



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



MINISTRY OF EDUCATION,
YOUTH AND SPORTS

PURCHASE CONTRACT

This purchase contract ("**Contract**") was concluded pursuant to section 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 Academy of Sciences of the Czech Republic, a public research institution**,
with its registered office at: Na Slovance 2, Praha 8, PSČ: 182 21,
registration no.: 68378271,
represented by: RNDr. Michael Prouza, Ph.D.. – director
(**"Buyer"**); and
- (2) TYDEX, LLC,
with its registered office at: Kavelergradskays str. 6, St. Petersburg, 191015 Russia,
registration no.: 1137847419874,
represented by: Mr. Grigory Kropotov, Ph.D. General Manager
(**"Seller"**).

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

WHEREAS

- (A) The Buyer is a public contracting authority and the beneficiary of a grant of the Ministry of Education, Youth and Sports of the Czech Republic for projects within the Operational Programme Research, Development and Education ("**Projects**").
- (B) For the successful realization of the Projects it is necessary to purchase the Objects of Purchase (as defined below) in accordance with the Rules for the Selection of Suppliers within the Operational Programme Research, Development and Education.
- (C) The Seller wishes to provide the Objects of Purchase to the Buyer for consideration.
- (D) The Seller's bid for the public procurement entitled "*High quality, large size uncoated off-axis parabolic mirrors for P3 platform*", whose purpose was to procure the Objects of Purchase ("**Public Procurement**"), was selected by the Buyer as the most suitable.

IT WAS AGREED AS FOLLOWS:



1. **BASIC PROVISIONS**

- 1.1 Under this Contract the Seller shall hand over to the Buyer 2 pieces of the uncoated OAP mirrors that are described in Annex 1 (*Technical Specification*) to this Contract in the quality and with the properties described therein (“**Objects of Purchase**”) and shall transfer to the Buyer ownership right to the Objects of Purchase, and the Buyer shall take over the Objects of Purchase and shall pay the Seller the Purchase Price (as defined below), all under the terms and conditions stipulated in this Contract.
- 1.2 The Objects of Purchase (all of its parts) shall be new (not remanufactured).

2. **MANUFACTURING OF THE OBJECTS OF PURCHASE**

- 2.1 Parties acknowledge that at the time of the conclusion of this Contract the Objects of Purchase do not exist and the Seller must prepare manufacturing drawings of the Objects of Purchase (“**Manufacturing Drawings**”), and subsequently manufacture the Objects of Purchase.
- 2.2 The Seller shall prepare Manufacturing drawings based on the drawings and conceptual designs of the Objects of Purchase that are provided by the Buyer under this Contract (“**Buyer’s Drawings**”). The Seller acknowledges that Buyer’s Drawings are protected by the act no. 121/2000 Coll., on Copyright and Rights Related to Copyright and on Amendment to Certain Acts as an author’s work. The Seller may use Buyer’s Drawings only and solely for the purposes of the fulfilment of this Contract, i.e. for the manufacture of the Objects of Purchase for the Buyer.
- 2.3 The Buyer considers Buyer’s Drawings to be confidential information. The Seller must ensure that Buyer’s Drawings will be accessed only by persons (e.g. employees and subcontractors) that need such access for the fulfilment of this Contract.
- 2.4 The Seller, as a professional business entity, must verify whether the Buyer’s Drawings have any deficiencies. The Seller must ensure that the Objects of Purchase comply with all the requirements stipulated in this Contract and are fully functional.
- 2.5 The Manufacturing Drawings must comply with Buyer’s Drawings and this Contract and shall be approved by the Buyer prior to the manufacture of the Objects of Purchase. The Buyer reserves the period of 15 working days to assess the compliance of the Manufacturing Drawings with the requirements of this Contract. The Buyer reserves the right to withhold the approval, if all the requirements are not met. In such a case, the Seller shall modify the Manufacturing Drawings accordingly. By approving the Manufacturing Drawings the Buyer does not accept the responsibility of any kind for any potential defects of the Objects of Purchase or failure to fulfil the requirements of this Contract. The Seller is solely responsible for ensuring the compliance of the Objects of Purchase with the requirements stipulated in this Contract.



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3. **THE PLACE OF DELIVERY**

The place of delivery shall be ELI Beamlines facility located at the address: Za Radnicí 835, post code 252 41, Dolní Břežany, district Prague-west, the Czech Republic.

4. **THE TIME OF DELIVERY**

4.1 The Seller shall deliver the Objects of Purchase within 10 months from the effectiveness of this Contract. The Seller is entitled to deliver the Object of Purchase earlier, if the Buyer agrees to it.

4.2 The Buyer shall extend the time of the delivery on the basis of the request of the Seller, if the Seller is in delay with the delivery due to the circumstances that the Seller had no control over and were hard to foresee. In such a case the Seller shall include in its request the description of such circumstances and attaches documents that are necessary for the assessment whether the conditions stipulated in the preceding sentence are met. The extension of the time of delivery shall correspond to the duration of the obstacle that prevented the Seller from fulfilling this Contract in time.

5. **THE OWNERSHIP RIGHT**

The ownership right to the Object of Purchase shall be transferred to the Buyer upon the signature of the acceptance protocol by both Parties.

6. **PRICE AND PAYMENT TERMS**

6.1 The purchase price for the Objects of Purchase (2 pieces) is **125.900,- EUR** (“**Purchase Price**”). Value added tax shall be paid in accordance with the applicable legal regulations.

6.2 The Purchase Price cannot be exceeded and include all costs and expenses of the Seller related to the performance of this Contract. The Purchase Prices include, among others, all expenses related to the handover of the Objects of Purchase, transportation, tests, customs, manufacturing, costs of copyright, insurance, warranty service and any other costs and expenses connected with the performance of this Contract.

6.3 The Purchase Price shall be paid in EUR on the basis of a tax document – invoice, to the account of the Seller designated in the invoice. The Purchase Price shall be paid in the following manner:

- a) 15% of the Purchase Price shall be paid after the signature of this Contract;
- b) 20% of the Purchase Price shall be paid after the Manufacturing Drawings are approved by the Buyer;
- c) 65% of the Purchase Price shall be paid after the signature of the acceptance protocol. The copy of the acceptance protocol shall be attached to the invoice.



- 6.4 The Buyer shall realize payments on the basis of duly issued invoices within 30 days from their receipt. The invoice shall be considered to be paid for on the day when the invoiced amount is deducted from the Buyer's account on behalf of the Seller's account.
- 6.5 The invoice issued by the Seller as a tax document must contain all information required by the applicable laws of the Czech Republic. Invoices issued by the Seller in accordance with this Contract shall contain in particular following information:
- a) name and registered office of the Buyer,
 - b) tax identification number of the Buyer,
 - c) name and registered office of the Seller,
 - d) tax identification number of the Seller,
 - e) registration number of the tax document,
 - f) scope of the performance (including the reference to this Contract),
 - g) the date of the issue of the tax document,
 - h) the date of the fulfilment of the Contract,
 - i) Purchase Price,
 - j) registration number of this Contract, which the Buyer shall communicate to the Seller based on Seller's request before the issuance of the invoice,
 - k) declaration that the performance of the Contract is for the purposes for a certain project - the Buyer shall inform the Seller of the title and registration number of such project at the request of the Seller.
- 6.6 In case that the invoice shall not contain the above mentioned information, the Buyer is entitled to return it to the Seller 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 Buyer.
7. **SELLER'S DUTIES**
- 7.1 The Seller shall ensure that the Object of Purchase are in compliance with this Contract including all its annexes and applicable legal (e.g. safety), technical and quality norms.
- 7.2 During the performance of this Contract the Seller proceeds independently. If the Seller receives instructions from the Buyer, the Seller shall follow such instructions unless these are against the law or in contradiction to this Contract. If the Seller finds out or should have found out if professional care was exercised that the instructions are for any reason inappropriate or illegal or in contradiction to this Contract, then the Seller must notify the Buyer.



7.3 All things necessary for the performance of this Contract shall procure the Seller, unless this Contract stipulates otherwise.

8. **HANDOVER AND TAKEOVER OF THE OBJECT OF PURCHASE**

8.1 Prior to the handover and takeover of the Objects of Purchase the Seller shall carry out tests and provide the Buyer with verifications in accordance with Annex 1 (*Technical Specification*) to this Contract.

8.2 After the delivery of the Objects of Purchase to the place of delivery, the Buyer may confirm to the Seller the custody of the Objects of Purchase (if Seller asks for such confirmation), however it does not mean that the Buyer takes over (accepts) the Objects of Purchase. The takeover (acceptance) of the Objects of Purchase shall be realized on the basis of an acceptance protocol only after the Buyer is satisfied that its requirements under this Contract are met.

8.3 Each Object of Purchase may be transported, handed over and accepted separately. In such case, the Object of Purchase shall have its own acceptance protocol.

8.4 If the Seller fails to duly package any of the Objects of Purchase or if any of the Objects of Purchase does not meet requirements stipulated in this Contract, the Buyer is entitled to refuse the takeover (acceptance) of such Object(s) of Purchase. In such a case the Seller shall remedy the deficiencies within ten (10) working days, unless Parties agree otherwise. The Buyer is entitled (but not obliged) to accept the Object(s) of Purchase despite the above mentioned deficiencies, in particular if such deficiencies do not prevent the Buyer in the proper operation or usage of the Object(s) of Purchase. In such a case the Seller and the Buyer 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 acceptance protocol regarding the date of the removal, the Seller shall remove the deficiencies within ten (10) working days.

9. **WARRANTY AND CLAIMS BASED ON DEFECTS OF THE SUPPLY**

9.1 The Seller provides the warranty of quality for the Objects of Purchase for a period of 6 months. The warranty period starts at the date of the acceptance of the Objects of Purchase. The Buyer shall raise a warranty claim against the Seller without undue delay after ascertaining a defect, but not later than on the last day of the warranty period, by means of a written notice sent to the Seller. A claim sent by the Buyer on the last day of the warranty period shall be deemed made in time.

9.2 The Seller shall remove the defect free of charge.

9.3 The Seller undertakes to remove any defect within a deadline agreed with the Buyer taking into account the nature of the defect. If the Parties do not reach an agreement, the defect shall be removed within two months. In case of necessity of remanufacture, the defect shall be removed within 10 months from raising the warranty claim.



9.4 The Parties shall execute a record on removal of the defect, in which they shall confirm that the defect has been removed.

