



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



*Buyer's Contract No. S20/30H*

## **PURCHASE CONTRACT**

This purchase contract ("**Contract**") was concluded pursuant to section 2079 *et seq.* of the act no. 89/2012 Coll., Civil Code, as amended ("**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, 182 21, Czech Republic

registration no.: 68378271

represented by: RNDr. Michael Prouza, Ph.D. – director

(„**Buyer**”); and

- (2) **Pfeiffer Vacuum Austria GmbH**

with its registered office at: Deifenbachgasse 35, AT 1150, Vienna, Austria

registration no.: FN 125744 v

represented by: DI R. Schnitzler, Dr. Ing. Radan Salomonovič, on the basis of a power of attorney

enrolled in the commercial registered kept by Vienna

(„**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 within the Operational Programme Research, Development and Education. The Buyer carries out a project financed by the grant specified herein in this provision („**Project**”).
- (B) For the successful realization of the Project it is necessary to purchase the Object 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 Object of Purchase to the Buyer for consideration.



- (D) The Seller's bid for the public procurement entitled „Vacuum chamber with pumping system, vacuum gauges, flanges and stand”, whose purpose was to procure the object of purchase („Public Procurement”), was selected by the Buyer as the most suitable.
- (E) The Seller acknowledges that the Buyer is not, in connection to the subject matter of this Contract, an entrepreneur, and also that the subject matter of this Contract is not related to any business activities of the Buyer.
- (F) The documentation necessary for the execution of the Contract is
- Technical Specification, which forms an integral part hereof as its Annex No. 1 to this Contract (hereinafter the “**TS**”); this TS also formed a part of the tender documentation for the Public Procurement in the form of Annex No.2,
  - The Seller's bid submitted for the Public Procurement, (hereinafter the “**Sellers's Bid**”); the Sellers's Bid in its parts which describe the Object of Purchase (as defined below) in technical detail forms an Annex No. 2 to this Contract and is an integral part hereof.

## IT WAS AGREED AS FOLLOWS:

### 1. BASIC PROVISIONS

- 1.1 Under this Contract the Seller shall deliver to the Buyer Vacuum chamber with pumping system, vacuum gauges, flanges and stand as defined in Annex 1 (Technical Specification) to this Contract in the required quality, and with the properties and related performance described therein („**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 Seller the Purchase Price (as defined below), all under the terms and conditions stipulated in this Contract.
- 1.2 Under this Contract the Seller shall also carry out the following activities („**Related Activities**”):
- a) Transport and delivery the Object of Purchase to the place of delivery (Art. 2.3 of the Contract);
  - b) Carrying out a leakage test proving that the vacuum chamber itself, part of the Object of Purchase, does not leak more than  $5 \cdot 10^{-9}$  mbar.l/s (excl. gas permeation) and resulting in certificate of leakage test; and
  - c) Cooperate with the Buyer during the performance of this Contract; including being present during unpacking of the Object of Purchase at the premises of the Buyer after its delivery, unless agreed otherwise between the Seller and the Buyer.



## 2. THE TIME AND PLACE OF DELIVERY

- 2.1 The Seller shall deliver the whole Object of Purchase and shall carry out Related Activities within **thirty (30) weeks** from the effectiveness of this Contract, unless stipulated otherwise in this Contract.
- 2.2 The Object of Purchase shall consist of two deliverables (“**Deliverables**”):
- (a) Design stage (hereinafter “**Deliverable 1**”) - Deliverable 1 shall include submission of drawing of the vacuum chamber and stand, which must be provided to the Buyer at least in electronic format, in pdf format and also a 3D model format (e.g. STEP, IGES, VRML/X3D). The Seller shall submit Deliverable 1 to the Buyer (to both e-mail addresses indicated in Art. 11.2 of the Contract) as soon as possible after Contract effectiveness; afterwards the Buyer shall comment on the submitted Deliverable 1 as soon as possible (the Buyer states that he may need up to two weeks for the comments) and the Seller shall implement the Buyer’s comments and requirements and submit final Deliverable 1 to the Seller within **six (6) weeks** from the Contract effectiveness at the latest. After final acceptance of Deliverable 1 by the Buyer and after signature of Hand – over protocol I., 20% of the Purchase Price (as defined below) will be paid, in line with all the respective provision of this Contract;
  - (b) Object of Purchase production stage (hereinafter “**Deliverable 2**”) – Deliverable 2 shall include production of the Vacuum chamber with pumping system, vacuum gauges, flanges and stand as described in the respective annexes to this Contract and shall be based on the Deliverable 1. The Seller shall submit Deliverable 2 to the Buyer within **thirty (30) weeks** from the Contract effectiveness at the latest. After acceptance of the Deliverable 2 by the Buyer and after signature of Hand – over protocol II., 80% of the Purchase Price will be paid. The Buyer is entitled to prolong the time for delivery of Deliverable 2 and for carrying out Related Activities for two (2) more weeks, should there be important reasons for that on the side of the Buyer, such as, but not only, impossibility to take over the Deliverable 2 at the Buyer’s premises due to reconstruction works taking place there.
- 2.3 The place of delivery shall be Fyzikální ústav AV ČR, v.v.i - HiLASE Centrum, Za Radnicí 828, 252 41 Dolní Břežany, Czech Republic or any other address in Dolní Břežany, Czech Republic, which the Buyer communicated to the Seller prior to the delivery of the Object of Purchase.
- 2.4 The Seller acknowledges that the deadlines stated in this Article are of essential importance to the Buyer with respect to the timeline of the Project with respect to



the deadline by which the Project are to be implemented, and that the Buyer could incur damage as a result of failure to meet the above stipulated deadlines.

