



## 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: prof. Jan Řídký, DrSc. – director  
("Buyer"); and
- (2) **DELONG INSTRUMENTS a.s.**  
with its registered office at: Palackého třída 3019/153b, Královo Pole, 612 00 Brno  
registration no.: 46903879  
represented by: Ing. Tomáš Papírek, member of the board  
("Supplier").

(The Buyer and the Supplier 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 a project „*ELI: Extreme Light Infrastructure - Phase 2*“, registration number CZ.02.1.01/0.0/0.0/15\_008/0000162 ("Project"), within the Operational Program Research, Development and Education.
- (B) For the successful realization of the Project it is necessary to purchase the Object of Purchase (as defined below) in accordance with Rules for the Selection of Suppliers within the Research, Development and Education Operational Program.
- (C) The Supplier's bid for the public procurement entitled "*Optomechanical grating mounts for the L3 compressor*", whose purpose was to procure the Object 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 Supplier shall deliver to the Buyer the equipment that is described in Annex 1 (*Technical Specification*) to this Contract, in the quality described therein including related services ("**Object of Purchase**"), and shall transfer to the Buyer ownership right to the Object of Purchase, and the Buyer shall take over the Object of Purchase and shall pay the Supplier the Purchase Price (as defined below), all under the terms and conditions stipulated in this Contract.
- 1.2 Under this Contract the Supplier shall also carry out the following activities ("**Related Activities**"):
- a) Verification that the Object of Purchase meets all requirements stipulated in this Contract;
  - b) Tests and verification that the Object of Purchase is fully functional;
  - c) Transport of the Object of Purchase to the place of delivery;
  - d) to elaborate and hand over to the Buyer Product User Manual to the Object of Purchase in the extent specified in Annex 1 (*Technical Specification*) and any other documents which are necessary for the proper takeover and use of the Object of Purchase in English language;
  - e) Cooperation with the Buyer during the performance of this Contract;
  - f) to provide information on executed or outgoing check of the Object of Purchase. At least this information shall include the declaration of conformity with technical requirements defined in Annex 1 (*Technical Specification*);
  - g) to establish and maintain a non-conformance control system compatible with CSN EN ISO 9001 : 2010 edition 2.
- 1.3 The Supplier promises to the Buyer that if for the fulfillment of the requirements of the Buyer under this Contract or the proper operation of the Object of Purchase are necessary other deliveries and activities not mentioned in this Contract, the Seller shall procure such deliveries or shall carry out such activities at its own expense without any effect on the Purchase Price.

**2. THE PLACE OF DELIVERY**

The place of delivery is: Fyzikální ústav AV ČR v.v.i/ ELI Beamlines, Za Radnicí 836, 252 41 Dolní Břežany, Czech Republic.

**3. THE TIME OF DELIVERY**

The Supplier shall deliver the Object of Purchase and shall carry out Related Activities within 4 months from the effectiveness of this Contract.



#### 4. THE OWNERSHIP RIGHT

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

#### 5. PRICE AND PAYMENT TERMS

- 5.1 The purchase price for the Object of Purchase is 1 920 700 CZK ("Purchase Price") without value added tax ("VAT"). VAT will be paid in accordance with the applicable legal regulations.
- 5.2 The Purchase Price cannot be exceeded and includes all costs and expenses of the Supplier related to the performance of this Contract. The Purchase Price includes, among others, all expenses related to the delivery of the Object of Purchase and execution of Related Activities, costs of copyright, insurance, customs, warranty service and any other costs and expenses connected with the performance of this Contract.
- 5.3 The Purchase Price for the Object of Purchase shall be paid in CZK on the basis of a tax document – invoice, to the account of the Supplier specified in the invoice. The Supplier is entitled to issue the invoice after signature of the Handover Protocol. Copy of the Handover Protocol must be attached to the invoice. The invoice must be delivered to the Buyer immediately after the signature of the Handover Protocol.
- 5.4 The Buyer shall realize the payment on the basis of duly issued invoice within 30 days from receipt thereof. 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 Supplier's account.
- 5.5 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 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 of a project "ELI: EXTREME LIGHT INFRASTRUCTURE – Phase 2", registr. number CZ.02.1.01/0.0/0.0/15\_008/0000162.

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



5.6 In case that the invoice shall not contain the above mentioned information, the Buyer 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 Buyer.

## 6. SUPPLIER'S DUTIES

6.1 The Supplier shall ensure that the Object of Purchase and Related Activities are in compliance with this Contract including all its annexes.

6.2 During performance of this Contract the Supplier proceeds independently. If the Seller receives instructions from the Buyer, the Supplier shall follow such instructions unless these are against the law or in contradiction to this Contract. If the Supplier 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 Supplier must notify the Buyer.

## 7. HANDOVER OF THE OBJECT OF PURCHASE

7.1 Handover and takeover of the Object of Purchase shall be realized on the basis of a handover protocol.

7.2 If the Supplier fails to duly carry out all Related Activities or if the Object of Purchase does not meet requirements of this Contract, the Buyer is entitled to refuse the takeover of the Object of Purchase. In such a case the Supplier shall remedy the deficiencies within ten (10) working days, unless Parties agree otherwise. The Buyer is entitled (but not obliged) to take over the Object of Purchase despite the above mentioned deficiencies, in particular if such deficiencies do not prevent the Buyer in the proper operation of the Object of Purchase. In such a case the Supplier and the Buyer shall list the deficiencies in the handover protocol, including the manner and the date of their removal (remedy). If the Parties do not reach agreement in the handover protocol regarding the date of the removal, the Supplier shall remove the deficiencies within ten (10) working days.

## 8. WARRANTY

8.1 The Supplier shall provide a warranty of quality of the Object of Purchase for the period of 24 months.

8.2 The warranty period shall begin on the day of execution of the Handover Protocol by both Parties. If the Handover Protocol lists any deficiencies, the warranty period shall begin on the day, which follows the day, in which the last deficiency was removed.

8.3 The Supplier shall remove defects that occur during the warranty period free of charge and in the terms stipulated in this Contract.

8.4 If the Buyer ascertains a defect of the Object of Purchase during the warranty period, the Buyer shall notify the Supplier such defect without undue delay. Defects may be notified on the last day of warranty period, at the latest.