9.5 The warranty shall not apply to defects caused by unprofessional handling, incorrect or unsuitable maintenance, non-compliance with written rules of operation and maintenance of the Objects of Purchase provided to the Buyer by the Seller or by environmental contamination. The warranty shall also not apply to defects caused by gross negligence or intentional conduct.

10. **PENALTIES**

10.1 If the Seller is in delay with the performance of this Contract and such delay lasts for more than 1 month, the Seller shall pay to the Buyer a contractual penalty in the amount of 0,01 % of the Purchase Price for every (even commenced) day of delay.

10.2 If any of the Objects of Purchase has to be remanufactured due to a defect (i.e. the Object of Purchase was damaged during transport to the place of delivery), then the time of the first remanufacture shall not be penalised with the contractual penalty in the preceding article, i.e. the Seller shall be granted additional 10 months to carry out the remanufacture. After the expiry of this new deadline, the contractual penalty in the preceding article shall apply.

10.3 If the Seller is in delay with the removal of the defect, the Seller shall pay to the Buyer a contractual penalty in the amount of 0,05 % of the Purchase Price for every (even commenced) day of delay.

10.4 The Seller shall pay contractual penalties within fifteen (15) days from the day, on which the Buyer enumerated its claims. The payment of contractual penalties shall not affect the right of the Buyer to damages even to the extent to which such damages exceeds the contractual penalty.

10.5 Total amount of contractual penalties that the Buyer is entitled to claim shall not exceed 10 % of the Purchase Price.

10.6 The Buyer is entitled to unilaterally set off claims arising from the contractual penalties against the claim of the Seller for the payment of the Purchase Price.

11. **LIMITATION OF COMPENSATION**

If any of the Parties breaches any provision of this Contract and such breach shall result in the financial loss or other harm to the other Party, the breaching Party shall provide compensation for such financial loss or other harm. However, Parties agree that such compensation shall be limited to 100 % of the Purchase Price. Indirect and consequential financial losses or other harms shall not be compensated.



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12. **RIGHT OF WITHDRAWAL**

12.1 The Buyer is entitled to withdraw from this Contract without any penalties, if any of the following circumstances occur:

- a) the Seller shall be in delay with the fulfilment of this Contract and such delay lasts more than 2 weeks;
- b) Manufacturing Drawings do not comply with the requirements in Annex 1 (*Technical Specification*) and the deficiencies cannot be remedied;
- c) The Object of Purchase during testing or verification does not fulfil the requirements stipulated in this Contract, in particular in Annex 1 (*Technical Specification*) and the deficiencies cannot be remedied;
- d) the insolvency proceeding is initiated against the Seller; or
- e) the Buyer ascertains that the Seller provided in its bid for the Public Procurement information or documents that do not correspond to the reality and that had or could have had impact on the result of the tendering procedure, which preceded the conclusion of this Contract.

13. **REPRESENTATIVES OF THE BUYER**

13.1 The Buyer appoints the following representatives for the communication with the Seller:

Chaulagain Uddhab, email: Uddhab.Chaulagain@eli-beams.eu

Weber Stefan Andreas, email: Stefan.Weber@eli-beams.eu

The representatives of the Buyer are also authorized to sign the acceptance protocol and act on behalf of the Buyer with respects to the defects of the Objects of Purchase.

14. **EXPORT CONTROL**

Export law of some countries may require an end-user statement regarding the use of the Objects of Purchase and may also require an export license. In the event that such items are required, the supply of the Object of Purchase is subject to receipt of an end-user statement from the Buyer and approval of application for an export license. The resale of the Objects of Purchase is subject to written approval of the Seller. Buyer shall not deliver Objects of Purchase either in part or whole to countries, where such delivery would constitute a violation of the original country export regulations and/or laws.

15. **SPECIAL PROVISIONS**

By signing this Contract, the Seller becomes a person that must cooperate during the finance control within the meaning of Section 2 letter e) of the act no. 320/2001 Coll., on finance control in the public administration, and shall provide to the Directing Body of the



Operational Programme Research, Development and Education or other control bodies access to all parts of the bid, Contract or other documents that are related to the legal relationship formed by this Contract. This duty also covers documents that are subject to the protection in accordance with other acts (business secrets, secret information, etc.) provided that control bodies fulfil requirements stipulated by these acts. The Seller shall secure that all its subcontractors are also obliged to cooperate with control bodies in the above stipulated extent. The possibility of effective control must be preserved until the year 2033.

16. **PUBLICITY**

Parties are aware that this Contract shall be published in the register of contracts in accordance with the Act no. 340/2015 Coll., on the Register of Contracts.

17. **FINAL PROVISIONS**

17.1 This Contract is governed by the laws of the Czech Republic, especially by the Civil Code.

17.2 All disputes arising out of this Contract or out of legal relations connected with 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.

17.3 The Seller is not entitled to set off any of its claims or his debtor's claims against the Buyer's claims. The Seller is not entitled to transfer its claims against Buyer that arose on the basis or in connection with this Contract on third parties. The Seller is not entitled to transfer rights and duties from this Contract or its part on third parties.

17.4 All modifications and supplements of this Contract must be in writing.

17.5 If any of provisions of this Contract are invalid or ineffective, 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.

17.6 This Contract is executed in four (4) counterparts and every Party shall receive two (2) counterparts.

17.7 An integral part of this Contract is Annex 1 (*Technical Specification*). If Annex 1 (*Technical Specification*) uses the term "Contracting Authority" or "contracting authority" it means Buyer. If Annex 1 (*Technical Specification*) uses the term "Supplier" or "supplier" it means Seller.

17.8 This Contract shall be valid on the date of the signature of both Parties and effective on the day, on which it was published in the register of contracts within the meaning of the Act no. 340/2015 Coll., on the Register of Contracts.



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IN WITNESS WHEREOF attach Parties their handwritten signatures:

Buyer

Signature: _____

Name: RNDr. Michael Prouza, Ph.D.

Position: director

Date:

Seller

Signature: _____

Name: Grigory Kropotov, Ph.D.

Position: General Manager

Date:



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ANNEX 1

TECHNICAL SPECIFICATION

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Document Type	<i>Specification (SP)</i>		

[RSD Product Category C]

***High quality, large size uncoated off-axis parabolic mirrors for P3 platform
(Hi2LMI off-axis parabola) TP20_029***



Keywords

Off-axis parabolic mirrors, parameters, requirements, beam transport and focusing

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1. Introduction

1.1. Purpose

This Requirements Specification Document (RSD) lists the technical requirements and constraints of the L3 target parabola for the Plasma Physics target chamber P3 of the ELI-Beamlines project. This can lead to the identification of product interfaces with the ELI science-based technology and ELI building facility. This RSD also acts as a parent document for technical requirements that need to be addressed in lower level design description documents.

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_029): **High quality, large size uncoated off-axis parabolic mirrors for P3 platform** (further "OAP mirrors").

The products are an integral part of the "P3 plasma physics platform" and will be located in the P3 vacuum target chamber in the E3 experimental hall after coating. These products are registered in the PBS software under the following PBS codes: *E.E3.P3.BO.4 and E.E3.P3.BO.5*.

1.3. Terms, Definitions and Abbreviations

For the purpose of this document, the following abbreviated terms are applied:

Abbreviation	Meaning
A	Analysis (as a verification method)
AOI	Angle Of Incidence
CA	Contracting Authority (Institute of Physics AV CR, v. v. i.)
CAP	Clear Aperture
DI	Deionized water
E3	Experimental hall 3
ELI	Extreme Light Infrastructure
I	Inspection (as a verification method)
LIDT	Laser Induce Damage Threshold
OAP	Off-Axis Parabola
pcs	Pieces
PD	Physical Dimension
PETG	Polyethylene Terephthalate Glycol
PV	Peak-to-Valley
QRs	Quality Reports
R	Review of documentation (as a verification method)
RA5	Research activity 5
RH	Relative Humidity

Abbreviation	Meaning
RSD	Requirements Specification Document
SFL	Segment Focal Length
T	Test (as a verification method)
ULE	Ultra-Low-Expansion
VCD	Verification Control Document

1.4. Reference documents

Number of doc.	Title of Document/File
RD-01	00192575-01_OAPSubstrate30Degree750mmFocus.pdf

1.5. 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.

2. General requirement

The requested OAP mirrors will be coated and used as a final focusing element of the 10 Hz repetition rate 30 J, 30 fs, 810 nm 1 PW L3 laser beam for high-intensity Plasma Physics Experiments.

REQ-028308/A

The Supplier shall provide **2 pcs** of the uncoated OAP mirrors in accordance with the requirements described in chapter 3.

NOTE: The following Table 1 provides numbering (and name) of the requested OAP mirrors according to their basic specifications. This notation will be used when referring to the particular OAP mirror.

Verification method: R – review, I – inspection

OAP notation number (Name)	PD, SFL, off-axis angle	PBS database code (for the CA identification)
OAP (P3)	310x290 mm ² , 750 mm, 30°	E.E3.P3.BO.4

Table 1: The notification of OAP mirrors according to its basic specifications (the detailed specifications are given in chapter 3)

3. Functional, Performance and Design requirements

3.1. Geometry and Substrate

REQ-028309/A

The substrate material of the OAP mirrors shall be manufactured from corning HPFS 7980, Fused Silica KV without any bubbles or other defects on the polished surface, NIFS-I mirror grade or equivalent quality high-power laser grade fused silica or, high-power laser compatible ULE.

NOTE: Zerodur and other mirror grades, that are susceptible to ionizing radiation damage, are prohibited to use.

Verification method: R - review (Substrate material report with compliance certificate)

REQ-028310/A

The OAP mirrors (along the beam) shall be rectangular in shape with the physical dimension of $(310+0-1) \times (290+0-1)$ mm².

NOTE 1: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).

*NOTE 2: The dimensions shall correspond to the requirements given in the reference drawing **RD-01** (see chapter 1.4; drawing N^o 00192575/01) which is an inseparable part of the OAP mirrors requirements.*

Verification method: R - review, T - test (Dimensional report)

REQ-028311/A

The clear aperture of the OAP mirrors (along the incoming collimated laser beam) shall be square (centre of the clear aperture is the mirror centre). The clear aperture shall be squared with dimensions of at least 250 x 250 mm² and with rounded corners.

Verification method: R - review, T - test

REQ-028312/A

The centre thickness of the OAP mirrors shall be (80 ± 0.5) mm.

NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).