### 3. THE OWNERSHIP RIGHT

The ownership right to the Object of Purchase shall be transferred to the Buyer upon the signature of the respective handover protocols (Hand – over protocol I., Hand – over protocol II.).

### 4. PRICE AND PAYMENT TERMS

- 4.1 The purchase price for the Object of Purchase is 67.770,- EUR („**Purchase Price**”) **excluding VAT and without appropriate customs duties.**
- 4.2 The Purchase Price cannot be exceeded and includes all costs and expenses of the Seller related to the performance of this Contract. The Purchase Price includes, among others, all expenses related to the delivery, the handover 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.
- 4.3 The Purchase Price for the Object of Purchase shall be paid 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 accordance with Art. 2.2 hereof.
- 4.4 The Buyer shall realize payments on the basis of duly issued invoice within thirty (30) calendar days from their receipt. If the Seller stipulates any shorter due period of an invoiced amount in an invoice, such different due period shall not be deemed relevant and the due period stipulated herein prevails. The first invoice for the 20% of the Purchase Price shall be issued only after the Handover protocol I. signature. The second invoice for 80% of the Purchase Price shall be issued only after the Handover protocol II. signature.
- 4.5 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 under this Contract (including the reference to this Contract),
- g) Date of the issue of the tax document,
- h) Date of the fulfillment 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 the Project; the exact details of the Project including name and reg. number will be communicated to the Seller based on Seller's request, which shall be sent to the Buyer to following e-mails: xxxxx and xxxxx before an invoice is issued. Seller shall issue an electronic invoice and send it to following e-mails xxxxx and xxxxx for preliminary check. After the preliminary check the Seller shall send the final electronic invoice to xxxxx,

and must also comply with any double taxation treaties applicable to the given case.

4.6 The last invoice in each calendar year must be delivered by the Seller to the Buyer's no later than by December 15 of the given calendar year. In case that the invoice shall not contain the above mentioned information or the invoice does not comply with the requirements stipulated by law or the invoice is delivered to the Buyer later than by December 15 of the given calendar year, 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.

4.7 The Buyer's invoicing details are set out in provision (1) hereof.

## 5. **SELLER'S RIGHTS AND DUTIES**

5.1 The Seller shall ensure that the Object of Purchase and Related Activities are in compliance with this Contract including all its annexes and applicable legal (e.g. safety), technical and quality norms.

5.2 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,



unless these are against the law or in contradiction to this Contract. If the Seller, while exercising due professional care, finds out or should have found out that the instructions are for any reason inappropriate or illegal or in contradiction to this Contract, then the Seller must notify the Buyer.

- 5.3 All things necessary for the performance of this Contract shall be procured by the Seller, unless this Contract stipulates otherwise.

## 6. **HANDOVER OF THE OBJECT OF PURCHASE**

- 6.1 Handover and takeover of the Object of Purchase shall be realized on the basis of two handover protocols (Hand – over protocol I., Hand – over protocol II.).

- 6.2 The Hand-over protocol I. shall be signed after final acceptance of Deliverable 1, not later than three (3) weeks after the Deliverable 1 is delivered and accepted in line with Art. 2.2 par. (a) hereof. The Handover protocol I. shall consist of:

- identification of the Seller, the Buyer and all subcontractors, if there are any;
- declaration of the authorized representatives for communication in technical matters of the Buyer stipulated in Art. 11.2 hereof that Deliverable 1 fulfills all requirements stipulated in Art. 2.2 par. (a) hereof; if Deliverable 1 does not meet the Buyer's requirements, the Buyer is entitled to require the amendment and/or additions of the Deliverable 1. The Buyer is not obliged to sign the Hand-over protocol I. until Deliverable 1 is delivered in accordance with the Buyer's comments and requirements and finally accepted by the Buyer. The Seller shall amend Deliverable 1 in line with the Buyer's comments and requirements within seven (7) calendar days from Buyer's request to do so, unless agreed otherwise;
- the signature and the date of the handover.

- 6.3 The Hand-over protocol II. shall be signed during Deliverable 2 delivery and which shall contain following information:

- identification of the Seller, the Buyer and all subcontractors, if there are any,
- description of the Deliverable 2,
- the list of defects and deficiencies of the Deliverable 2, if there are any, and the deadlines for their removal,
- the signature and the date of the handover.

- 6.4 Instructions and manuals shall be attached to the Hand-over protocol II., and also



to the Hand-over protocol I. if it is necessary for Deliverable 1 usage.