The Buyer notifies defects in writing via e-mail. The Supplier shall accept notifications of defects on the following e-mail address: [service@dicomps.com](mailto:service@dicomps.com). The Supplier shall confirm within 2 working days from the receipt of the notification.

- 8.5 In the notification the Buyer shall describe the defect and the manner of removal of the defect. The Buyer has the right to:
- a) ask for the removal of the defect by the delivery of new Object of Purchase or its individual parts, or
  - b) ask for the removal of the defect by repair, or
  - c) ask for the reasonable reduction of the Purchase Price.

The choice among the above mentioned rights belongs to the Buyer. In case of a defect which is repairable and occurs for the first time the Buyer is not entitled to request delivery of a new Object of Purchase. The Buyer is also entitled to withdraw from this Contract, if by delivering the Object of Purchase with defects this Contract is substantially breached.

- 8.6 The Seller shall remove the defect within 21 calendar days from its notification, unless Parties agree otherwise.
- 8.7 Parties shall execute 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 by a period of time that elapses between the notification of the defect until its removal if the defect prevents the Buyer from using the Object of Purchase for intended use.
- 8.8 In case that the Supplier does not remove the defect within stipulated time or if the Supplier refuses to remove the defect, then the Buyer is entitled to remove the defect at his own costs and the Supplier shall reimburse these costs within 10 days after the Buyer's request to do so.
- 8.9 The warranty does not cover defects caused by unprofessional manipulation or by failure to follow Supplier's written instructions for the operation and maintenance of the Object of Purchase.
- 8.10 Parties exclude the application of Section 1925 of the Civil Code.

## 9. PENALTIES

- 9.1 If the Supplier is in default regarding timely delivery of the Object of Purchase, i.e. the Supplier breaches its duty to perform this Contract in time and due manner, the Seller shall pay to the Buyer a contractual penalty in the amount of 0.05% of the Purchase Price of the Object of Purchase without VAT for each (even commenced) day of default.
- 9.2 If the Seller is in default with the removal of the defect of individual part of the Object of Purchase, the Seller shall pay to the Buyer a contractual penalty in the amount of 0.05% calculated from the Purchase Price of the Object of Purchase for each (even commenced) day of default.



- 9.3 The Supplier 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 in the extent in which such damages exceed the contractual penalty.
- 9.4 Total amount of contractual penalties that the Buyer is entitled to claim shall not exceed 20 % of the Purchase Price.
- 9.5 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.

#### 10. RIGHT OF WITHDRAWAL

- 10.1 The Buyer is entitled to withdraw from this Contract without any penalties, if any of the following circumstances occur:
- a) the expenses or the part of the expenses that will arise on the basis of this Contract will be found by the provider of the grant or other control body as ineligible solely for reasons given on the side of the Supplier;
  - b) the Supplier shall be in delay with the fulfilment of this Contract and such delay lasts more than two (2) months;
  - c) The Object of Purchase will not fulfil the requirements stipulated in this Contract, in particular in Annex 1 (*Technical Specification*), and thereby this Contract is deemed substantially breached; or
  - d) the insolvency proceeding is initiated against the Supplier.

#### 11. SPECIAL PROVISIONS

By signing this Contract, the Supplier 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 Research, Development and Education Operational Program 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.

#### 12. FINAL PROVISIONS

- 12.1 This Contract is governed by the laws of the Czech Republic, especially by the Civil Code.
- 12.2 All disputes arising out of this Contract or out of legal relations connected with this Contract shall be preferable 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.
- 12.3 The Supplier is not entitled to set off any of its claims or his debtor's claims against the Buyer's claims. The Supplier is not entitled to transfer its claims against Buyer 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.

- 12.4 All modifications and supplements of this Contract must be in writing.
- 12.5 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.
- 12.6 This Contract is executed in four (4) counterparts and every Party shall receive two (2) counterparts.
- 12.7 Integral part hereto is Annex 1 (*Technical Specification*). In case of any discrepancy between the provisions of this Contract and the provisions of Annex 1 (*Technical Specification*) the provisions of this Contract shall prevail.
- 12.8 This Contract shall be valid and effective on the date of the signature of both Parties.







IN WITNESS WHEREOF attach Parties their handwritten signatures:

Buyer

Signature: 

Name: prof. Jan Řídký, DrSc.

Position: director

Date: 17. 10. 2016

Supplier

Signature: 

Name: Ing. Tomáš Papírek

Position: member of the board

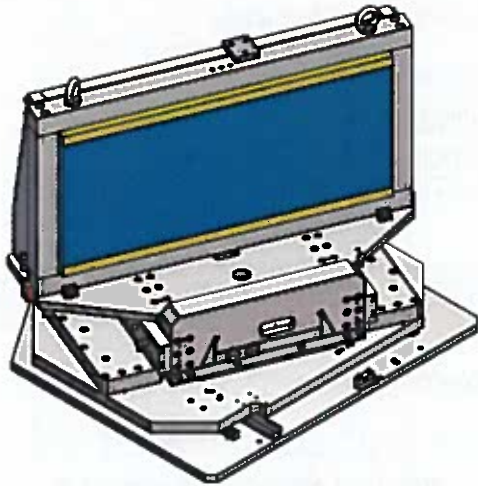
Date: 26. 10. 2016





**ANNEX 1**  
**TECHNICAL SPECIFICATION**



Confidentiality Level	<i>BL - Restricted for internal use</i>	TC ID / Revision	00137730/D
Document Status	<i>Document Released</i>	Document No.	N/A
WBS code	<i>3.3 - L3 System</i>		
PBS code	<i>RA1.L3.HAPL.CMP.CMP; Compressor grating assemblies</i>		
Project branch	<i>Engineering &amp; Scientific documents (E&amp;S)</i>		
Document Type	<i>Specification (SP)</i>		
<p><i>[RSD product category C,D]</i></p> <p><b>Optomechanical grating mounts</b></p> <p><b>for the L3 compressor</b></p> <p><b>TP16_135</b></p>  <p><b>Keywords</b></p> <p>N/A</p>			
	<b>Position</b>	<b>Name</b>	
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<i>RSS TC ID/revision</i>	<i>RSS - Date of Creation</i>	<i>RSS - Date of Last Modification</i>	<i>Systems Engineer</i>
010446/A.001	15.08.2016 05:41	17.08.2016 18:28	Marek Malý
010446/A	15.08.2016 05:41	26.08.2016 16:11	Aleksei Kuzmenko
010446/A.002	26.08.2016 16:16	26.08.2016 16:16	Aleksei Kuzmenko
010446/A.002	14.09.2016 16:59	14.09.2016 16:59	Marek Malý
010446/A.002	22.09.2016 10:56	22.09.2016 10:56	Marek Malý