Verification method: R - review, T - test (Dimensional report)

REQ-028313/A

The off-axis angle of the OAP mirrors shall be $30.0 \pm 0.5^\circ$ (angle subtended between the segment axis and the segment focal length).

NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).

Verification method: R - review, T - test

REQ-028314/A

The off-axis distance (to the centre of the OAP mirror) shall be (375 ± 1.5) mm.

NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).

Verification method: R - review

REQ-028315/A

The segment focal length (vertex of the OAP mirror to the focal point) shall be (750 ± 10) mm.

NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).

Verification method: R - review, T - test

3.2. OAP mirrors surface

REQ-028316/A

The Peak-to-valley (PV) surface figure error of the OAP mirrors shall be less than 105 nm peak-to-valley over at least 240×240 mm² with best commercially reasonable effort to achieve a $PV \leq 63$ nm.

Verification method: R - review, T - test (Interferometric report)

REQ-028317/A

The RMS surface figure error of the OAP mirrors shall be lower than 10 nm (best effort ≤ 8 nm) for spatial periods > 10 mm over the central 250 mm \times 250 mm aperture to obtain the Strehl ratio

$S = \exp[-2 \cdot (2 \cdot \pi \cdot \text{RMS (nm)} / \lambda \text{ (nm)})^2]$ of at least 0.99 over the central 240×240 mm² aperture.

NOTE: The best commercially reasonable effort of the RMS surface figure error over central 250×250 mm² aperture is equal to 8 nm or less.

Verification method: R - review, T - test (Interferometric report)

REQ-028318/A

The RMS surface slope error of the OAP mirrors shall not exceed 2.5 μ rad (best effort ≤ 10 nm / 1 cm, ≤ 1 μ rad) for spatial periods from 1 to 10 mm for 95 % of the CAP.

Verification method: R - review, T - test (Interferometric report)

REQ-028319/A

The surface roughness over CAP of the OAP mirrors shall be $R_z < 5$ nm, $R_a < 0.7$ nm, R_q (RMS) $R_z < 0.9$ nm.

Verification method: R - review, T - test

REQ-028320/A

The scratch/dig of the reflective surface of the OAP mirrors shall be $\leq 60/40$ with a best effort to achieve $\leq 40/20$ S/D for full CA according to the MIL-PRF-13830B standard.

Verification method: R - review, T - test (Surfaces quality report)

REQ-028321/A

4 pcs 2-inch diameter substrates shall be manufactured from the exact same material and polished with the exact same surface finish as the OAP mirrors as representative witness samples of the OAP for surface tests and further coating LDT tests.

Verification method: R – review, I - inspection

3.3. Other requirements of the OAP mirrors

REQ-028322/A

The OAP mirrors shall be vacuum compatible. All specifications of this RSD document shall be met when the OAP mirrors are exposed to a vacuum of 10^{-6} mbar. In this working environment, the OAP mirrors shall also not outgas.

Verification method: R – review, A – analysis

REQ-028323/A

The back face of the OAP mirrors shall be fine ground, without a wedge, parallel to the tangent in OAP vertex.

Verification method: R - review, I – inspection (including photo documentation)

REQ-028324/A

The side face of the OAP mirrors shall have a mark indicating the plane with the optical axis and the focal point.

Verification method: I – inspection (including photo documentation)

REQ-028325/A

The chamfers of the OAP mirrors substrates shall comply with the reference drawing **RD-01** (see chapter 1.4; drawing N^o 00192575/01).

Verification method: R - review, T - test (Dimensional report)

REQ-028326/A

The lateral side of the OAP mirrors shall have the mounting interface in the form of a groove along 2 vertical sides as defined in the reference drawing **RD-01** (see chapter 1.4; drawing N^o 00192575/01) which is an inseparable part of the OAP mirrors requirements.

Verification method: R – review, T - test

REQ-028327/A

The OAP mirrors shall have a pictogram specifying the off-axis angle with respect to the optical axes.

Verification method: I – inspection (including photo documentation)

REQ-028328/A

The OAP mirrors shall have an OAP alignment feature on the rear surface of the OAP (~50 mm x 50 mm stripe) oriented perpendicular to the optical axis of the incoming parallel laser beam to allow the alignment of the parabola with the help of an autocollimator or similar metrology to the nominal tip and tilt angles of the parabola.

The final design and location shall be part of a 1-week design phase followed by the final approval of the CA.

Verification method: I – inspection (including photo documentation)

REQ-028329/A

The OAP mirrors shall have the following information engraved into the top of the substrate barrel:

□ **Part number:**

▽ ELI EX L3 OAP 0810 PQQAA LLLxWWWxTTT XXXXX ▽

□ **Mark (triangle) pointing to the HR coated front side S1**

*NOTE 1: The following **example** demonstrates the correct engraved information:*

▽ **ELI E3 L3 OAP 0810 PQQ30 310x290x080 00001** ▽

NOTE 2: This engraved information (see NOTE 1 above) denotes as follows (see Figure 1 below):

- ELI Beamlines,
- Experimental hall 3,
- L3 laser Off-Axis Parabolic mirror @ 810 nm,
- p-polarization, material quality QQ, Off-axis angle of 30°,
- Substrate size,
- Serial number,
- Triangles pointing to HR coated side S1.

*NOTE 3: Serial number of the ordered two OAPs shall be **00002** and **00003**.*

Verification method: I – inspection

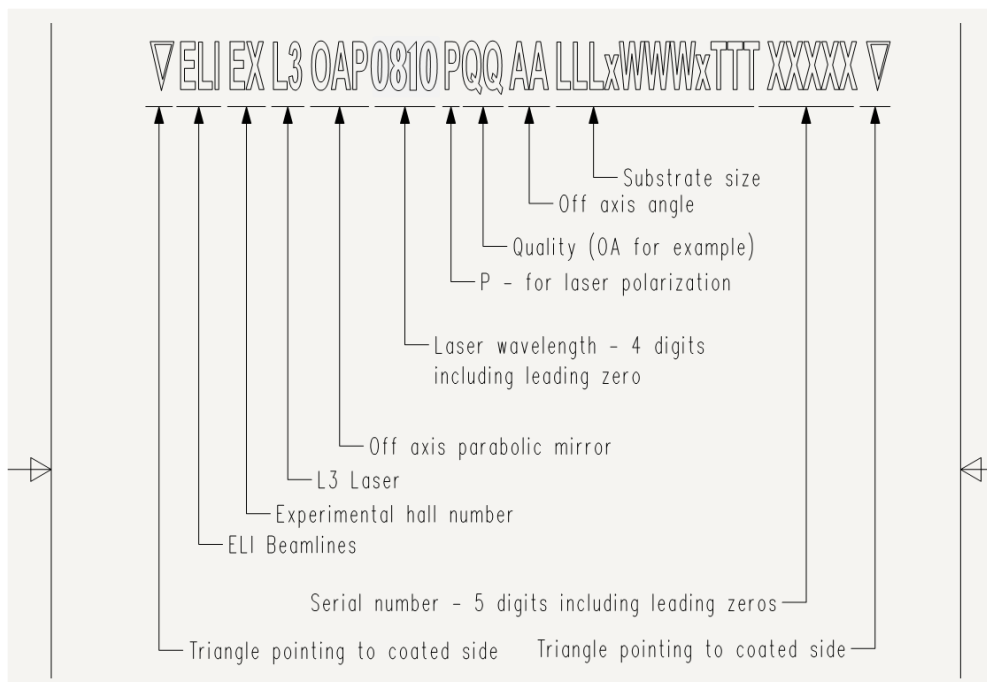
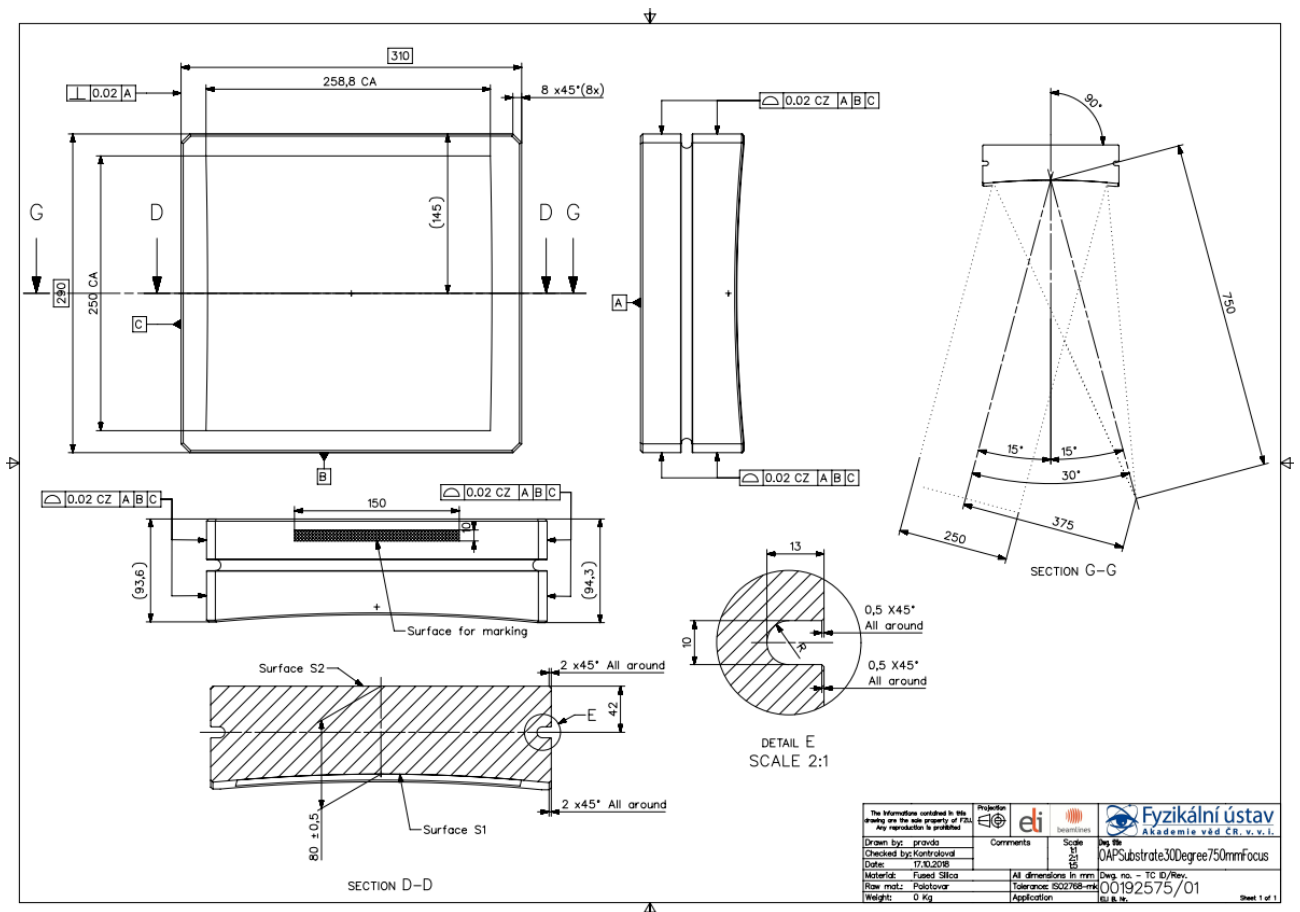