6.5 If the Seller fails to duly carry out all Related Activities or if the Object of Purchase/Deliverable 2 does not meet requirements of this Contract, the Buyer is entitled to refuse the takeover of the Object of Purchase/Deliverable 2. In such a case, the Seller shall remedy the deficiencies within thirty (30) calendar days, unless Parties agree otherwise. The Buyer is entitled (but not obliged) to take over the Object of Purchase/Deliverable 2 despite the above mentioned deficiencies, in particular if such deficiencies do not prevent the Buyer in the proper operation of the Object of Purchase/Deliverable 2. In such a case, the Seller 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 Seller shall remove the deficiencies within fourteen (14) calendar days.

6.6 Parties hereby exclude application of section 2126 of the Civil Code.

## 7. WARRANTY

7.1 The Seller hereby provides a warranty of quality of the Object of Purchase for the period of 12 calendar months.

Regarding the specific parts of the Object of Purchase, the Seller hereby provides the following warranty lengths:

- 12 calendar months for the cylindrical vacuum chamber itself and its supporting frame (warranty length sub-criterion 1)
- 12 calendar months for the pumping system: turbomolecular pump, roughing pump, gate valve, bellows and connection valves (warranty length sub-criterion 2)
- 12 calendar months for the set of 4 gauges and the 3 control/display units required in the tender specifications (warranty length sub-criterion 3)
- 12 calendar months for the set of mass flow controllers with their control/display units as required in the tender specifications (warranty length sub-criterion 4)
- 12 calendar months for the following set of feedthroughs: the thermocouple feedthrough with reader, all electrical feedthroughs required in the tender specification, all coaxial feedthroughs required in the tender specifications and the rotary feedthrough with motorization and controller. (warranty length sub-criterion 5)



- 7.2 The warranty period shall commence on the day of the signature of the Hand-over protocol II. by both Parties. However, if the Object of Purchase/Deliverable 2 is taken over with defects or deficiencies, the warranty period shall commence on the date of the removal of the last defect or deficiency by the Seller.
- 7.3 The Seller shall remove defects that occur during the warranty period free of charge.
- 7.4 If the Buyer ascertains a defect of the Object of Purchase/Deliverable 2 during the warranty period, the Buyer shall notify such defect without undue delay to the Seller (“**Warranty Claim**”). Defects may be notified on the last day of warranty period, at the latest; an email is considered an adequate way to initiate a Warranty Claim. Warranty Claim sent by the Buyer on the last day of the warranty period shall be deemed to be made in time.
- 7.5 The Buyer notifies defects in writing via e-mail. The Seller shall accept notifications of defects on the following e-mail address: xxxxx
- 7.6 In the Warranty Claim the Buyer shall describe the defect and the manner of removal of the defect. The Parties shall agree on the manner of defect’s removal. If the Parties do not reach the agreement, the Buyer has the right to:
- a) request removal of the defect by the delivery of Object of Purchase/Deliverable 2 or its individual parts, or
  - b) request removal of the defect by repair, or
  - c) request adequate discount from the Purchase Price.

The choice among the above mentioned rights shall be made by the Buyer, who shall take into account reasonable balance between economic perspective of the Seller and Buyer’s work planning on the Project. However, in case of a removable defect that occurs for the first time the Buyer shall not request removal of the defect by delivery of new Object of Purchase/Deliverable 2 or its individual parts.

- 7.7 The Seller shall remove the defect within thirty (30) calendar days from the date on which the Warranty Claim was notified to the Seller, at the latest, unless the Buyer and the Seller agree otherwise.
- 7.8 The Seller shall remove defects of the Object of Purchase/Deliverable 2 within periods stated in the Contract also in the instances when the Seller is of the opinion that he is not liable for such defects. In cases when the Seller will not recognize the defect and the Buyer will not agree with such conclusion, the validity of the Warranty Claim shall be ascertained by an expert, which is to be commissioned by



the Buyer but with whom the Supplier also must agree. In the event the expert declares the Warranty Claim as justified, the Seller shall bear the costs of the expert's assessment. If the Warranty Claim is raised unjustly according to expert's assessment, the Buyer shall reimburse the Seller all reasonably incurred costs associated with removing the defect.

- 7.9 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 the time that expires from the date of exercising the Warranty Claim until the defect is removed in cases where the Buyer was prevented from using the Object of Purchase/Deliverable 2 for its intended purpose.
- 7.10 In case that the Seller fails to remove the defect within time stipulated in this Contract or if the Seller refuses to remove the defect, then the Buyer is entitled to remove the defect at his own costs and the Seller shall reimburse these costs within thirty (30) calendar days after the Buyer's request to do so.
- 7.11 The warranty does not cover defects caused by unprofessional handling or by the failure to follow Seller's instructions for the operation and maintenance of the Object of Purchase/Deliverable 2.
- 7.12 Parties exclude application of the section 1925 (the sentence behind semi-colon) of the Civil Code.
- 7.13 The Seller shall provide to the Buyer technical support (consultation of operational, maintenance and other issues regarding the Object of Purchase/Deliverable 2) free of charge on the phone no.: xxxxxx

