REQ-030592/A

The pressure drop at the MLA at the nominal parameters given in Table 1 shall be taken to be 15 kPa.

Table 1.

REQ-030589/A

The performance and stability parameters of **CSB** specified in REQ-030591/A

Only turbomachines shall be allowed to ensure gas compression and expansion.

REQ-030592/A

The pressure drop at the MLA at the nominal parameters given in Table 1 shall be taken to be 15 kPa.

Table 1 shall be satisfied for the following ambient environmental conditions and lab infrastructure:

- 1) Room temperature 20 °C, stability ± 0.5 °C, Humidity 50 %
- 2) Facility water provided to chiller: 16°C, inlet pressure max 5 bar on input
- 3) Helium ^4He with purity 5.9 or better shall be provided for the primary cooling circuit.

REQ-030590/A

All technologies involved in CSB (primary and secondary circuits) shall be oil-free.

REQ-030591/A

Only turbomachines shall be allowed to ensure gas compression and expansion.

REQ-030592/A

The pressure drop at the MLA at the nominal parameters given in Table 1 shall be taken to be 15 kPa.

Table 1: Technical parameters of CSB

#	Parameter	Required value (description)
	Primary loop	
1.1	Operational temperature of He-gas at the inlet to MLA (K)	120
1.2	Operational pressure of He-gas at the inlet to MLA at the requested temperature of 120 K (bar absolute)	11
1.3	Peak temperature variation from setpoint over 6 hours (K)	< 0.5
1.4	Cooling power available for heat removal from the MLA (kW)	2
1.5	Required level of insulation vacuum of the cold box (see Fig 1) (mbar)	10^{-5} or better
1.6	The maximum electrical power consumption of the CSB (kW)	100
1.7	Maximum permissible pressure drop due to leakage of helium (bar / day)	0.05
1.8	Nominal Flow	160 g/s

1.9	Working medium	^4He , purity 5.9 or better
	Secondary loop	
2.1	Working medium	^4He , purity 4.6 or better
2.2	Operational pressure of He-gas	Defined by the supplier
2.3	Maximum permissible pressure drop due to leakage of helium (bar / day)	0.05

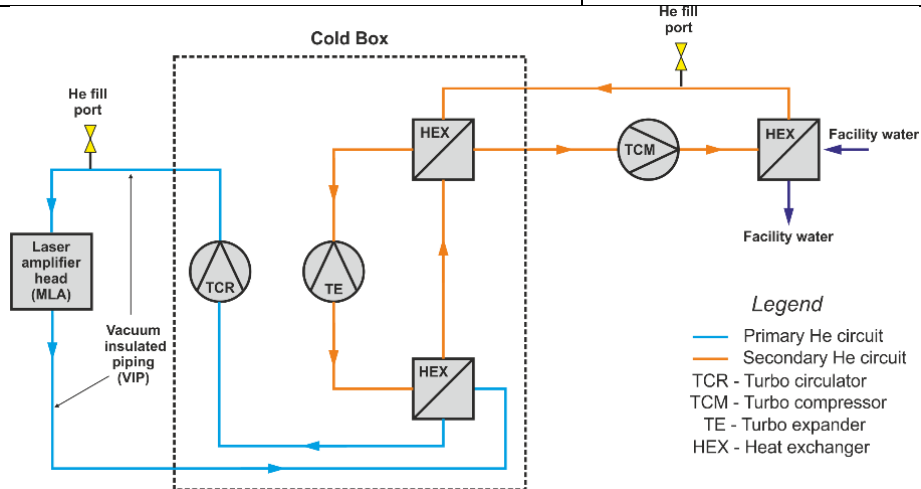


Fig. 1 Generic scheme of a cryogenic cooling loop and its main components (the specific scheme of the loop depends on the implementation of the Brayton-type thermodynamic cycle with heat dissipation into water).