Figure 1: Marking of the OAP mirrors

Requirement TC ID / Rev.	Parameter / Property of the OAP mirrors	Specified value / Requirement	Quality report (see REQ-028344/A)	Verification Method
REQ-028309/A	Material	Corning HPFS 7980 fused silica, NIFS-I mirror grade or equivalent high power laser grade fused silica, fused Silika KV without any bubbles or other defects on the polished surface or ULE (Zerodur material is prohibited)	<i>III. Substrate material report or certificate</i>	R - review
REQ-028310/A	OAP mirrors shape (along the beam)	Rectangular in shape: (310±0-1) x (290±0-1) mm ²	<i>IV. Dimensional report</i>	R – review T - test
REQ-028311/A	Clear aperture (along the beam)	Squared with dimensions at least 250x250 mm ² and with rounded corners	—	R - review T - test
REQ-028312/A	Centre thickness	80 mm ± 0.5 mm	<i>IV. Dimensional report</i>	R – review T - test
REQ-028313/A	Off-axis angle	30.0 ± 0.5°	—	R – review T - test
REQ-028314/A	Off-axis distance from the vertex to the centre of the mirror	375 mm ± 1.5 mm	—	R - review
REQ-028315/A	Segment focal length (OAP vertex to the focal point)	750 mm ± 10 mm	—	R – review T - test
REQ-028316/A	Peak-to-valley (PV) surface figure error	≤ 105 nm PV over 240 x 240 mm ² aperture with best commercially reasonable effort to achieve a PV ≤ 63 nm	<i>I. Interferometric report</i>	R - review T – test
REQ-028317/A	RMS surface figure error	≤ 10 nm RMS (Power term removed) over 250 x 250 mm ² central aperture and to obtain the Strehl ratio $S = \exp[-2*(2*\pi*RMS (nm)/\lambda (nm))^2]$ of at least 0.99 over the central 240 x 240 mm ² aperture, best commercially reasonable effort to achieve: ≤ 8 nm RMS surface figure error	<i>I. Interferometric report</i>	R - review T - test
REQ-028318/A	RMS Surface slope error	≤ 2.5 μrad RMS, test wavelength (633±2) nm, Best effort: <1 μrad RMS	<i>I. Interferometric report</i>	R - review T - test
REQ-028320/A	Surface quality, Scratch/Dig (S/D)	≤ 60/40 with best effort to achieve ≤ 40/20 S/D per MIL-PRF-13830B	<i>II. Surface quality report</i>	R - review T - test
REQ-028319/A	Surface roughness/mid-spatial frequencies	Rz<5 nm, Ra<0.7 nm, Rq (RMS) Rz<0.9 nm	<i>I. Interferometric report</i>	R – review T – test
REQ-028322/A	Operational conditions	Vacuum compatible under vacuum level up to 10 ⁻⁶ mbar without materials outgassing	—	R - review A - analysis
REQ-028323/A	Backface	Fine ground, no wedge, parallel to tangent in OAP vertex, Commercial polish	—	R - review I – inspection
REQ-028324/A	Side face	Marking the position of the OAP optical axis: OAP (P3): 310x290 mm ² , 750 mm, 30°	—	I – inspection
REQ-028325/A	Chamfers	According to the drawing number 00192575/01 (see RD-01; chapter 1.4)	<i>IV. Dimensional report</i>	R – review, T - test
REQ-028326/A	Lateral side	Mounting interface in the form of a groove along 2 vertical sides according to the drawing number 00192575/01 (see RD-01; chapter 1.4)	—	R - review T – test

Requirement TC ID / Rev.	Parameter / Property of the OAP mirrors	Specified value / Requirement	Quality report (see REQ-028344/A)	Verification Method
REQ-028327/A	Pictogram	Specifying the off-axis angle with respect to the optical axes	—	I – inspection
REQ-028328/A	OAP tip/tilt rear surface alignment feature	on the rear surface of the OAP (~50 mm x 50 mm stripe) oriented perpendicular to the optical axis of the incoming parallel laser beam to allow the alignment of the parabola with the help of an autocollimator or similar metrology to the nominal tip and tilt angles of the parabola. The final design and location approved by the CA shall be part of a 1 week design phase.	—	I – inspection

Table 2: Summary of the specifications for the OAP mirrors

Figure 2: Overview of the OAP mirrors drawing for P3 platform: PD = 310x290 mm², CAP= 250x250 mm², SFL=750 mm, off axis angle = 30° (see chapter 1.4; **RD-01**).

4. Environmental requirements

REQ-028330/A

The Supplier and the CA shall agree on the cleaning method to clean the OAP mirrors without decreasing the mirror's properties and to avoid contamination of clean space.

NOTE: The cleaning methods may use high gas flow (dry and clean air or N₂) and specialized chemical cleaning liquids (alcohol, Isopropyl alcohol, demineralized water).

Verification method: R - review

5. Delivery requirements

REQ-028331/A

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

NOTE: The Supplier is fully responsible for the delivery of undamaged mirror.

Verification method: I - inspection

REQ-028332/A

The OAP mirrors shall be delivered in a protective container – preferably a PETG container – that shall not contact with the side of the OAP mirrors for coating and prevents its damage, degradation and contamination. The container shall then be sealed with ultra-low outgassing clean room tape and wrapped into 2 aluminized clean room 100 (ISO class 5 according to ČSN EN ISO 14644 or EN ISO 14644) compatible polyethylene bags. Packaging shall be performed in a clean environment.

Verification method: I – inspection, R – review

REQ-028333/A

The Supplier shall provide an appropriate shipping crate with shock and tilt watch and packaging material compliant for overseas shipping.

Verification method: I – inspection

REQ-028334/A

The serial number shall be clearly marked on the outer layer of the outermost aluminized polyethylene bag as well as on the bubble wrap. The outermost aluminized bag shall have a label: "To be opened only in the ISO class 6 clean rooms and by trained laser optics experts" as well as "FRAGILE – GLASS".

NOTE: The same labels should be applied on the outside of the shipping crate/box.

Verification method: I – inspection, R – review

6. Safety Requirements

REQ-028343/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 Device sale in the Czech Republic to fulfil the requirements of 2001/95/EC directive or applicable Czech law.

Verification method: I – inspection

7. Quality control

7.1. Quality Reports (QRs) before the OAP mirrors coating

REQ-028344/A

The Supplier shall perform a factory verification of the substrate and provide the following **specific quality reports for meeting corresponding requirements (I - IV)**:

- I. **Interferometric report** of the OAP mirrors surfaces with a map showing a departure from the ideal reflected wavefront in units of testing wavelength λ and in nm as well as wavefront RMS, gradient and mid spatial frequencies (see REQ-028316/A, REQ-028317/A, REQ-028318/A and REQ-028319/A).
- II. **Surface quality report** with scratch and dig map showing the locations of all defects (see REQ-028320/A).
- III. **Substrate material report** or certificate showing what is the material of the substrate (see REQ-028309/A).
- IV. **Dimensional report** providing information about a measured physical dimension of the manufactured product (see REQ-028310/A, REQ-028312/A and REQ-028325/A).

NOTE: The results of the factory verification of the substrates shall be provided to the CA in the corresponding specific QRs.

Verification method: R - review of report, I – inspection

7.2. Documentation and data control

REQ-028345/A

For each uncoated substrates, the Supplier shall provide a Declaration of Conformity (or the equivalent document) with technical requirements defined by the product RSD and ensure completeness of the products.

Verification method: I - inspection

REQ-028346/A

The Supplier shall supply the following relevant manufacturing documents (extent as stipulated in the contract):

- Full technical documentation on the mirror substrates (e.g. storage, cleaning, operation and maintenance instructions);
- Final manufacturing drawings approved by the CA (see REQ-028355/A);
- Specific quality reports (see REQ-028344/A) that demonstrate fulfilment of technical requirements described in chapter 3;
- All approved by the CA "requests for deviation/wavier from requirements described herein".

NOTE 1: Scope of the technical documentation and formats shall be agreed with the CA.

NOTE 2: The technical documentation including Quality Reports (see REQ-028344/A) shall be submitted electronically and on CD.

Verification method: R - review, I - inspection

REQ-028347/A

The manufacturing documents shall contain strictly the units which are used to define the requirements in chapter 3.

Verification method: R - review

REQ-028348/A

The manufacturing documents shall include the accuracy of the manufacturing process. This accuracy shall be also included in the corresponding QRs (see REQ-028344/A).

Verification method: R - review

REQ-028349/A

The Supplier shall use following data formats:

- *.JPG, *.PNG, *.TIFF, *.PDF/A, *.HTML, *.doc, *.docx, *.xls, *.xlsx, *.ppt, *.pptx, OpenDocument Format;
- CAD 2D: *.dwg;
- CAD 3D: *.stp, *.ste, *.step or other 3D CAD formats agreed with the CA;
- interferometer *.dat files.

Verification method: Not To Be Tracked within VCD

7.3. Nonconformity Control System

REQ-028351/A

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

Verification method: Not To Be Tracked within VCD

8. Verification requirements for the Supplier

8.1. Verification methods

REQ-028352/A

The verification shall be accomplished by the Supplier through one or more of the following verification methods:

1. **Review**; Verification via Review (**R**) shall consist of using approved records (examples of such approved records are design documents and reports, technical descriptions, and engineering drawings, manuals and accompanying operation documentation) or evidence that unambiguously shows that the requirement is met.
2. **Inspection**; Verification via Inspection (**I**) shall consist of a visual determination of physical characteristics including photographs taken by the Supplier and sent to the CA proving that the specific requirements have been met.
3. **Test**; Verification via Test (**T**) shall consist of measuring product performance and functions under realistic operating conditions.
4. **Analysis**; Verification via Analysis (**A**) shall consist of performing theoretical or empirical evaluations (e.g. mathematical models, calculations and etc.).