## 8. **TERMINATION, RIGHT OF WITHDRAWAL, CONTRACTUAL PENALTIES**

- 8.1 This Contract may be terminated by completing the performance required hereunder, by agreement of the Parties or by withdrawal from the Contract on the grounds stipulated by law or in the Contract.
- 8.2 The Buyer is entitled to withdraw from this Contract, if any of the following circumstances occur:
  - (a) the Seller has materially breached obligations imposed by the Contract, specifically by being in delay with the fulfillment of this Contract and such delay lasts more than 4 weeks; or



qualities or other requirements defined in the Annex 1 (Technical Specification);

- (c) the insolvency proceeding is initiated against the Seller's assets;
  - (d) the funding body providing finances for the Project ("Financial subsidy") or any other control body determines that the expenditures or part of the expenditures incurred on the basis of this Contract are ineligible;
  - (e) the Financial subsidy for implementation of the Project is withdrawn from the Buyer, however Buyer hereby declares that there is financial subsidy in place at the time of signing the Purchase Contract; or
  - (f) should it become apparent that the Seller provided information or documents in the Seller's bid, which were not true and which could, therefore, influence the outcome of the Procurement Procedure leading to the conclusion of this Contract (Section 223(2)(b) of the Act No. 134/2016 Coll., on public procurement).
- 8.3 The Seller is entitled to withdraw from the Contract in the event of material breach of the Contract by the Buyer and in case of events outside the control of the Seller (e.g. natural disasters, etc.).
- 8.4 In the event the Seller is in delay with term of delivery as stipulated in Art. 2 herein, the Seller shall pay to the Buyer the contractual penalty in the amount of 0.1% of the Purchase Price for each, even commenced calendar day of delay.
- 8.5 In the case where the Seller fails to remove defects within the periods stipulated in the Contract, the Seller shall pay to the Buyer a contractual penalty in the amount of 100,- EUR for each defect and for each calendar day of delay.
- 8.6 If the Buyer fails to pay the Purchase Price or the Price for Services within the deadlines set out in this Contract, the Buyer shall pay the Seller interest on delay in the amount set forth by the law for each day of delay unless the Buyer proves that the delay with the payment of the Purchase Price was caused by late release of the Financial subsidy for the Project by the funding body.
- 8.7 The obliged party must pay any contractual penalties to the entitled party not later than within fifteen (15) calendar days of the date of receipt of the relevant claim from the other party.
- 8.8 Payment of the contractual penalties pursuant to this Article shall in no way prejudice the Buyer's right to claim compensation for damage incurred by the Buyer as a result of the Seller's breach of obligations to which the penalty applies. The Parties have agreed that the maximal amount of claim compensation for damage





incurred by the Buyer as a result of the Seller's breach of obligations to which the penalty applies shall be limited to 100% of the Purchase Price.

8.9 The Parties have agreed that the maximal amount of contractual penalties shall be limited to 10% of the Purchase Price.

8.10 The Buyer is entitled to set off by unilateral declaration any of its receivable or part of its receivable resulting from contractual penalty against Seller's claim to pay Purchase price.

## 9. **SPECIAL PROVISIONS**

By signing this Contract, the Seller becomes a person that must cooperate during the finance control within the Act no. 320/2001 Coll., on finance control in the public administration, as amended, and shall provide to the Directing Body of the Operational Programme Research, Development and Education or other control bodies (such as, but not only, European Commission, European Court of Auditors) 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 fulfill 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 Seller shall secure that all its subcontractors are also obliged to cooperate with control bodies in the above stipulated extent. The Seller is obliged to duly archive all written material prepared in connection with the execution of this Contract and to provide access to the Buyer to these archived documents until 2029; any finance control may also be carried out until year 2029.

## 10. **FINAL PROVISIONS**

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

10.2 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) calendar days, such dispute shall be decided by courts of the Czech Republic in the procedure initiated by one of the Parties.

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

10.4 In the event that any of the provisions of this contract shall later be shown or determined to be invalid, putative, ineffective or unenforceable, then such invalidity, putativeness, ineffectiveness or unenforceability shall not cause invalidity, putativeness, ineffectiveness or unenforceability of the Contract as a



whole. In such event the Parties undertake without undue delay to subsequently clarify any such provision using Sec 553(2) of the Civil Code, or to replace after mutual agreement such invalid, putative, ineffective or unenforceable provision of the Contract by a new provision, that in the extent permitted by the laws and regulations of the Czech Republic, relates as closely as possible to the intentions of the Parties to the Contract at the time of creation hereof.