#### Reviewed By

<i>Name (Reviewer)</i>	<i>Position</i>	<i>Date</i>	<i>Signature</i>
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Pavel Korouš	Chief Engineer	See RSD TC#00137730/C	
Martin Laub	Group leader of mechanics	See RSD TC#00137730/C	
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Alice Hamalová	Clean room specialist	See RSD TC#00137730/C	
Ladislav Půst	Manager installation of technology	See RSD TC#00137730/C	
Petr Procházka	Safety Coordinator	See RSD TC#00137730/C	
Viktor Fedosov	SE & Planning group leader; Quality Manager ( <i>Appointed temporarily</i> )	See RSD TC#00137730/C	

#### Approved by

<i>Name (Approver)</i>	<i>Position</i>	<i>Date</i>	<i>Signature</i>
Bedřich Rus	Scientific Coordinator of Laser Technology (RP1)		

#### Revision History / Change Log

<i>Change No.</i>	<i>Made by</i>	<i>Date</i>	<i>Change description, Pages, Chapters</i>	<i>TC rev.</i>
1	B.Rus, M.Malý	12.08.2016	RSD draft creation	A
2	B.Rus, M Griffiths, M.Malý	17.08.2016	Preparation for internal review; to be checked by RSD author/responsible	A
3	A.Kuzmenko	18.08.2016	RSD update, version for internal review	B
4	A.Kuzmenko	26.08.2016	RSD update, final version for approval	C
5	M.Malý	14.09.2016	RSD update (typo correction - table 1), released version	D
6	R.Toman, B.Rus	22.09.2016	RSD modification according to final contract revision, released version	D

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## 1. Introduction

### 1.1. Purpose

This Requirements Specification Document (RSD) specifies the technical requirements and constraints applicable to the design, manufacture and testing of optomechanical grating mounts for the L3 laser compressor.

It identifies the interfaces with the ELI-Beamlines L3 laser systems and acts as the originating document for the technical requirements that need to be addressed in lower level design documents.

### 1.2. Scope

This RSD contains all of the top level functional, performance, safety, operational and quality requirements for the design and manufacture of optomechanical mounts for the L3 compressor gratings (*PBS: number RA1.L3.HAPL.CMP.CMP*). In addition to the requirements specified in this RSD, this system shall comply completely with the requirements given in the Reference Documents [see Section 1.4].

### 1.3. Terms, Definitions and Abbreviations

Abbreviation	Meaning
CDRR	Critical Design Review Report
E1,2,3,4,5,6	Experimental Hall 1, 2,3,4,5,6
ELI	Extreme Light Infrastructure
L1,2,3,4,5,6	Laser Hall 1, 2,3,4,5,6
NCR	Non-Conformance Report
RSD	Requirements Specification Document
VCD	Verification Control Document

### 1.4. Reference Documents

See Section 10 Drawing Package



## 2. General System Requirements

### 2.1. System Configuration

The optomechanical grating mounts, which are the subject of this specification, are part of the ELI-Beamlines L3 Laser system.

The optomechanical grating mounts will be located inside the L3 Compressor vacuum chamber and will provide a support structure for large optical gratings, which are procured separately. The optomechanical mounts will enable the gratings to be held in a precisely defined position and to be remotely steered, with very high precision and stability, whilst operating under high vacuum within the compressor chamber.

There are two versions of optomechanical grating mount used in the L3 compressor: Type GR1/4 and Type GR2/3. Two units of each design will eventually be required for the operational compressor but the initial requirement will be for delivery of one fully operational and verified example of each design.

### 2.2. Interface Requirements

The optomechanical grating mounts provide a structural supporting interface between the optical gratings and the internal optical table of the L3 compressor. Mechanical requirements are detailed in Section 5.

The optomechanical grating mounts shall be designed to accommodate the gratings specified in LLNL drawings AAA12-107042\_AE and AAA12-107043. For handling and protection purposes the gratings will be mounted within bezels (frames) constructed in accordance with the design principles shown in LLNL drawing AAA07-106770\_AA\_5001 and related drawings (see drawing package in Section 10).

The grating/bezel units shall provide an interface to lifting equipment used to position the gratings inside the compressor. Similarly, the optomechanical grating mounts shall provide an interface to the lifting equipment used to position the mounts inside the compressor. The mounts shall never be lifted with the gratings installed.

The optomechanical grating mounts shall also have an interface with the L3 Laser control system for the function of grating positioning. The control system is being designed under a separate contract. Within the scope of this contract only the wiring connections are required from various actuators and sensors to the respective feedthrough connector mounted at the relevant vacuum chamber flange.

## 3. Functional Requirements

### 3.1. Optomechanical Arrangement

The optomechanical mount design for the support of gratings 1 and 4 (Type GR1/4) is shown in Figure 1 and the mount design for gratings 2 and 3 (Type GR2/3) is shown in Figure 2.

Mount Type GR1/4 is equipped with a 2-axis flexure joint unit providing roll and pitch movements (for an explanation of the principle of the flexure joint frame see Section 5.5). Alignment of the compressor also requires that these mounts are able to rotate within a range of several tens of degrees of yaw around the vertical axis. This amount of rotation exceeds that available within a flexure joint unit, so the whole assembly sits on a commercial motorized rotation stage (type Newport RV350PE V6) with accurate absolute position readout. No translation movement is required for mount Type GR1/4. Movement of the flexure joint unit is motorized using high-resolution vacuum-rated actuators (type Newport VHRU -10V6; travel range 10 mm, resolution 50 nm, absolute accuracy 2  $\mu\text{m}$ , load capacity 500 N). The mount Type GR1/4 is designed to have the point of rotation, for all axes, on the centre of the front surface of the mounted grating, with an accuracy of approximately 1 mm. The required range of motion in each axis is given in Table 1.