Verification method: Not To Be Tracked within VCD

8.2. Verification Control Document (VCD)

Verification Control Document (**VCD**) is a living document which shall be used throughout the entire Contract delivery and its phases (see chapter 8.3 Phasing of the delivery). The **VCD** provides traceability during delivery phases (Qualification of Design, Manufacturing, Acceptance, etc.).

The **VCD** represents a formal tool of communication between the Supplier and the CA (formal record, reporting tool).

The **VCD** will be provided by the CA and it can be accommodated to the Supplier's needs.

REQ-028353/A

The Supplier shall provide a Verification Control Document (VCD) for the reviews as agreed with the CA.

NOTE 1: Guidelines for VCD preparation will be provided by the CA.

NOTE 2: The form of VCD will be agreed between the CA and the Supplier based on the best commercial praxis used by the Supplier.

NOTE 3: The form of VCD will be agreed before completion of the Qualification Design phase (see chapter 8.3.1).

*NOTE 4: The VCD specifies **HOW** and **WHEN** each requirement is planned to be verified by the Supplier, when it was actually verified.*

Verification method: R - review

8.3. Phasing of the delivery

This chapter is intended to briefly summarize basic milestones of the Contract delivery. These milestones represent gates (checkpoints) where the quality of the delivery is to be evaluated.

Delivery shall not proceed past these gates unless their satisfactory accomplishment is approved by the CA.

Delivery lifecycle shall contain at least the following phases (**quality gates**):

- **Qualification of Design;**
- **Manufacturing;**
- **Acceptance.**

8.3.1. Qualification of Design

Summary of what has to be provided by the Supplier in terms of documentation (QRs and manufacturing drawings) before starting the manufacturing. The goal is to verify the **manufacturing drawings and design supporting documentation**.

The output of this phase is **Qualified Design and agreed scope of technical documentation**.

REQ-028354/A

Before completion of the Qualification Design phase the Supplier shall provide following information that shall be agreed by the CA:

- structure and content of the Quality Reports (QRs, see REQ-028344/A);
- structure and content of the VCD ready to be implemented (see REQ-028353/A).

Verification method: R - review

REQ-028355/A

Before completion of the Qualification Design phase the Supplier and the CA shall agree on:

- final manufacturing drawings (see REQ-028346/A);
- detailed procedures related to the testing during Manufacturing phase (see chapter 8.3.2 Manufacturing);
- common nonconformity control system (see REQ-028351/A).

Verification method: R - review

8.3.2. Manufacturing

The goal is to demonstrate that the manufactured product meet the specified technical requirements (RSD) of the CA.

This quality gate concerns primarily:

- **Inspection of manufactured product;**
- **Testing at the Supplier's site** (factory testing);
- **Cleaning, Packaging and shipping.**

Output of this phase is the **Verified Final Product**.

REQ-028356/A

The results of the Manufacturing phase of verification shall be recorded by the Supplier in the appropriate **QRs** (or in other factory/quality reports, if not specified in chapter 7.1) and overall results (including review of documentation/reports and inspection of product) shall be recorded in the **VCD** (see chapters 8.2).

NOTE: The results of all the tests shall be given strictly in units which are used to define the requirements in chapter 3.

Verification method: R - review

REQ-028357/A

The final issue of the VCD shall be submitted to the CA after the approval of the last report, within the time frame agreed with the CA in the VCD (see chapter 8.2).

Verification method: R - review

8.3.3. Acceptance

The Acceptance phase shall demonstrate the following:

- Final products have been successfully verified and this process has been documented in an appropriate way through the QRs (see REQ-028344/A) and the VCD (see REQ-028353/A);
- All detected nonconformities have been solved in accordance with REQ-028351/A;
- Final products are free of fabrication errors.

The basis for acceptance will be completed VCD summarizing the overall verification results together with relevant documentation supporting the verification (i.e. QRs, approved manufacturing drawings, Declaration of conformity and etc.).