- 10.5 The Parties agree that the Seller shall not be entitled to set off any part of its receivable, or receivable of its sub-debtor against the Buyer or any of his receivables, unless this Contract stipulates otherwise. The Seller shall not be entitled to assign any receivable arising in connection herewith to a third party. The Seller shall not be entitled to assign any rights or obligations arising to him hereunder or any of its parts to third parties.
- 10.6 The Parties declare that they accept the “risk of changed circumstances” within the meaning of Sec 1765(2) of the Civil Code.
- 10.7 The Parties declare that they shall maintain confidentiality with respect to all facts and information they learned in connection with the Contract or during the performance of the Contract, and the disclosure of such facts or information could cause damage to the other Party. This confidentiality provision does not affect duties of Parties with respect to applicable legislation.
- 10.8 This Contract shall constitute complete agreement of the Parties on the Contract subject matter including the Object of Purchase and shall substitute any and all possible previous discussions, negotiations and agreements of the Parties related to the Contract subject matter including the Object of Purchase.
- 10.9 This Contract is executed in one (1) counterpart in electronic form.
- 10.10 The following Annexes form an integral part of the Contract:
- **Annex No. 1:** Technical Specification Document (if Annex 1 uses the term “Contracting Authority” or “contracting authority” it means Buyer. If Annex 1 uses the term “Supplier” or “supplier”, it means Seller);
  - **Annex No. 2:** Technical description of the Object of Purchase as stated in the Seller’s Bid.
  - **Annex No. 3:** Price Sheet
  - **Annex No. 4:** Offered Parameters: Partial criterion Quality and Performance
  - **Annex No. 5:** Offered Parameters: Partial criterion Warranty Lengths



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10.11 The Parties agree to publish the full text of this Contract, including its annexes, in the Register of Contracts pursuant to Act No. 340/2015 Coll., on Special Conditions for the Effectiveness of Certain Contracts, the Disclosure of These Contracts and the Register of Contracts, as amended (Act on the Register of Contracts).

10.12 This Contract shall become valid on the date of the signature of both Parties. The Contract shall become effective on the date of its publication at Register of Contracts.

#### 11. **Representatives of the Parties**

11.1 The Seller has appointed the following authorised representatives for communication with the Buyer in relation to the subject of performance hereunder:

In technical matters: Martin Mišina; xxxxx

11.2 The Buyer has appointed the following authorised representatives for communication with the Seller in relation to the subject of performance hereunder:

In technical matters: Yoann Levy; xxxxx and Inam Mirza; xxxxx

**IN WITNESS WHEREOF** attach Parties their signatures:

#### **Buyer**

Signature: \_\_\_\_\_

Name: RNDr. Michael Prouza, Ph.D.

Position: director

Date:

#### **Seller**

Signature: \_\_\_\_\_

Name: Dr. Ing. Radan Salomonovič on the basis of a power of attorney

Position: Country Manager

Date:



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## **ANNEX 1**

### **TECHNICAL SPECIFICATION**

*Vacuum chamber with pumping system,  
gas inlet system, vacuum gauges,  
flanges and stand*

## Cylindrical Vacuum Chamber

Chamber vessel important dimensions and all ports information can be viewed on a preliminary drawing in Figs. 1 and 2. Dimensions and flanges/valves positioning precision required is 0.5 mm except otherwise stated.

A certification is required proving that the vacuum chamber itself does **not** show leakage rate higher than or equal to  $5 \cdot 10^{-9}$  mbar.l/s (excl. gas permeation).

Parameter name	Required technical and functional characteristics
Chamber shape	Cylindrical chamber.
Material	Stainless steel for high vacuum: 304/1.4301 or 304L/1.4307 or 316L/1.4404.
Size	500 mm inner diameter and 600 mm inner height.
Ultimate vacuum pressure reachable (chamber itself)	$\leq 5 \cdot 10^{-7}$ mbar.
Ports/flanges on the vacuum chamber	<p>Top and bottom flanges of the cylinder must be ISO-K* flanges.</p> <p>Additionally, 38 ports are required (majority of them pointing to the center of the cylinder or to its revolution axis), see Fig. 1 and table 1, among which, in particular:</p> <ul style="list-style-type: none"> <li>• 1 port (#9) with rotatable DN160 CF* flange (see Fig. 1) for attachment to another (not to be provided) differentially pumped chamber (that will have its own supporting frame);</li> <li>• 1 port (#21) with rotatable DN160 CF* flange which need to be offset from the center by 45 mm (see Fig. 1);</li> <li>• 1 port (#4) with stainless steel DN250 ISO-K* flange with a viewport in borosilicate glass of diameter larger than or equal to 135 mm;</li> <li>• Several viewports (see next row of this table) among which 2 of them, #8 and #10, at an angle of 35 degrees, pointing toward the center of the chamber.</li> </ul> <p>If the ISO-K* flange with a viewport in borosilicate glass of diameter larger than or equal to 135 mm is not available as a DN250* (for port #4), it is possible to propose the flange with viewport as a DN200* provided an ISO-K* adaptation (with all adequate fittings) from DN200* to DN250* is given.</p>
Viewports	<ul style="list-style-type: none"> <li>• 1 flange DN250 ISO-K* with viewing port, Stainless steel/Borosilicate glass (mentioned above, #4);</li> <li>• 1 viewport DN160 ISO-K* Stainless steel/Borosilicate glass (#30);</li> <li>• 1 viewport, DN63 ISO-K* Stainless steel/Fused Silica, UV grade (#26);</li> <li>• 2 viewports, DN63 ISO-K* Stainless steel/ Borosilicate glass (#6 and #7) or better quality (see quality and performance criteria);</li> <li>• 2 viewports DN40 ISO-KF* Stainless steel/UV fused silica, UV grade, at an angle of 35 degrees, pointing toward the center of the chamber (#8</li> </ul>