Mount Type GR2/3 is equipped with a 3-axis flexure joint unit providing roll, pitch and rotation movements. This unit sits on a translation stage providing movement along the optical axis. Mount Type GR2/3 also uses vacuum actuators (type Newport VHRU -10V6) in the flexure joint unit.

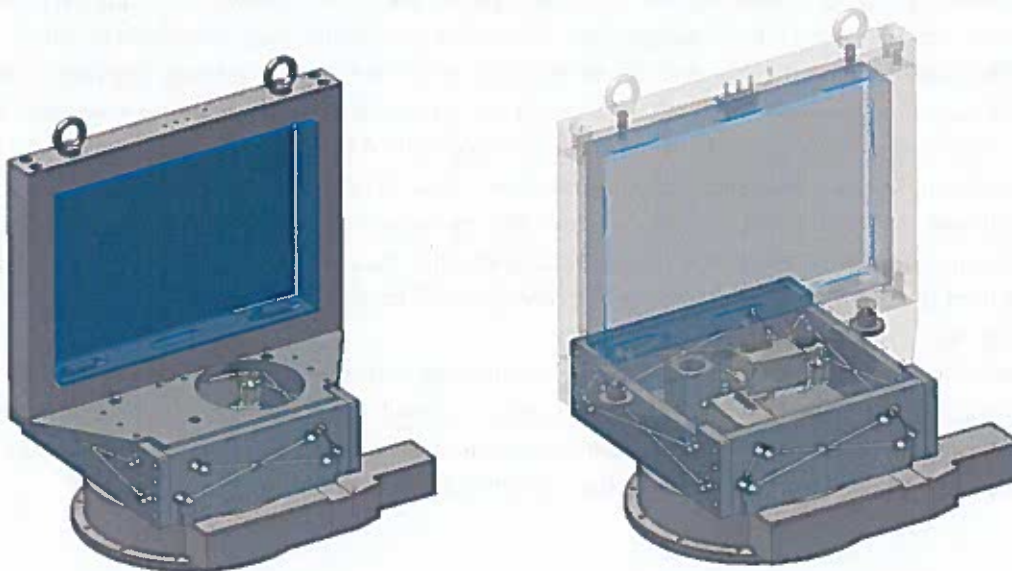


Figure 1: Overall and cutaway view of the optomechanical design of grating mount Type GR1/4.

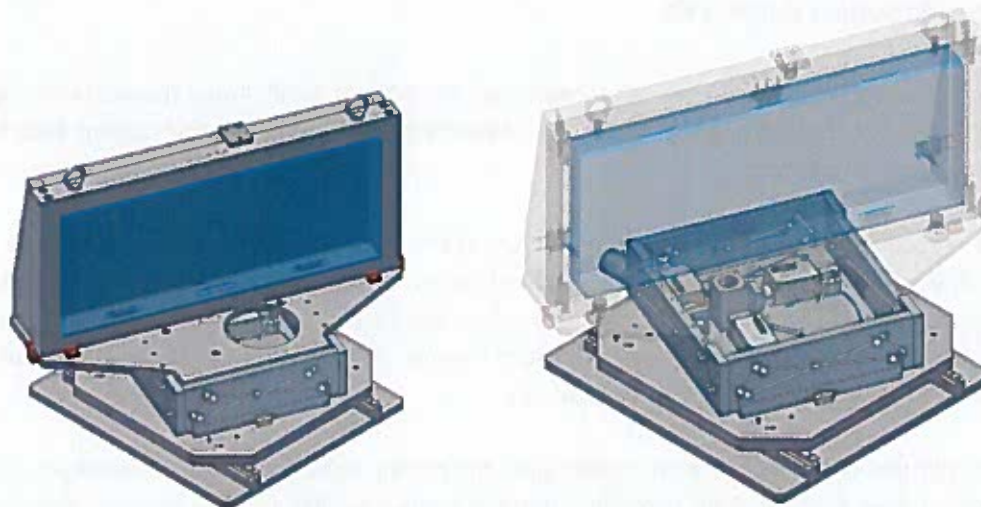


Figure 2: Overall and cutaway view of the optomechanical design of grating mount Type GR2/3.

Optomechanical mount Type	Range	Resolution	Accuracy	Actuator type
<b>GR1/4</b>				
Yaw	$\pm 90^\circ$	0.5 $\mu\text{rad}$	1 $\mu\text{rad}$	Stepper motor
Pitch	$\pm 1^\circ$	1 $\mu\text{rad}$	2 $\mu\text{rad}$	Stepper motor
Roll	$\pm 1^\circ$	0.5 $\mu\text{rad}$	1 $\mu\text{rad}$	Stepper motor
<b>GR2/3</b>				
Translation	100 mm	0.5 $\mu\text{m}$	1 $\mu\text{m}$	Stepper motor
Yaw	$\pm 2^\circ$	0.5 $\mu\text{rad}$	1 $\mu\text{rad}$	Stepper motor
Pitch	$\pm 1^\circ$	1 $\mu\text{rad}$	2 $\mu\text{rad}$	Stepper motor
Roll	$\pm 1^\circ$	0.5 $\mu\text{rad}$	1 $\mu\text{rad}$	Stepper motor

Table 1: Grating mount movement requirements.

Definitions relating to Table 1:

**Resolution:** One incremental step of motorized actuator; one graduation of fine adjustment scale for micrometric screw.

**Accuracy:** Absolute position knowledge by encoder readout, bidirectional repeatability for motions without encoder.

**Yaw:** rotation around the vertical axis.

**Pitch:** rotation around the horizontal axis parallel to the mirror surface.

**Roll:** rotation around the horizontal axis perpendicular to the mirror surface.

Further details including attachment of the gratings to the positioning mounts and the attachment to the optical table, can be found in the drawing package, Section 10.

### 3.2. Grating Supporting Bezels

The optomechanical mounts are designed to accommodate the gratings within Bezels (frames) as shown in the drawings in Section 10 - Drawing Package. Fully detailed 3D models of the grating support bezels will be provided on award of contract.