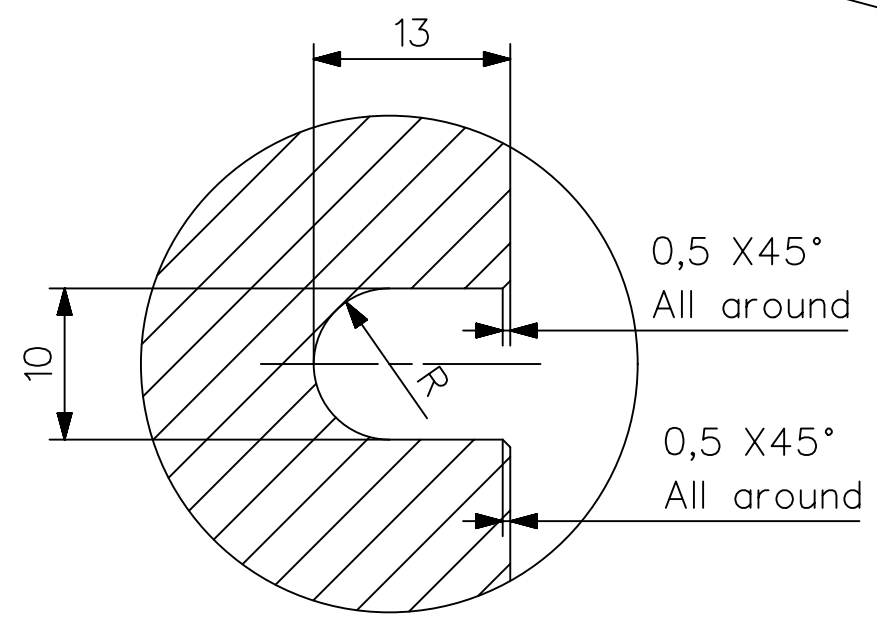
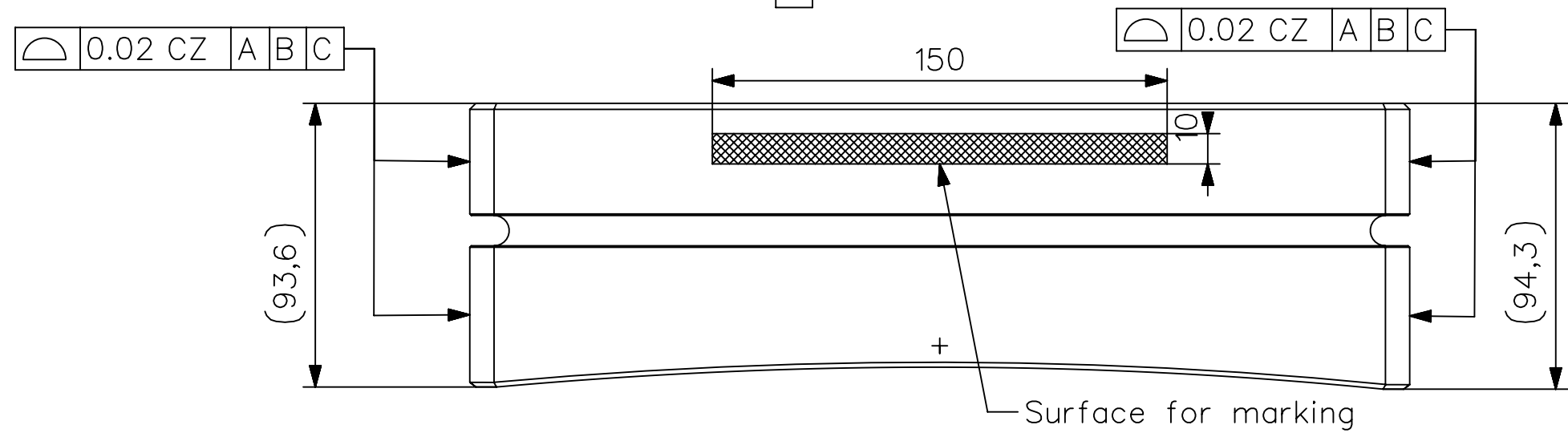
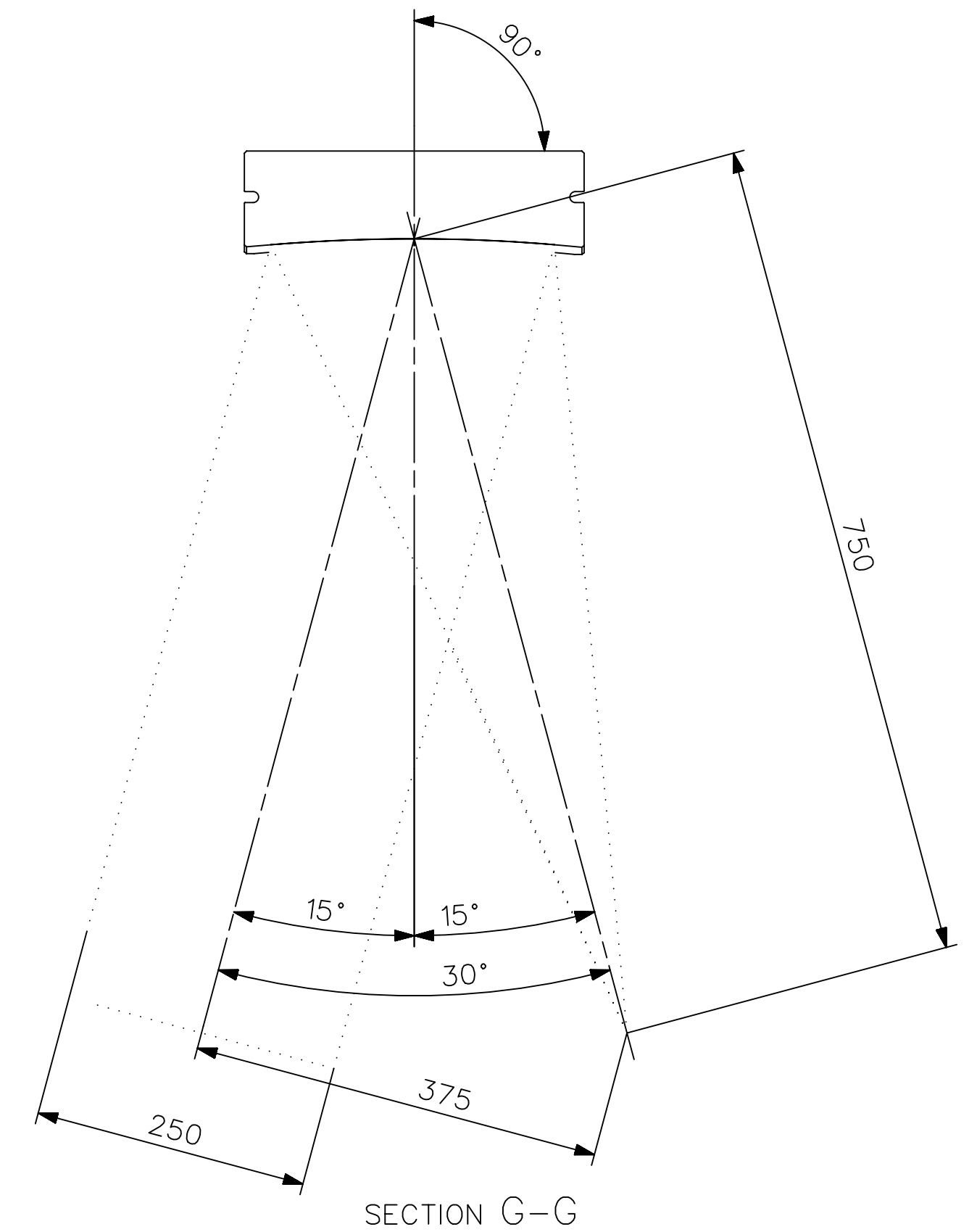
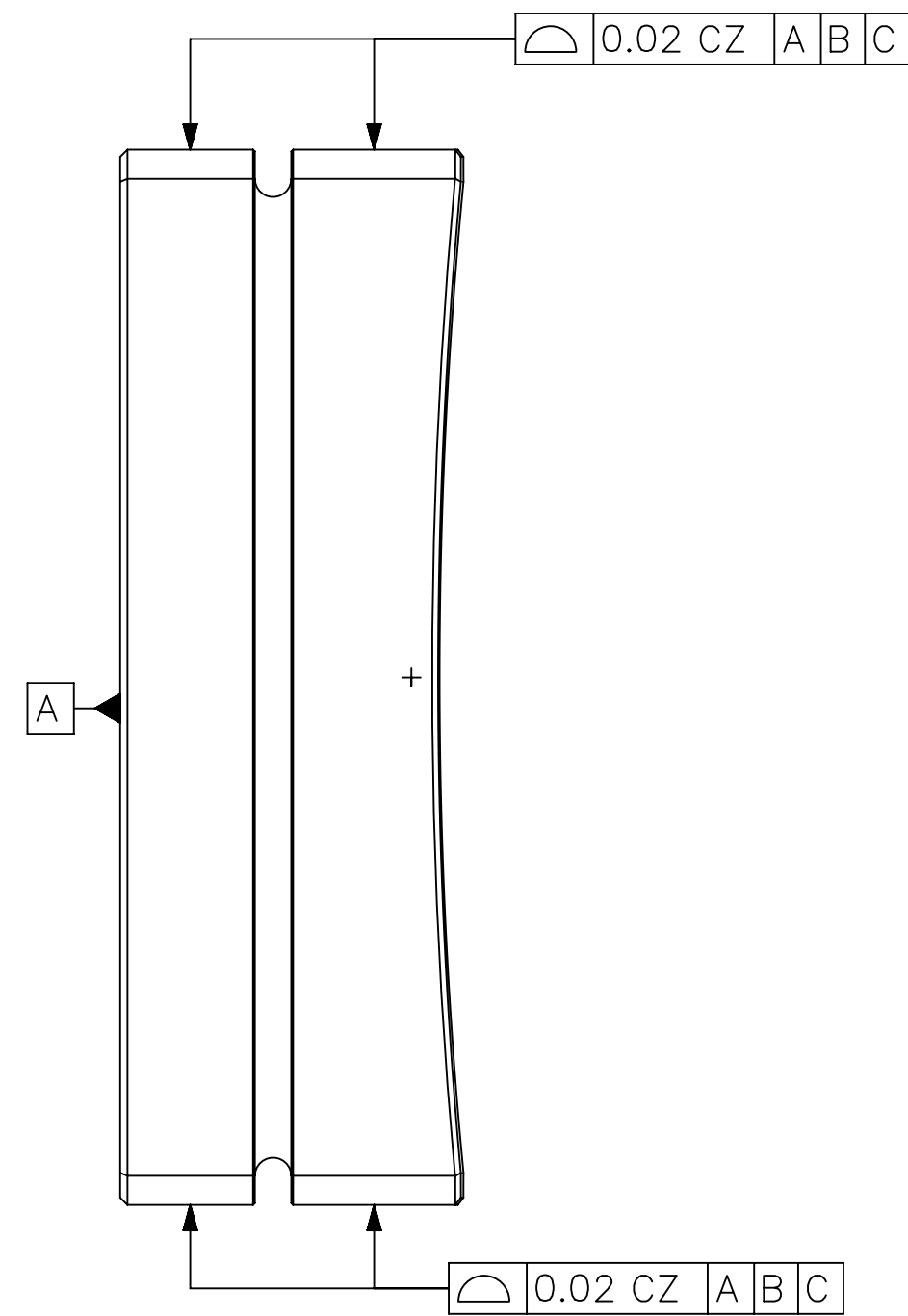
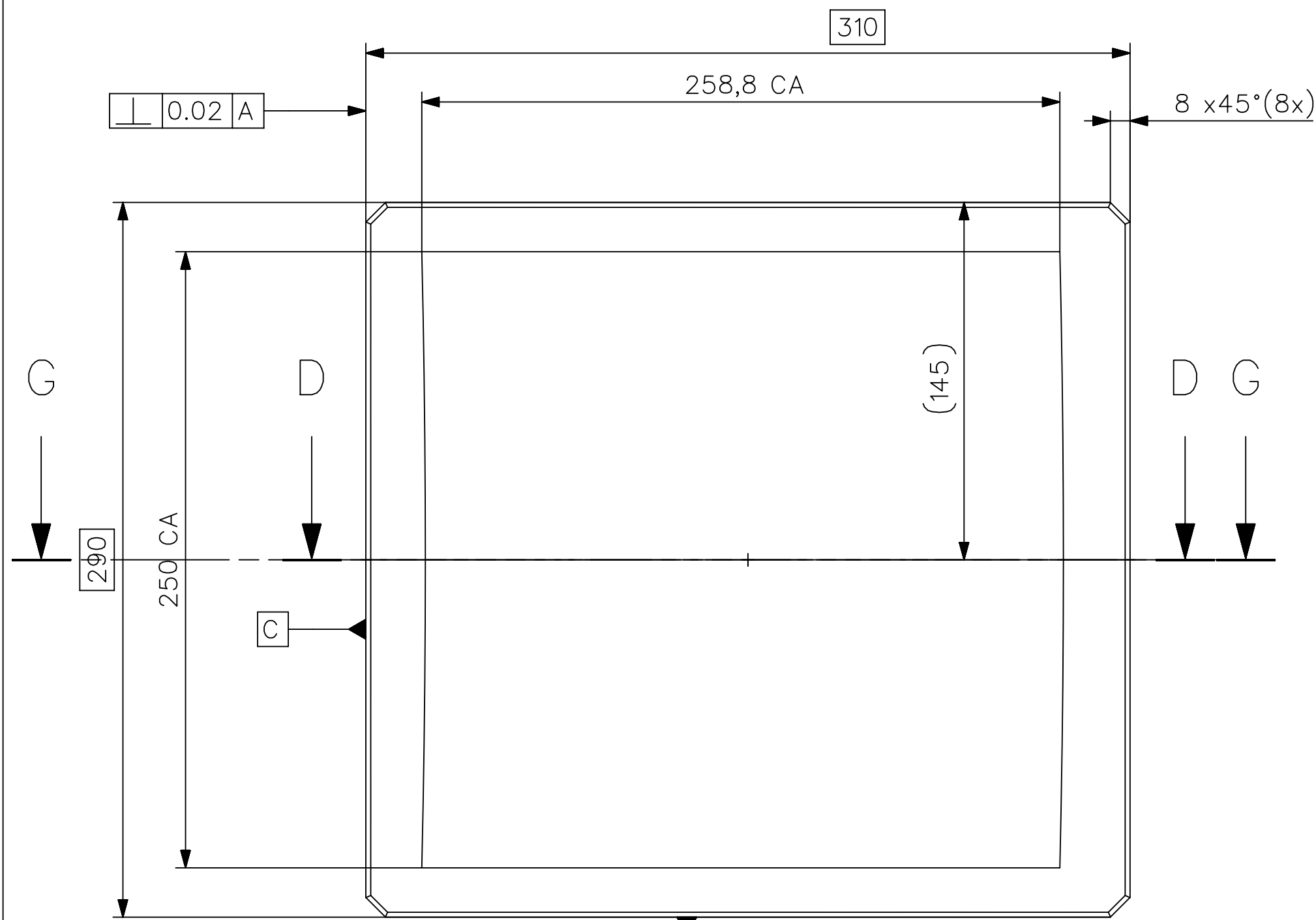
In case of successful acceptance phase, the CA will provide to the Supplier signed acceptance protocol. In case of unsuccessful acceptance stage, the CA will provide to the Supplier a Nonconformity Report (NCR) and process in accordance with REQ-028351/A shall be applied.