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*



	<p>and #10).</p> <p>In case they are not available as standard products, DN63 ISO-K* viewports may be replaced by DN63 CF* viewports provided appropriate adaptation from DN63 CF* to DN63 ISO-K* are supplied for the connection to the vacuum chamber.</p>
Hooks (lifting eye bosses)	<p>At least 3 lifting eye bosses affixed (screwed or welded) on the top flange + at least 4 lifting eye bosses affixed (welded) to the upper part of the cylinder vessel outer wall to make it possible to lift just the upper lid (top flange), or the whole chamber for its installation on the mechanical stand and for lifting it when installed.</p>

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

## Gas Inlet System

A gas inlet and control system must be provided to be fitted on the vacuum chamber with the following requirements.

Parameter name	Required technical and functional characteristics
Gas inlet	Yes. Suitable for air, N <sub>2</sub> , O <sub>2</sub> , He, Ar, at least.
Inlet control	For the gas inlet control, 2 mass flow controllers (MFCs) and 1 needle valve are required, with their appropriate connections/tubing to the chamber.
MFCs type	<ul style="list-style-type: none"> <li>• 1 multigas MFC adapted and calibrated for N<sub>2</sub>, with seal in viton, with full-scale flow rate of 20 standard cubic centimeters per minute (sccm);</li> <li>• 1 multigas MFC adapted and calibrated for N<sub>2</sub>, with seal in viton, with full-scale flow rate of 100 sccm.</li> </ul> <p>Each MFC must be with normally-closed valve type. Additionally to the required readout/control unit (see below) it may (but must not) be computer controllable via a provided software compatible with Windows 10 exploitation system.</p>
Differential pressure range for normal operation of the MFCs	from $\leq 10$ psid to $\geq 40$ psid.
Range of control of the flow rate	From $\leq 2\%$ of the full-scale flow (FSF) up to the FSF.
Resolution of the flow rate of each MFC	$\leq 0.5\%$ of the FSF.
Flow rate accuracy of each MFC	$\leq 2\%$ of the FSF.
MFCs readout and control	<p>1 single readout and control unit with at least 4 separate channels (with sequentially selectable channel to readout and to control at least 4 different MFCs independently), with necessary power supply and with connections to be able to read out and control the 2 required MFCs. It must be possible to set the gas correction factor.</p> <p>It is possible to provide (but is not required, see quality and performance criteria) this readout-control unit with an entry for a capacitance gauge with an option to self-regulate the MFCs, but the simple readout and control of the MFCs without gauge connection must also be possible.</p>
Connection/tubing of each MFC	<ul style="list-style-type: none"> <li>• Either Swagelok- or VCR-type tube fittings (the same for both MFCs) for connection to the chamber flange, (for the flange type, see the section related to extra flanges);</li> <li>• at least 1 compatible manual shut-off valve;</li> <li>• 1/4" stainless steel tubing/connections to the MFCs.</li> </ul>

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

Needle valve	<p>1 needle valve, manual type, multigas, allowing for tuning (control) of gas flow smaller than <math>1 \times 10^{-5}</math> mbar.l/s.</p> <p>With appropriate tubing (1/4" stainless steel tubing)/connections and adaptations to enable direct connections to the chamber.</p>
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*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

## Pumping system for the chamber

The pumping system and its connections to the vacuum chamber are addressed here. It must be made of a turbomolecular pump and a roughing pump with the appropriate connections (bellows) and flanges types to ensure efficient pumping of the above described vacuum chamber. The pumping system may be in the form of a single autonomous module (with the appropriate connections) controlled by the same display and containing the 2 kinds of pumps.

The pumping system must fit descriptions of following tables. (A schematic diagram can be seen in Fig. 3).

Parameter name	Required technical and functional characteristics
<b>Turbomolecular pump</b>	
Pumping speed	$\geq 680$ l/s (DN160 ISO-F* inlet flange).
Connection	The pump shall be connected at the bottom of the chamber through a to-be-provided manual HV compatible gate valve, also ISO-F*, having an aluminum or stainless steel valve plate.
Control and display unit	Yes, must be provided.
Fittings	Air cooling kit, control cables, power supplies.
<b>Roughing pump:</b>	
Type of roughing pump	Oil-free dry roughing pump.
Standard pumping speed	$\geq 7.5$ l/s
Noise level	In case of noise level higher than or equal to 60 dB(A) at 1 m from the pump, a sound enclosure kit must be provided to reduce the noise level below 60 dB(A).
Fittings	Necessary power supplies.
<b>Pumping system connections</b>	
The Fig. 3 shows the configuration planned for the connections between the pumps and the chamber	
Connection valves	At least: <ul style="list-style-type: none"> <li>• The already mentioned manual gate valve HV-compatible DN160 ISO-F* to isolate the turbomolecular pump;</li> <li>• 1 manual angle valve ISO-KF* of appropriate diameter to connect exit of the turbomolecular pump to the Tee (via a bellow);</li> <li>• 1 manual angle valve DN40 ISO-KF* to connect one flange of the chamber to the Tee (via a bellow);</li> <li>• 1 manual valve ISO-KF* of appropriate diameter to</li> </ul>