The above described units for optomechanical positioning of the gratings provide sufficient margin, as well as design flexibility, for attaching grating bezels on top of the optomechanical mount and to allow keeping the centre of rotation of the grating on the grating front surface centre (or on any other selected point at the grating). The design also provides space for implementation of grating backside cooling plates, or the heat removal system using a cooled bezel (see Figure 3).

The inherent stiffness of the flexure joint system gives the grating positioning units an extra advantage with respect to forces resulting from potential mechanical micro-oscillations due to liquid flow in the cooling panels. The flexure joint system stiffness can be further tuned by adjusting various joint design parameters (thickness of the elastic bridges, shape of the cavities forming the joint, etc.) if necessary.

The working roll and pitch position of all gratings, i.e. aligned configuration of the compressor, is designed to be precisely vertical. To this purpose the grating mounts or mounting frames will be equipped with miniature high-precision tilt gravitational sensors providing absolute information on correct vertical position of the gratings.

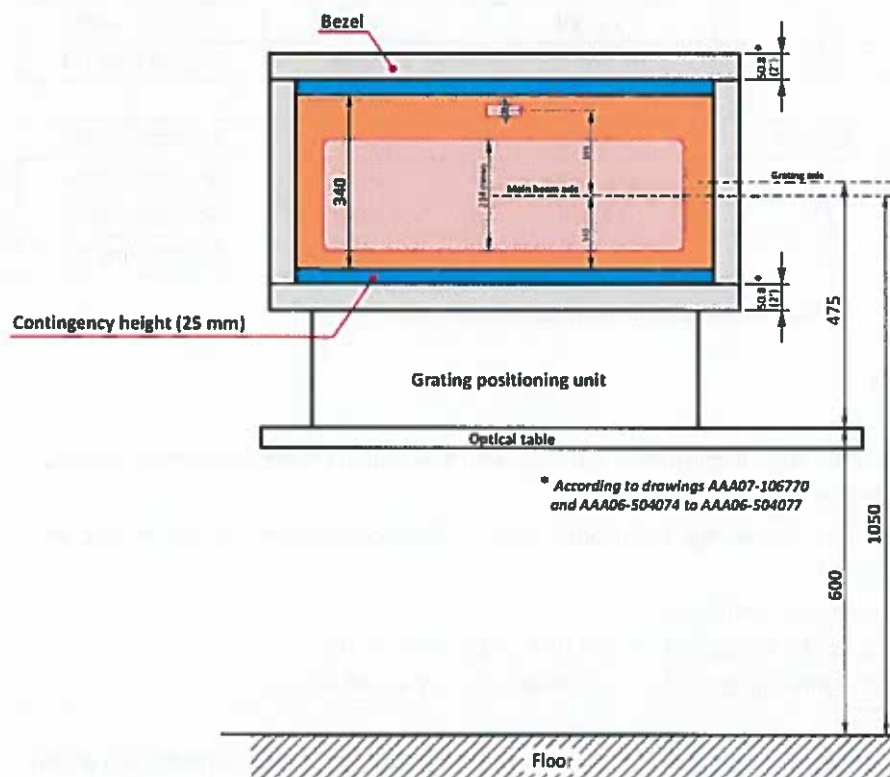


Figure 3: Major dimensions of the grating frames (bezels) incorporated in the design.

## 4. Performance Requirements

The individual movements as described in Table 1: Grating mount movement requirements, must be executable independently (free of cross talk) and with the indicated range, resolution and accuracy.

## 5. Design Requirements

### 5.1. General Design Requirements

REQ-017886/A

The grating optomechanical mounts shall be detail designed and manufactured according to the attached general drawings (see Section 10) and a fully detailed 3D model that will be provided following award of contract.

Verification method: R - review of design

REQ-017887/A

The grating optomechanical mounts shall be attachable to the optical table and shall be able to be pre-positioned (without engaging the actuators) with precision of  $\pm 1$  mm.

Verification method: R - review of design

REQ-017888/A

Each individual optomechanical mount shall provide long-term angular mechanical stability (drift) of the optical element better than  $10 \mu\text{rad}$  (in thermally stabilized environment).

Verification method: T - test

REQ-017889/A

The principal material of the mounts shall be aluminium and/or stainless steel.

Verification method: R - review of design

REQ-017890/A

The mounts design shall feature integration of electrical actuator including wiring for electrical actuators and devices up to the vacuum feedthroughs.

Verification method: R - review of design

REQ-017891/A

The detailed design will include position encoders for each movement according to Table I, allowing reading out absolute position with a precision of at least of the indicated resolution. The encoders must allow absolute position readout after switching the encoder on, without homing the movement.

Verification method: R - review of design

REQ-017892/A

The detailed design will include a precision clinometer allowing reading out absolute pitch and roll of the grating frame of both Type GR1/4 and Type GR2/3. The clinometers will have precision equal or better than  $0.5 \mu\text{rad}$  for both pitch and roll.

Verification method: R - review of design

REQ-017893/A

All edges of the optomechanical mounts shall be chamfered.

Verification method: R - review of design

REQ-017894/A

Best practice shall be followed in the design, type choice and implementation of the vacuum electrical feedthroughs, and it shall be approved by the Contracting Authority.

Verification method: R - review of design

REQ-017895/A

Any principal documentation shall be in English language.

Verification method: I - inspection

REQ-017896/A

Only new materials and equipment shall be used.

NOTE: Recycled material and reused equipment shall not be acceptable. Material certificates shall be provided by Supplier.

Verification method: R - review of design

REQ-017897/A

Each optomechanical mount (minus grating) shall be supplied with a means of lifting that ensures the base of the mount is horizontal in both axes when the mount is lifted from a single point of suspension.

Verification method: T - test

REQ-017898/A

Each grating bezel shall be supplied with a grating simulant manufactured from aluminium and a removable grating cover.

Verification method: R - review of design

## 5.2. Operational Design Requirements

REQ-017899/A

Parameters of the individual movements, i.e. range, resolution, accuracy and absence of cross talk of the mounts shall correspond to those specified in Table I.

Verification method: R - review of design

REQ-017900/A

The detailed design shall include contingency space of 25mm above and under of each grating for future implementation of the cooling bars, as specified in Figure 3 in this document.