REQ-028358/A

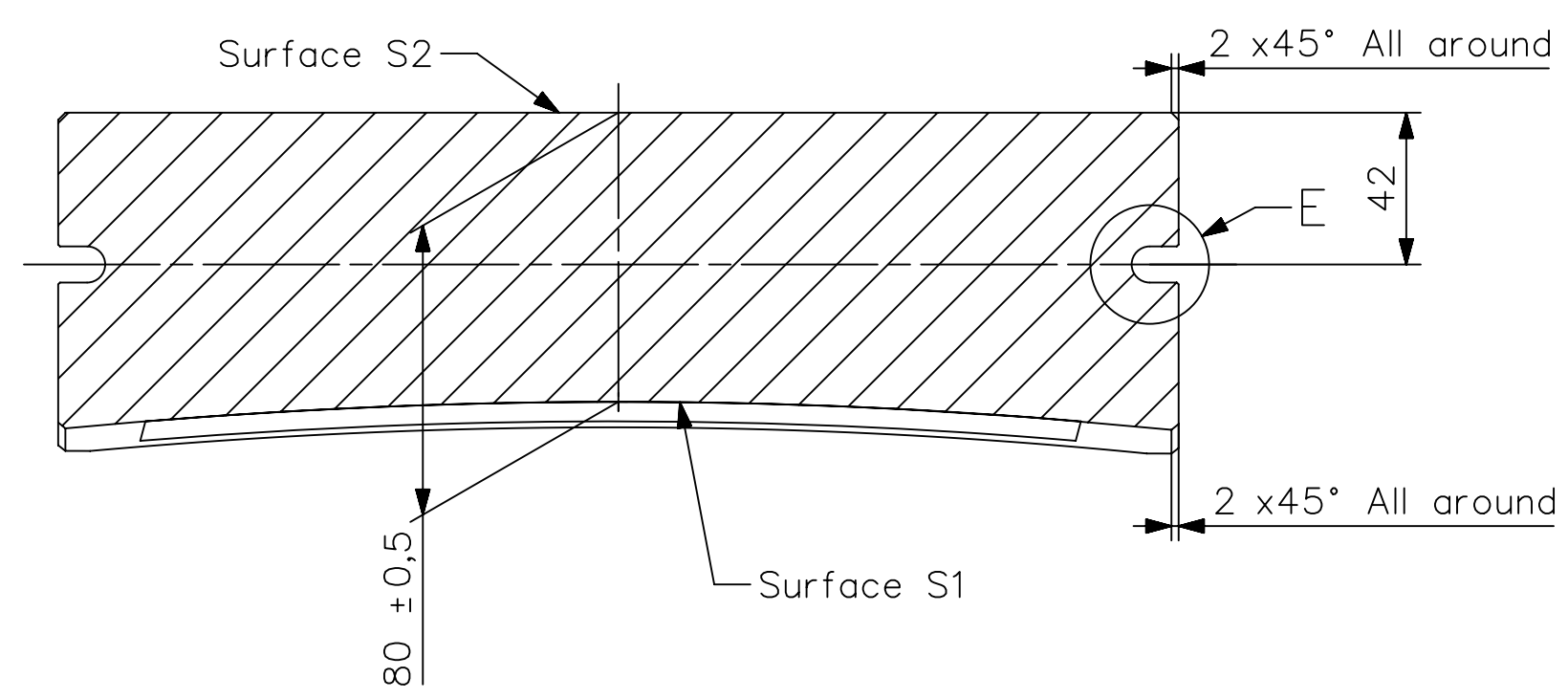
Verification process shall be carried out by the Supplier and it is successfully completed when the OAP mirrors comply with all specifications and the results of this process are documented in an appropriate way through QRs (see REQ-028344/A) and the VCD (see REQ-028353/A).

NOTE: Acceptance will be carried out by the CA (or if required, representatives/contractors appointed by the CA) upon delivery of the OAP mirrors not obviously damaged during transport.

Verification method: Not To Be Tracked within VCD



DETAIL E
SCALE 2:1



SECTION D-D

The informations contained in this drawing are the sole property of FZU. Any reproduction is prohibited		Projection	eli beamlines	Fyzikální ústav Akademie věd ČR, v. v. i.
Drawn by: pravda	Comments	Scale 1:1 2:1 1:5	Dwg. title	
Checked by: Kontroloval			OAPSubstrate30Degree750mmFocus	
Date: 17.10.2018			Dwg. no. - TC ID/Rev.	
Material: Fused Silica	All dimensions in mm	00192575/01		
Raw mat.: Polotovar	Tolerance: ISO2768-mk	ELI B. Nr.		
Weight: 0 Kg	Application	Sheet 1 of 1		

Program: [5.4.0.0 - RP5 Laser plasma and high-energy-density physics]
Subject: [Large size uncoated OAP mirrors for P3]. Verification Control Document (VCD)
Specification: [TC ID # 00251417/C - RSD_Large size uncoated OAP mirrors for P3_TP20_029]

<i>RSS TC ID # 020023/A.003; Large size uncoated OAP mirrors for P3_TP20_029</i>							
Requirement TC ID	Rev.	Requirement text	Verification Method	VM clarification (see also QRs, REQ-028344/A)	Close-out	Verification Record Document (ID # QR or protocol, declaration, etc., page #)	Comments
					Yes / No		
2. General requirement							
REQ-028308	A	The Supplier shall provide 2 pcs of the uncoated OAP mirrors in accordance with the requirements described in chapter 3. NOTE: The following Table 1 provides numbering (and name) of the requested OAP mirrors according to their basic specifications. This notation will be used when referring to the particular OAP mirror.	R - review, I - inspection				
3. Functional, Performance and Design requirements							
REQ-028309	A	The substrate material of the OAP mirrors shall be manufactured from coming HPFS 7980, Fused Silica KV without any bubbles or other defects on the polished surface, NIFS-I mirror grade or equivalent quality high-power laser grade fused silica or, high-power laser compatible ULE. NOTE: Zerodur and other mirror grades, that are susceptible to ionizing radiation damage, are prohibited to use.	R - review	Substrate material report with compliance certificate			
REQ-028310	A	The OAP mirrors (along the beam) shall be rectangular in shape with the physical dimension of (310+0-1) x (290+0-1) mm ² . NOTE 1: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A). NOTE 2: The dimensions shall correspond to the requirements given in the reference drawing RD-01 (see chapter 1.4; drawing № 00192575/01) which is an inseparable part of the OAP mirrors requirements.	R - review, T - test	Dimensional report			
REQ-028311	A	The clear aperture of the OAP mirrors (along the incoming collimated laser beam) shall be square (centre of the clear aperture is the mirror centre). The clear aperture shall be squared with dimensions of at least 250 x 250 mm ² and with rounded corners.	R - review, T - test				
REQ-028312	A	The centre thickness of the OAP mirrors shall be (80 ± 0.5) mm. NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).	R - review, T - test	Dimensional report			
REQ-028313	A	The off-axis angle of the OAP mirrors shall be 30.0° (angle subtended between the segment axis and the segment focal length). NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).	R - review, T - test				
REQ-028314	A	The off-axis distance (to the centre of the OAP mirror) shall be (375 ± 1.5) mm. NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).	R - review				
REQ-028315	A	The segment focal length (vertex of the OAP mirror to the focal point) shall be (750 ± 10) mm. NOTE: The Supplier and the CA shall agree on the tolerance during the design phase that shall be given in the manufacturing documents (see REQ-028346/A).	R - review, T - test				

Program: [5.4.0.0 - RP5 Laser plasma and high-energy-density physics]
Subject: [Large size uncoated OAP mirrors for P3]. Verification Control Document (VCD)
Specification: [TC ID # 00251417/C - RSD_Large size uncoated OAP mirrors for P3_TP20_029]

RSS TC ID # 020023/A.003;Large size uncoated OAP mirrors for P3_TP20_029							
Requirement TC ID	Rev.	Requirement text	Verification Method	VM clarification (see also QRs, REQ-028344/A)	Close-out	Verification Record Document (ID # QR or protocol, declaration, etc., page #)	Comments
					Yes / No		
REQ-028316	A	The Peak-to-valley (PV) surface figure error of the OAP mirrors shall be less than 105 nm peak-to-valley over at least 240 x 240 mm2 with best commercially reasonable effort to achieve a PV ≤ 63 nm.	R - review, T - test	Interferometric report			
REQ-028317	A	The RMS surface figure error of the OAP mirrors shall be lower than 10 nm (best effort ≤ 8 nm) for spatial periods > 10 mm over the central 250 mm x 250 mm aperture to obtain the Strehl ratio $S = \exp[-2*(2*\pi*RMS (nm)/\lambda (nm))^2]$ of at least 0.99 over the central 240 x 240 mm2 aperture. NOTE: The best commercially reasonable effort of the RMS surface figure error over central 250 x 250 mm2 aperture is equal to 8 nm or less.	R - review, T - test	Interferometric report			
REQ-028318	A	The RMS surface slope error of the OAP mirrors shall not exceed 2.5 μrad (best effort ≤ 10 nm / 1 cm, ≤1 μrad) for spatial periods from 1 to 10 mm for 95 % of the CAP.	R - review, T - test	Interferometric report			
REQ-028319	A	The surface roughness over CAP of the OAP mirrors shall be Rz < 5 nm, Ra < 0.7 nm, Rq (RMS) Rz < 0.9 nm.	R - review, T - test				
REQ-028320	A	The scratch/dig of the reflective surface of the OAP mirrors shall be ≤ 60/40 with a best effort to achieve ≤ 40/20 S/D for full CA according to the MIL-PRF-13830B standard.	R - review, T - test	Surfaces quality report			
REQ-028321	A	4 pcs 2-inch diameter substrates shall be manufactured from the exact same material and polished with the exact same surface finish as the OAP mirrors as representative witness samples of the OAP for surface tests and further coating LDT tests.	R - review, I - inspection				
REQ-028322	A	The OAP mirrors shall be vacuum compatible. All specifications of this RSD document shall be met when the OAP mirrors are exposed to a vacuum of 10-6 mbar. In this working environment, the OAP mirrors shall also not outgas.	R - review, A - analysis				
REQ-028323	A	The back face of the OAP mirrors shall be fine ground, without a wedge, parallel to the tangent in OAP vertex.	R - review, I - inspection	Including photo documentation			
REQ-028324	A	The side face of the OAP mirrors shall have a mark indicating the plane with the optical axis and the focal point.	I - inspection	Including photo documentation			
REQ-028325	A	The chamfers of the OAP mirrors substrates shall comply with the reference drawing RD-01 (see chapter 1.4; drawing № 00192575/01).	R - review, T - test	Dimensional report			
REQ-028326	A	The lateral side of the OAP mirrors shall have the mounting interface in the form of a groove along 2 vertical sides as defined in the reference drawing RD-01 (see chapter 1.4; drawing № 00192575/01) which is an inseparable part of the OAP mirrors requirements.	R - review, T - test				
REQ-028327	A	The OAP mirrors shall have a pictogram specifying the off-axis angle with respect to the optical axes.	I - inspection	Including photo documentation			
REQ-028328	A	The OAP mirrors shall have an OAP alignment feature on the rear surface of the OAP (~50 mm x 50 mm stripe) oriented perpendicular to the optical axis of the incoming parallel laser beam to allow the alignment of the parabola with the help of an autocollimator or similar metrology to the nominal tip and tilt angles of the parabola. The final design and location shall be part of a 1-week design phase followed by the final approval of the CA.	I - inspection	Including photo documentation			