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

	<p>connect the inlet of the roughing pump to the Tee;</p> <ul style="list-style-type: none"> <li>• 2 Tee's with proper ISO-KF* adaptations/reductions (see Fig. 3).</li> </ul>
Hoses (bellows)	<ul style="list-style-type: none"> <li>• 1 x Corrugated hose (bellow), ISO-KF* Stainless steel, flexible, length <math>\geq 1500</math> mm, with appropriate fittings (ISO-KF* clamps and O-rings, centering rings, etc.) and diameter to be connected between the outlet of the turbomolecular pump and the Tee.</li> <li>• 1 x Corrugated hose (bellow), DN40 ISO-KF* Stainless steel, flexible, length <math>\geq 1500</math> mm with appropriate fittings (ISO-KF* clamps and O-rings, centering rings, etc.) to connect the chamber to the Tee.</li> </ul>
Fittings	<ul style="list-style-type: none"> <li>• Fittings necessary for the assembly of the pumping system must be provided: <ul style="list-style-type: none"> <li>◦ o-ring, centering ring, clamp for each ISO-KF* flange connection;</li> <li>◦ o-ring, centering ring and sufficient amount of claws for each ISO-K* flange connection;</li> <li>◦ o-ring, centering ring and sufficient amount of screws for each ISO-F* flange connection;</li> <li>◦ gasket and sufficient amount of screws for CF flange connections.</li> </ul> </li> </ul>

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## Gauges

4 different gauges and 3 appropriate controllers are required.

Parameter name	Required technical and functional characteristics
Pressure gauges	<p>1 Full range pressure gauge with measurement range from <math>10^{-8}</math> mbar to 1000 mbar, DN40 ISO-KF* flange. Pressure measurements with <math>\leq \pm 30\%</math> accuracy between <math>10^{-7}</math> mbar and 100 mbar.</p> <p>Fittings included (O-ring, centering ring and clamp, connections, etc.).</p>
	<p>1 Full range pressure gauge with measurement range from <math>10^{-8}</math> mbar to 1000 mbar, DN40 CF* flange. Pressure measurements with <math>\leq \pm 30\%</math> accuracy between <math>10^{-7}</math> mbar and 100 mbar.</p> <p>Fittings included (O-ring, centering ring and clamp, connections, etc.) and also adaptation from DN40 CF* to DN40 ISO-KF*.</p>
	<p>1 Pirani gauge with measurement range from <math>10^{-4}</math> mbar to 1000 mbar and ISO-KF* flange of appropriate dimension and connections for measuring pressure in the fore-vacuum line, between a Tee and the turbomolecular pump (installed on the other Tee). Pressure measurements with <math>\leq \pm 10\%</math> accuracy between <math>2 \cdot 10^{-3}</math> mbar and 20 mbar.</p> <p>Fittings included (O-ring, centering ring and clamp, connections, etc.).</p>
	<p>1 capacitance gauge DN16 ISO-KF* for <math>10^{-4}</math> mbar to 1 mbar pressure range of measurement. Pressure measurements with <math>\leq \pm 0.2 \%</math> accuracy from <math>10^{-4}</math> mbar to 1 mbar.</p> <p>Fittings included (O-ring, centering ring and clamp, connections, etc.).</p>
Display and control units	<p>- 1 Display-and-control unit for operation of two gauges (for one of the full-range and the Pirani gauge) and - 1 separate unit for another full-range gauge</p> <p>These two control units must have</p> <ul style="list-style-type: none"> <li>◦ analog output signals;</li> <li>◦ bright display;</li> <li>◦ simultaneous display of all two pressure readings;</li> <li>◦ simple to operate;</li> <li>◦ versatile connectivity (USB 2.0 or 3.0, RS-485,</li> </ul>

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*



	<p>Ethernet);</p> <ul style="list-style-type: none"> <li>◦ power supply.</li> </ul> <p>- 1 Gauge display-and-control unit for the capacitance gauge with power supply. In case the readout and control unit for MFCs allows for the connection of the capacitance gauge (for gas pressure regulation) and allows for display of the pressure, then this gauge display-control unit is not required, provided the pressure readout can be simultaneous with the readout of the MFCs and provided it can be independent also.</p>
Gauges cables	4 sensor cables of at least 3 meter long (one adapted for each of the required gauges).

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## Flanges

Several other flanges are also required. They are described in this section.