REQ-030593/A

Each cooling circuit shall be filled with the He-gas from the cylinder at room temperature. The loop shall be then sealed, and the working pressure of approx. 11 bar in the primary loop shall be reached in the system by cooling-down the He-gas to approx. 120 K.

NOTE: The supplier should consider the advantage of using a buffer tank - this is an additional subsystem, which, however, reduces the pressure requirements of the circuit during the filling procedure and also when the loop is off.

REQ-030594/A

The system shall be designed to handle the flow rate of 200 g/s in the primary loop for expected pressure drop at the MLA of 23 kPa. For this flow-rate and pressure drop the cooling power as high as possible is requested.

NOTE: More values of the expected pressure drop at the MLA with respect to flow rate can be provided to the supplier, if requested.

REQ-030595/A

Heat exchangers in the primary loop shall be connected to the cooling circuit via flanges (no welding), so that it can be disconnected from the secondary circuit if necessary for cleaning, maintenance, or replacement.

REQ-030596/A

Installation of the **CSB** pressure parts shall be performed and inspected by persons authorized for works with gas equipment according to Czech regulations No. 18/1979 Sb. – pressure equipment, and 21/1979 Sb. – gas equipment.

REQ-030597/A

Assembly of final parts of the primary circuit, after final cleaning and cleanliness inspection at the CA's premises (see Section 2.2), shall be carried out at the CA's premises (unless otherwise agreed upon with CA) by the supplier.

2.2. Material requirements and Cleanliness requirements

To ensure sufficient cleanliness of the cooling gas in the MLA it is important to choose low-outgassing and oil-free materials for the primary cooling circuit. This limits the choice of electrical insulating materials, resins, and glues which can be used. All materials used in the primary cooling circuit must be approved by the CA. Additionally, the procedures for cleaning components and assembling components for the primary circuit is anticipated to be a collaborative effort between the CA and supplier.

REQ-030598/A

There shall be no materials inside the primary cooling circuit that could release dust or other solid particles larger than 1 μm into the cooling helium.

REQ-030599/A

There shall be no materials inside the primary cooling circuit that could release hydrocarbon fumes or other gaseous impurities into the cooling helium. The criterion for potential trace amount of these gaseous impurities is the absence of condensation of these impurities in the MLA area. Only gaseous impurities defined by the He 5.9 (or higher) gas purity are allowed.

REQ-030600/A

Any filter used within the system shall be approved by the CA.
NOTE: The primary circuit can be equipped with filtration and a molecular sieve cryoadsorber.

REQ-030601/A

The Supplier shall provide to the CA technical documents for all materials used within the primary circuit.

REQ-030602/A

All materials within the primary cooling circuit shall be approved by the CA.

NOTE: In some cases material samples may need to be provided to the CA for tests to evaluate suitability for the application.

REQ-030603/A

All materials going into the primary loop shall be cleaned before installation. Assemblies, such as motors or turbomachines, shall be cleaned component by component according to a method approved by the CA before assembly. The possible methods of cleaning include, but are not limited to ultra-sonic bath in isopropyl alcohol, ultra-sonic bath with detergent and water, cleaning with high pressure spray, spray of cryogenic CO₂, and/or vacuum bake-out.

NOTE: The CA must approve the cleaning devices (baths, ovens, etc) before use; if not approved, the cleaning will take place at the CA premises using the CA's infrastructure.

REQ-030604/A

After cleaning, any assembly of the components of the primary loop which cannot be done at the CA premises shall take place in an ISO Class 7 (ČSN EN ISO 14644-1) cleanroom (unless otherwise agreed upon with CA) with clean tools (free of oil and contaminants) and clean, powder-free gloves (no oil residues on the surface). There is a strong preference for assembly to take place at the CA's facility whenever possible.

REQ-030605/A

All components of primary loop shall be subjected to cleanliness evaluation via Fourier Transformation Infrared Spectroscopy or Residual Gas Analysis by the CA.

2.3. Layout and interface requirements

The MLA head and the nominal scheme of its assembly (the construction of the support frame is only indicative) are shown in Fig. 2. The optical axis of the MLA is about 1.36 m above the floor.