Program: [5.4.0.0 - RP5 Laser plasma and high-energy-density physics]
Subject: [Large size uncoated OAP mirrors for P3]. Verification Control Document (VCD)
Specification: [TC ID # 00251417/C - RSD_Large size uncoated OAP mirrors for P3_TP20_029]

<i>RSS TC ID # 020023/A.003; Large size uncoated OAP mirrors for P3_TP20_029</i>							
Requirement TC ID	Rev.	Requirement text	Verification Method	VM clarification (see also QRs, REQ-028344/A)	Close-out	Verification Record Document (ID # QR or protocol, declaration, etc., page #)	Comments
					Yes / No		
REQ-028329	A	The OAP mirrors shall have the following information engraved into the top of the substrate barrel: <ul style="list-style-type: none"> • Part number: <ul style="list-style-type: none"> ▼ ELI EX L3 OAP 0810 PQQAA LLLxWWWxTTT XXXXX ▼ • Mark (triangle) pointing to the HR coated front side S1 NOTE 1: The following example demonstrates the correct engraved information: <ul style="list-style-type: none"> ▼ ELI E3 L3 OAP 0810 PQQ30 310x290x080 00001 ▼ NOTE 2: This engraved information (see NOTE 1 above) denotes as follows (see Figure 1 below): <ul style="list-style-type: none"> • ELI Beamlines, • Experimental hall 3, • L3 laser Off-Axis Parabolic mirror @ 810 nm, • p-polarization, material quality QQ, Off-axis angle of 30°, • Substrate size, • Serial number, • Triangles pointing to HR coated side S1. NOTE 3: Serial number of the ordered two OAPs shall be 00002 and 00003. 	I - inspection				
4. Environmental requirements							
REQ-028330	A	The Supplier and the CA shall agree on the cleaning method to clean the OAP mirrors without decreasing the mirror's properties and to avoid contamination of clean space. NOTE: The cleaning methods may use high gas flow (dry and clean air or N2) and specialized chemical cleaning liquids (alcohol, Isopropyl alcohol, demineralized water).	R - review				
5. Delivery requirements							
REQ-028331	A	The transportation to the final destination of the OAP mirrors shall be conducted by the Supplier. NOTE: The Supplier is fully responsible for the delivery of undamaged mirror.	I - inspection				
REQ-028332	A	The OAP mirrors shall be delivered in a protective container – preferably a PETG container – that shall not contact with the side of the OAP mirrors for coating and prevents its damage, degradation and contamination. The container shall then be sealed with ultra-low outgassing clean room tape and wrapped into 2 aluminized clean room 100 (ISO class 5 according to ČSN EN ISO 14644 or EN ISO 14644) compatible polyethylene bags. Packaging shall be performed in a clean environment.	R - review, I - inspection				
REQ-028333	A	The Supplier shall provide an appropriate shipping crate with shock and tilt watch and packaging material compliant for overseas shipping.	I - inspection				
REQ-028334	A	The serial number shall be clearly marked on the outer layer of the outermost aluminized polyethylene bag as well as on the bubble wrap. The outermost aluminized bag shall have a label: "To be opened only in the ISO class 6 clean rooms and by trained laser optics experts" as well as "FRAGILE – GLASS". NOTE: The same labels should be applied on the outside of the shipping crate/box.	R - review, I - inspection				
6. Safety Requirements							

Program: [5.4.0.0 - RP5 Laser plasma and high-energy-density physics]
Subject: [Large size uncoated OAP mirrors for P3]. Verification Control Document (VCD)
Specification: [TC ID # 00251417/C - RSD_Large size uncoated OAP mirrors for P3_TP20_029]

<i>RSS TC ID # 020023/A.003;Large size uncoated OAP mirrors for P3_TP20_029</i>							
Requirement TC ID	Rev.	Requirement text	Verification Method	VM clarification (see also QRs, REQ-028344/A)	Close-out	Verification Record Document (ID # QR or protocol, declaration, etc., page #)	Comments
					Yes / No		
REQ-028343	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 Device sale in the Czech Republic to fulfil the requirements of 2001/95/EC directive or applicable Czech law.	I - inspection				
7. Quality control							
REQ-028344	A	The Supplier shall perform a factory verification of the substrate and provide the following specific quality reports for meeting corresponding requirements (I - IV): Interferometric report of the OAP mirrors surfaces with a map showing a departure from the ideal reflected wavefront in units of testing wavelength λ and in nm as well as wavefront RMS, gradient and mid spatial frequencies (see REQ-028316/A, REQ-028317/A, REQ-028318/A and REQ-028319/A). Surface quality report with scratch and dig map showing the locations of all defects (see REQ-028320/A). Substrate material report or certificate showing what is the material of the substrate (see REQ-028309/A). Dimensional report providing information about a measured physical dimension of the manufactured product (see REQ-028310/A, REQ-028312/A and REQ-028325/A). NOTE: The results of the factory verification of the substrates shall be provided to the CA in the corresponding specific QRs.	R - review of report, I - inspection				
REQ-028345	A	For each uncoated substrates, the Supplier shall provide a Declaration of Conformity (or the equivalent document) with technical requirements defined by the product RSD and ensure completeness of the products.	I - inspection				
REQ-028346	A	The Supplier shall supply the following relevant manufacturing documents (extent as stipulated in the contract): Full technical documentation on the mirror substrates (e.g. storage, cleaning, operation and maintenance instructions); Final manufacturing drawings approved by the CA (see REQ-028355/A); Specific quality reports (see REQ-028344/A) that demonstrate fulfilment of technical requirements described in chapter 3; All approved by the CA "requests for deviation/wavier from requirements described herein". NOTE 1: Scope of the technical documentation and formats shall be agreed with the CA. NOTE 2: The technical documentation including Quality Reports (see REQ-028344/A) shall be submitted electronically and on CD.	R - review, I - inspection				
REQ-028347	A	The manufacturing documents shall contain strictly the units which are used to define the requirements in chapter 3.	R - review				
REQ-028348	A	The manufacturing documents shall include the accuracy of the manufacturing process. This accuracy shall be also included in the corresponding QRs (see REQ-028344/A).	R - review				
8. Verification requirements for the Supplier							

Program: [5.4.0.0 - RP5 Laser plasma and high-energy-density physics]
Subject: [Large size uncoated OAP mirrors for P3]. Verification Control Document (VCD)
Specification: [TC ID # 00251417/C - RSD_Large size uncoated OAP mirrors for P3_TP20_029]

<i>RSS TC ID # 020023/A.003;Large size uncoated OAP mirrors for P3_TP20_029</i>							
Requirement TC ID	Rev.	Requirement text	Verification Method	VM clarification (see also QRs, REQ-028344/A)	Close-out	Verification Record Document (ID # QR or protocol, declaration, etc., page #)	Comments
					Yes / No		
REQ-028353	A	The Supplier shall provide a Verification Control Document (VCD) for the reviews as agreed with the CA. NOTE 1: Guidelines for VCD preparation will be provided by the CA. NOTE 2: The form of VCD will be agreed between the CA and the Supplier based on the best commercial praxis used by the Supplier. NOTE 3: The form of VCD will be agreed before completion of the Qualification Design phase (see chapter 8.3.1). NOTE 4: The VCD specifies HOW and WHEN each requirement is planned to be verified by the Supplier, when it was actually verified.	R - review				
REQ-028354	A	Before completion of the Qualification Design phase the Supplier shall provide following information that shall be agreed by the CA:structure and content of the Quality Reports (QRs, see REQ-028344/A);structure and content of the VCD ready to be implemented (see REQ-028353/A).	R - review				
REQ-028355	A	Before completion of the Qualification Design phase the Supplier and the CA shall agree on:final manufacturing drawings (see REQ-028346/A);detailed procedures related to the testing during Manufacturing phase (see chapter 8.3.2 Manufacturing);common nonconformity control system (see REQ-028351/A).	R - review				
REQ-028356	A	The results of the Manufacturing phase of verification shall be recorded by the Supplier in the appropriate QRs (or in other factory/quality reports, if not specified in chapter 7.1) and overall results (including review of documentation/reports and inspection of product) shall be recorded in the VCD (see chapters 8.2). NOTE: The results of all the tests shall be given strictly in units which are used to define the requirements in chapter 3.	R - review				
REQ-028357	A	The final issue of the VCD shall be submitted to the CA after the approval of the last report, within the time frame agreed with the CA in the VCD (see chapter 8.2).	R - review				

Most of Supplier activities related to the realization of Client requirements ongoing outside the Client direct control scope. Due to this fact, the Supplier shall execute the required verification using the verification methods prescribed by the Client. For this purpose, the Client requires creating Verification control document VCD.

The VCD document represents a list of Client requirements which fulfilment shall be verified by the Supplier at the suitable time.

The VCD serves for the gradual recording of executed verifications by the Supplier during the Contract realization. The records consist of date (time) when the verification was executed, by whom, the result (OK/NOK or YES/NO) and usually also refer to the related document as evidence that the result of verification was OK.

For example, the Client needs some part to be produced from a specific material. The Supplier ensured the material and before the production starts some employee verifies that the part will be produced from that material, then it is produced and, finally, it was produced from that material. It is fully under Supplier responsibility of how this verification will be established. The Client only requires the Supplier to execute the verification and provide reliable evidence about it.

The Client requires the Supplier will use the VCD document provided by the Client. The Supplier can extend and adapt the VCD document for better reflection to the real condition and fulfilment of the basic purpose of the VCD – to document and demonstrate the results of verification and fulfilment of Client requirements.

Verification control document VCD includes:

1. List of requirements which shall be verified (requirement wording and its TC ID number)
2. Verification method which shall be used for verification of related requirement
3. Result of the verification
4. Reference to related documents – evidence which confirm the results of the verification.

Verification methods recommended by the Client:

1. Test – real verification that the subject of delivery fulfils required parameters usually carried out under controlled conditions, as close as possible to real operation. As documented evidence usually serves the Test protocol with test

results or the complete Test report (Test - T)

- a. Test at the Supplier (Factory Acceptance Test – FAT)
 - b. Test at the Client (Site Acceptance Test – SAT)
2. Review – verification that the Documentation meets the requirements or the Documentation documents fulfilment of the requirements (Review – R)
- A. Inspection – visual evaluation physical characteristics of the subject whether to meet the requirements (Inspection – I).