Verification method: R - review of design

### 5.3. Vacuum Design Requirements

REQ-017901/A

The manufacturing design of the mounts shall avoid any trapped volumes of air, e.g. the mounting holes shall not be blind tapped.

Verification method: R - review of design

REQ-017902/A

All actuators used in the mounts shall be factory certified for vacuum at least  $10^{-6}$  mbar.

Verification method: R - review of design

REQ-017903/A

Vacuum test of the completed mounts shall be carried out to prove that the mounts are compatible with pressures down to  $10^{-7}$  mbar. The test shall include a mass spectrometer to demonstrate that volatile organic compounds (VOCs) and other impurities are not present at the lower limit of detection of the spectrometer.

Verification method: T - test

### 5.4. Mechanical Design Requirements

For precise angular positioning the gratings will employ a flexure joint system constituting, in the basic configuration, the kinematic equivalent of a goniometric cradle. The flexure joint system intrinsically employs elasticity of the material and its principle is represented in Figure 4. The system is manufactured from one block of appropriate material divided into two bases (upper and lower) connected by pairs of thin elastic bridges formed by accurately separated circular holes arranged in trapezoidal geometry. With the lower plate fixed the upper plate is free to perform circular motion with the effective center of rotation determined by geometry of the trapezoid (the axis of rotation is located in intersection of arms of the trapeze). By "stacking" two pairs of flexi joints plates a two-axis system is constituted (see Figure 4) representing kinematic equivalent of a goniometric cradle, providing pitch and roll angular travel around two horizontal axes. An obvious advantage of the system is that the point of rotation, i.e. intersection point of the two flexi joint pairs of plates, can be arbitrarily determined by the design.

A system providing also rotation around vertical axis, i.e. 3-degree of freedom rotation positioning, may be obtained by adding to the block represented in Figure 4 a horizontal plate equipped with appropriate flexi joints located symmetrical by two sides of the plate. The flexi joints divide the plate into the outer fixed part and the inner part able to perform rotational movement. This arrangement is required for the mount Type GR2/3.

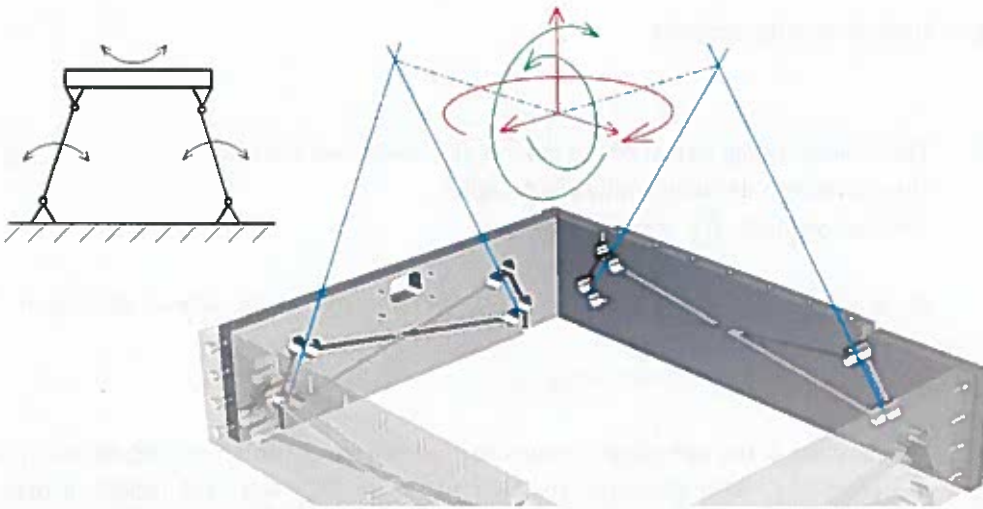


Figure 4: Principle of flexure joint and basic layout of a pitch-roll table mechanically equivalent to precise two-axis goniometric cradle. The device provides positioning indicated by the green arrows and is rigid in the third rotational degree of freedom (red arrow), i.e. rotation around vertical axis. Engineering optimization consists in obtaining maximal contrast between flexibility of the pitch-roll, maximum load support and maximal rigidity against rotation around vertical axis.

REQ-017904/A

The grating mounts shall employ the flexure joint system to enable the small angle pitch, roll and yaw movements required for the grating mounts.

Verification method: R - review of design, T - test

## 5.5. Electrical Design Requirements

REQ-017905/A

Only stepper motors shall be used in the actuators (see also Table I).

Verification method: R - review of design

REQ-017906/A

Electrical wiring shall be supplied from the actuators, position encoders, and signals from the clinometers up to the connectors at the feedthrough flanges on the vacuum chamber. The wiring shall be of sufficient length and flexibility to allow in-situ installation.

Verification method: R - review of design

REQ-017907/A

Electrical wires leading from the actuators, position encoders, and signals from the clinometers to the connectors shall be shielded by flexible metallic hose against scattered light in the compressor.

Verification method: R - review of design



## 6. Transportation and Installation Requirements

### 6.1. General Requirements

REQ-017827/A

The transportation to the final destination of the technologies and the instruments shall be conducted by the Supplier.

Verification method: R - review

REQ-017829/A

The transportation procedure shall be discussed and reviewed by the Contracting Authority.

**NOTE:** *These regulations shall be defined by the Contracting Authority and provided to the Supplier after contract signature and before detailed design contract phase.*

Verification method: R - review

REQ-017831/A

The Supplier shall allow supervising the activities related to the transportation by the Contracting Authority.

**NOTE:** *Any acts of supervision shall not mean that the Contracting Authority assumes additional liability of any kind exceeding its liabilities according to the contract.*

Verification method: R - review

REQ-017832/A

The technologies and instruments shall be delivered in protective package preventing damage and contamination and a minimum of two plies separate clean packaging. The technologies shall be cleaned and packaged complying the cleanliness of class 7 according to ČSN EN ISO 14644.

Verification method: R - review, I - inspection

REQ-017833/A

The Supplier and Contracting Authority shall agree on the cleaning method to clean devices without decreasing the devices' performance and to avoid contamination of clean space.