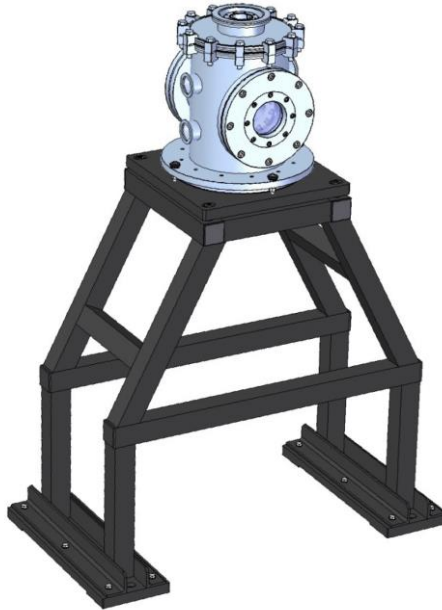


Fig. 2 MLA on a support stand. The optical (laser) axis of the system is at a height of about 1.36 m above the floor.

A sketch of the MLA head and VIP interface for the connection of the He-gas pressure line is shown in Fig. 3.

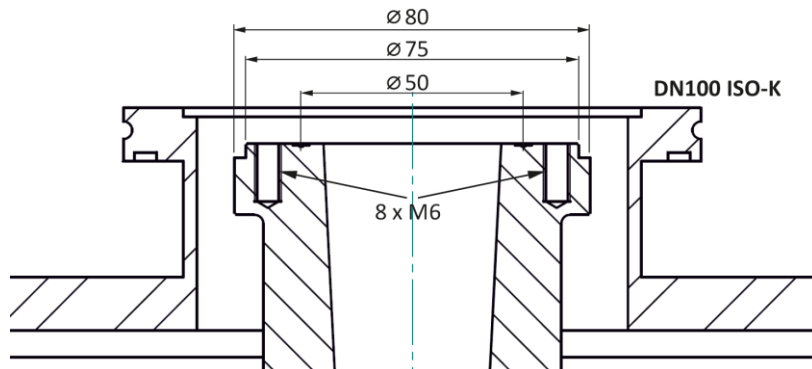


Fig. 3 MLA head interface for connection of the He-gas and insulation lines. The helium pressure line is connected via a specific interface using an EVAC ISO CeFiX® type seal.

REQ-030606/A

The MLA head shall be connected to the cooling loop from the top and bottom side of the head by VIP with inner diameter of the pressure He-line of 40 mm and with insulating vacuum jacket DN100 ISO-K type.

NOTE: The upper (inlet) and lower (outlet) interfaces are structurally identical.

REQ-030607/A

The He-gas pressure line shall be connected to MLA head by a specific interface using an EVAC ISO CeFiX® type seal (technical description of this seal system can be found e.g. at www.evacvacuum.com) with a diameter of 50 mm.
NOTE: A detailed technical drawing of the interface with all tolerances will be handed over to the supplier after contract signing.

REQ-030608/A

Max height of the **CB** including all non-removable accessories shall not exceed 2.6 m.

Max diameter of the **CB** shall not exceed 1.45 m.

NOTE: The dimensions can be altered after signature if detailed technical drawings of the CB are deemed suitable by the CA.

REQ-030970/A

The CB shall be delivered with a base which can be lifted by a palette jack (for easy movement and placement of the CB) and provides height adjustment to the CB with a range of 5 cm.

REQ-030609/A

Turbo-compressor in secondary loop with accessories shall have target dimensions of cca $3 \times 3 \times 2 \text{ m}^3$ (l×w×h).

NOTE: The final dimensions will be decided upon with the CA based on technical requirements.

*NOTE: The turbo compressor in secondary loop with accessories will be placed up 50 meters from the **CB**. Final distances will be fixed by CA and during the study phase.*

2.4. Operational requirements

REQ-030611/A

Operational conditions (see REQ-030591/A

Only turbomachines shall be allowed to ensure gas compression and expansion.

REQ-030592/A

The pressure drop at the MLA at the nominal parameters given in Table 1 shall be taken to be 15 kPa.

Table 1) shall be achieved up to 120 min after turning on the **CSB** on a best effort basis.

NOTE: The start-up time of 120 min is meant as a time after turning on the CSB after a maximum 18 hours downtime when the CSB is not yet fully warmed up to ambient temperature.

REQ-030612/A

The **CSB** shall be capable of uninterrupted operation. It is assumed that the loop will be nominally operated 8 hours in weekdays. The system shall be capable of both manual operation for the purpose of testing and must also be capable of fully remote, computer controlled operation from the L2 laser master control system.

REQ-030613/A

The **CSB** shall not be damaged as a result of electrical power failure or loss of cooling water from the facility during operation.

REQ-030614/A

The **CSB** shall monitor key parameters (such as internal pressures, temperatures, motor vibration, etc) which could lead to system failure or damage. When these parameters are outside the range of safe, damage-free operation the **CSB** shall automatically shut down and generate an error identifying the cause.

REQ-030615/A

The cooling loop shall include temperature sensors at the inlet and outlet of the MLA, at the outlet of the **CSB** and on all critical subsystems of the central unit where the temperature changes.

2.5. Control system requirements

REQ-030616/A

The **CSB** control system shall be compliant with the Interface Control Document (RD-01) specifications.

3. Delivery requirements

REQ-030617/A

The transportation to the final destination shall be conducted by the Supplier.

NOTE: The bid price will be considered by the CA as the final price, including transportation cost.

REQ-030971/A

It is the responsibility of the supplier to assemble, install, integrate, and verify the CSB.

4. Safety requirements

REQ-030618/A

The Supplier shall supply a Declaration of Conformity or any other equivalent document legally recognized and accepted in the Czech Republic for each product type if the appropriate legislation determines the Supplier's obligation to have a Declaration of Conformity (or the equivalent document) for the purposes of a Product sale in the Czech Republic to fulfil the requirements of 2001/95/EC directive or applicable Czech law.

5. Quality Requirements

5.1. General Quality Requirements

REQ-030619/A

The Supplier shall provide Instructions for use (Product User Manual) as part of the delivered Product. The Instructions for use shall be written in accordance with standard ČSN EN 82079-1 (equivalent to EN 82079-1) and shall include the instructions and descriptions regarding the following:

- transport, handling and storage;
- installation and cleaning;
- safe operation and maintenance procedures.

REQ-030620/A

The Supplier shall provide a declaration of conformity with technical requirements defined by the product RSD and ensure completeness of the products.

REQ-030621/A

The Supplier shall provide verification protocols outlining the results of tests executed for installed **CSB**, integrated with MLA, at ELI Beamlines premises to confirm specification conformity (see REQ-030592/A).

NOTE: The content of the verification protocols shall be agreed with the CA.

REQ-030622/A

The Supplier shall establish and maintain a nonconformity control system compatible with ČSN EN ISO 9001 (or equivalent, e.g. EN ISO 9001).

5.2. Acceptance

Acceptance will be carried out by the CA upon delivery and final verification of the **CSB** at ELI Beamlines premises. The basis for acceptance will be verification protocols summarizing the overall verification results together with relevant documentation supporting the verification (see Chapter 5.1.).

In case of successful acceptance phase, the CA will provide to the Supplier signed acceptance protocol. In case of unsuccessful acceptance stage, the CA will provide to the Supplier Nonconformity Report (NCR) and process in accordance with REQ-030622/A will be applied.

REQ-030623/A

The Acceptance phase shall demonstrate the following:

- Final Products have been successfully verified by the Supplier and the results of this process have been documented in an appropriate way through verification protocols (see REQ-030621/A);

- All detected nonconformities have been solved in accordance with REQ-030622/A;
- Final Products are free of fabrication errors and are ready for the intended operational use.