**NOTE:** *The cleaning methods may use high temperatures (baking out), high gas flow (dry air) and specialised chemical cleaning liquids (alcohol, Isopropyl alcohol, demineralised water).*

Verification method: R - review

REQ-017835/A

All transportation tools and equipment entering the clean rooms shall be cleaned and reviewed by the Contracting Authority's approved methods.

**NOTE:** *Some tools can be provided by the Contracting Authority upon agreement.*

Verification method: I - inspection, T - test

## 7. Safety Requirements

REQ-017839/A

The Supplier shall supply a Declaration of Conformity for each product type if the appropriate legislation determines the Supplier's obligation to have a Declaration of Conformity for the purposes of a Device sale in the Czech Republic.

In such a case the Declaration of Conformity shall comply with Act No. 22/1997 Coll., as amended.

Verification method: R – review, I - inspection

## 8. Quality Requirements

### 8.1. General Quality Requirements

REQ-017842/A

The Supplier shall define and document the responsibilities and the interfaces of the Quality functions, either external or internal, involved in a project.

Verification method: R - review

REQ-017844/A

The Supplier shall prepare, maintain and implement a plan of the QA (quality assurance) activities (quality plan) in accordance with the Contracting Authority requirements.

*NOTE 1: The Supplier shall provide to Contracting Authority the quality plan for agreement and approval.*

*NOTE 2: The Contracting Authority can assist with the quality plan definition.*

Verification method: R - review

### 8.2. Documentation and Data Control

REQ-017846/A

The Supplier shall provide the following relevant manufacturing documents:

- Full technical documentation (including manufacturing drawings);
- breakdown list as built;
- all approved “requests for deviation/wavier”(see REQ-017851/A).

Verification method: R – review

REQ-017847/A

The Supplier shall provide to the Contracting Authority the Product User Manual including following conditions and procedures for:

- Transportation;
- Handling and manipulation;
- Storage and Installation;
- Operation and maintenance;
- Warranty terms.

Verification method: R - review

REQ-017848/A

Documentation shall be supplied in all following formats: hardcopy and PDF.

Verification method: Not To Be Tracked within VCD

REQ-017849/A

The Supplier shall provide following type of documents:

- 3D model (if available);
- 2D drawings;
- Text documents in printable format.

Verification method: Not To Be Tracked within VCD

REQ-017850/A

The Supplier shall use following data formats:

- \*.JPG
- \*.PDF/A
- CAD 2D: \*.dwg
- CAD 3D: STEP type files (\*.stp;\*.ste;\*.step)
- text processors \*.doc, \*.docx, OpenDocument Format
- spreadsheet processors \*.xls, \*.xlsx, OpenDocument Format
- presentations \*.ppt, \*.pptx; OpenDocument Format
- \*.HTML

Verification method: Not To Be Tracked within VCD

### 8.3. Non-Conformance Control System

REQ-017851/A

The Supplier shall establish and maintain a non-conformance control system compatible with CSN EN ISO 9001: 2010 edition 2.

Verification method: Not To Be Tracked within VCD

## 9. Verification Requirements for a Supplier

Optomechanical grating mounts for the L3 compressor (product) is called in the further text of this chapter by the word Device.

### 9.1. General

REQ-017852/A

The verification process shall be performed by the Supplier to demonstrate that the delivered Device meets the specified requirements of the Contracting Authority. The verification process consists of:

1. Verification execution and reporting;
3. Verification control and close-out.

Verification method: Not To Be Tracked within VCD

REQ-017853/A

The Supplier shall assign clear responsibility for the implementation of the verification process including all activities defined in REQ-017852/A.

Verification method: R - review

### 9.2. Verification Documentation

REQ-017854/A

The Supplier shall establish and maintain the system of verification process documentation.

Verification method: Not To Be Tracked within VCD

REQ-017855/A

Verification documentation shall consist of following basic types of documents:

- Verification Reports including: CDR Report and Tests reports.
- VCD, Verification Control Document.

Verification method: Not To Be Tracked within VCD

REQ-017856/A

The verification report shall be submitted to the Contracting Authority for the review as agreed with the Contracting Authority after corresponding verification activity completion, within the time frame agreed with the Contracting Authority.

**NOTE:** Verification activity can be design review, inspection and test of the final Device.

Verification method: Not To Be Tracked within VCD

### 9.3. Verification Control Document (VCD)

The Verification Control Document (VCD) lists the requirements to be verified with the selected methods at the defined levels. The VCD is a living document and provides traceability during contract phases (design, manufacturing, testing and deployment) how and when each requirement is planned to be verified and is actually verified.

VCD represents a formal tool of communication between the Supplier and Contracting Authority (formal record, reporting tool).

REQ-017857/A

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

**NOTE 1:** *Guidelines for VCD preparation shall be provided by the Contracting Authority.*

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

Verification method: R - review

REQ-017859/A

In the Verification Control Document (VCD) the Supplier shall add the information about **HOW** and **WHEN** each of the technical requirements is to be verified.

**NOTE 1:** *Since some requirements are to be verified through a review of design the VCD must be accepted by the Contracting Authority before the beginning of the Design Review.*

**NOTE 2:** *Guidelines for VCD preparation can be provided by the Contracting Authority.*

Verification method: R - review

### 9.4. Verification Execution

REQ-017860/A

The verification execution process shall consist of following stages according to the phasing of the contract execution:

- **Critical design review (CDR);**
- **Verification of final device** (testing at Supplier's site);
- **Acceptance by Contracting Authority at customer site.**

**NOTE 1:** *CDR is intended to verify that the design meets corresponding requirements (could be accepted) and/or identify required corrective actions needed to accept the design and start manufacturing phase of the contract.*

**NOTE 2:** *Verification of final device is executed at the end of manufacturing phase by inspection and tests. This verification stage is intended for the check of product readiness to shipment to the Contracting Authority.*

**NOTE 3:** *In the acceptance stage the verification shall demonstrate that the product is free of fabrication errors and is ready for the intended operational use.*

Verification method: Not To Be Tracked within VCD

REQ-017861/A

Acceptance shall be carried out on the final hardware (Device).

**NOTE 1:** Output of this verification stage is **Verified Design and Verified Device**.

**NOTE 2:** The results of acceptance stage shall be recorded within VCD.

Verification method: Not To Be Tracked within VCD

REQ-017862/A

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

1. **Review of design;** Verification by 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 by Inspection (I) shall consist of visual determination of physical characteristics.

3. **Test (including functional demonstration);** Verification by Test (T) shall consist of measuring product performance and functions under realistic operating conditions. When the test objectives include the demonstration of qualitative operational performance (functional demonstration) the execution shall be observed and results recorded.

Verification method: Not To Be Tracked within VCD

REQ-017863/A

The results of a review of design shall be documented in the **Critical Design Review Report (CDRR)** and tracked by the VCD.

**NOTE:** The Contracting Authority can provide to the Supplier the template of CDRR.

Verification method: R - review

REQ-017864/A

The parts of the VCD related to the *Design* of the Device shall be accepted by the Contracting Authority before manufacturing of the Device starts.

Verification method: Not To Be Tracked within VCD

REQ-017865/A

The results of the inspection shall be tracked by the VCD.

Verification method: R - review

REQ-017866/A

The results of the test shall be documented in the appropriate Test Report and tracked in the VCD.

Verification method: R - review

## 9.5. Verification Close Out

REQ-017868/A

The verification process shall be considered completed when the Contracting Authority approves the VCD by confirming that:

1. Identified requirements have successfully been verified;
2. All detected non-conformances have been solved according to REQ-017851/A;
2. Documented evidence is recorded in the VCD.

Verification method: Not To Be Tracked within VCD

REQ-017869/A

In case of successful acceptance stage (confirmation by inspection accordingly to REQ-017862/A) the Contracting Authority shall provide to Supplier signed acceptance protocol.

Verification method: Not To Be Tracked within VCD

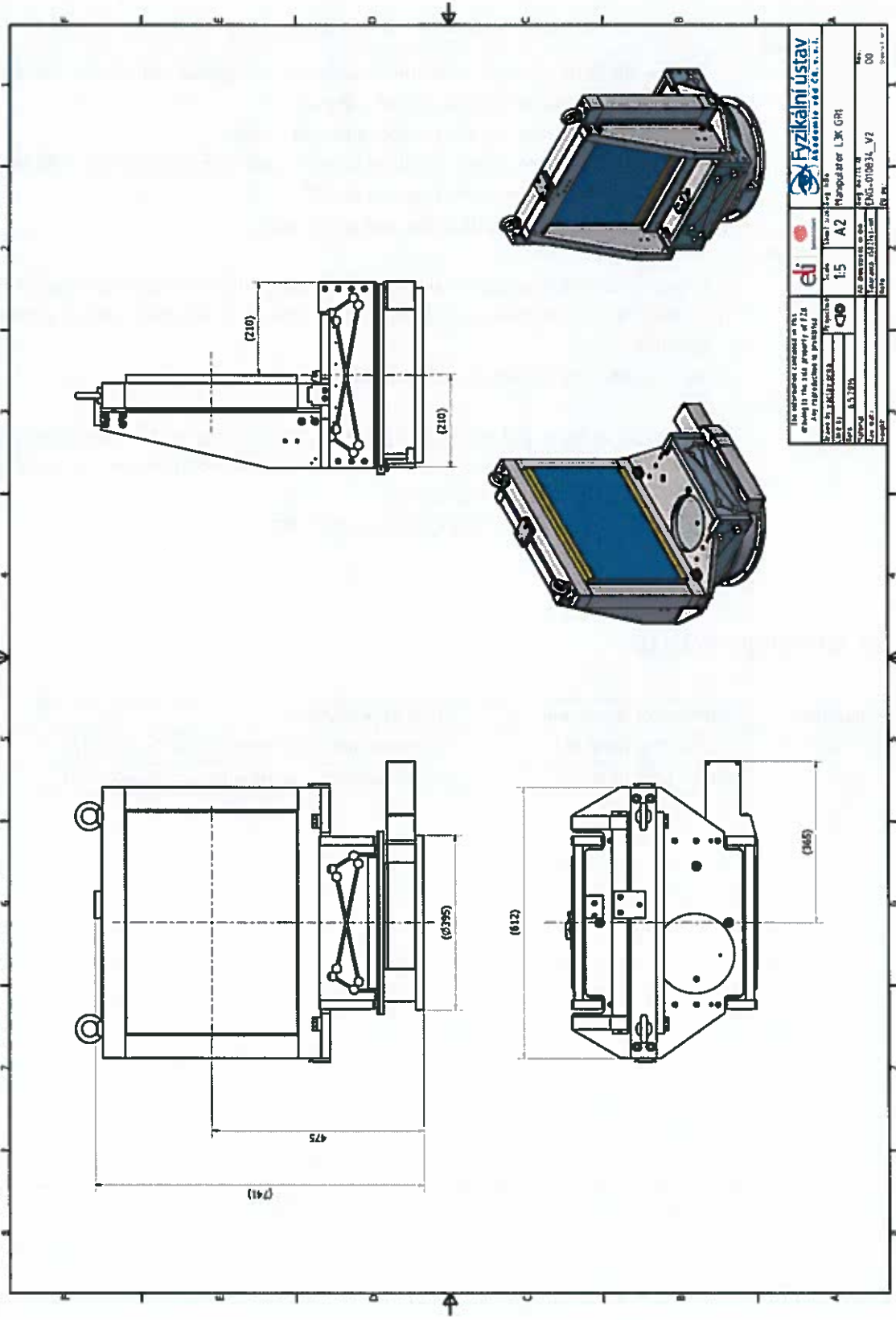
REQ-017870/A

In case of unsuccessful acceptance stage the Contracting Authority shall provide to Supplier Non-Conformance Report (NCR) and ELI non-conformance control process shall be applied (see REQ-017851/A).

Verification method: Not To Be Tracked within VCD

## 10. Drawing Package

TC Number	Number of document	Title of document
00139050	GR14_ENG-010834	Optomechanical Grating Mount Type GR1/4
00139049	GR23_ENG-012241	Optomechanical Grating Mount Type GR2/3



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Checked	A.S. JEDL	Client	IZM GRH
Drawn	A.S. JEDL	Contract No.	ENG-010834_V2
Date		Version	00