Parameter name	Required technical and functional characteristics
<b>Specific flanges</b>	
Coaxial feedthroughs	<ul style="list-style-type: none"> <li>• 1 DN40 ISO-KF* flange with 2 or 3 coaxial feedthrough connections (2-pin or 3-pin coaxial feedthroughs) with BNC(air side) – pin(vacuum side) terminations, grounded shield, impedance 48-52 Ohms, with clamp, centering ring and o-ring.</li> <li>• 1 DN40 ISO-KF* flange with 1 coaxial feedthrough connection (1-pin coaxial feedthroughs) with SHV(air side) – pin(vacuum side) terminations, grounded shield, impedance 48-52 Ohms, with clamp, centering ring and o-ring.</li> </ul>
Electrical feedthroughs	<ul style="list-style-type: none"> <li>• 2 DN40 ISO-KF* flanges with electrical feedthroughs (wire conductors), <math>\geq 1</math> kV, <math>\geq 20</math> A, 4 pins (4-pin electrical feedthrough flanges), with clamp, centering ring and o-ring.</li> <li>• 1 DN40 ISO-KF* flange with electrical feedthroughs (wire conductors), <math>\geq 5</math> kV, <math>\geq 15</math> A, 2 pins (2-pin electrical feedthrough flange), with clamp, centering ring and o-ring.</li> </ul>
Thermocouple feedthroughs	<ul style="list-style-type: none"> <li>• 1 DN 40 ISO-KF* thermocouple feedthrough flange with 2 pairs of type-K thermocouples, with clamp, with centering ring and o-ring.</li> </ul> <p>A separate dual channel, digital temperature reader must be provided with connections and power supply.</p>
Rotary feedthrough	<p>1 DN40 ISO-KF* magnetically coupled rotary feedthrough, motorized, including motor, driver, controller and connections to be able to make, via a computer (computer must not be included), rotation angle positioning (at least 4 different positions available) and continuous rotation.</p> <p>It must be provided with clamp, with centering ring and o-ring.</p> <p>The rotation velocity must be tunable between <math>\leq 5</math> rpm and <math>\geq 25</math> rpm and the torque it can deliver <math>\geq 1</math> Nm.</p> <p>In case this is not available as standard product with DN40 ISO-KF* flange, then DN40* rotary feedthrough with the corresponding flange adapter may be supplied, with associated fittings (o-rings/gaskets, etc.)</p>

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

Flanges for MCFs and needle valve	<p>2 flanges DN40 ISO-KF*, with adaptation to swagelok or VCR type to connect them to the tubing (1/4") of the (to be provided) MFCs, with clamp, with centering ring and o-ring.</p> <p>1 flange DN40 ISO-KF*, with adaptation to the needle valve, with clamp, with centering ring and o-ring.</p>
Bottom flange of the vacuum chamber	On the inner side of the bottom flange, 4 blind M6 tapped holes located on a diameter of 250 mm must be made with sufficient precision for mounting a circular optical breadboard. A drawing of the breadboard is shown on Fig. 4.
Top flange of the vacuum chamber	On the inner side of the top flange, 4 blind M6 tapped holes are also required to make it possible to fix relatively light optomechanics. Positioning of these 4 holes is to be agreed about during the design validation phase.
<p style="text-align: center;"><b>Blank flanges</b></p> <p style="text-align: center;">Additionally, we also require the following blank flanges</p>	
DN 160 CF*	2 flanges, each with a copper gasket and adapted number of screws
DN 100 ISO-K*	2 flanges, each with 4 claws, with centering ring and o-ring
DN 63* ISO-K*	9 flanges, each with at least 3 claws, with centering ring and o-ring
DN 40* ISO-KF*	9 flanges, each with clamp, with centering ring and o-ring
DN 16* ISO-KF*	3 flanges, each with clamp, with centering ring and o-ring

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## Mechanical stand

A single and appropriate steel or aluminum stand (frame) for the vacuum chamber must be provided. The design is flexible but care must be observed regarding the weight and height, which must be as given the Fig. 2. Also, the frame and its feet/wheels must be sturdy enough to hold the chamber with mentioned flanges, the vacuum system and extra 50 kg of future set-up in the chamber.

Parameter name	Required technical and functional characteristics
Height of the frame	Must be designed to bring the center of the DN 160 CF* flange to 1200 mm from the floor. The height must be adjustable around this position in a minimum range of $\pm 30$ mm.
Frame feet and wheels	The frame must have four (4) height-adjustable feet to allow to adjust and fix the chamber at the exact working height with respect to other experimental systems (minimum range of $\pm 30$ mm tunability around the height: 1200 mm from the floor).  Additionally, the frame must have four (4) heavy load wheels for displacing the chamber (usable when the feet are completely lifted up).
Shelf	The frame must have a shelf at the bottom (placed at the bottom for example on horizontal support bars) capable of supporting the roughing pump, 3 gauges readout/controllers and the readout/controller of MFCs.
Weight of the chamber and frame together, per m <sup>2</sup> of total feet surface in contact with the floor	< 1000 kg/m <sup>2</sup>

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

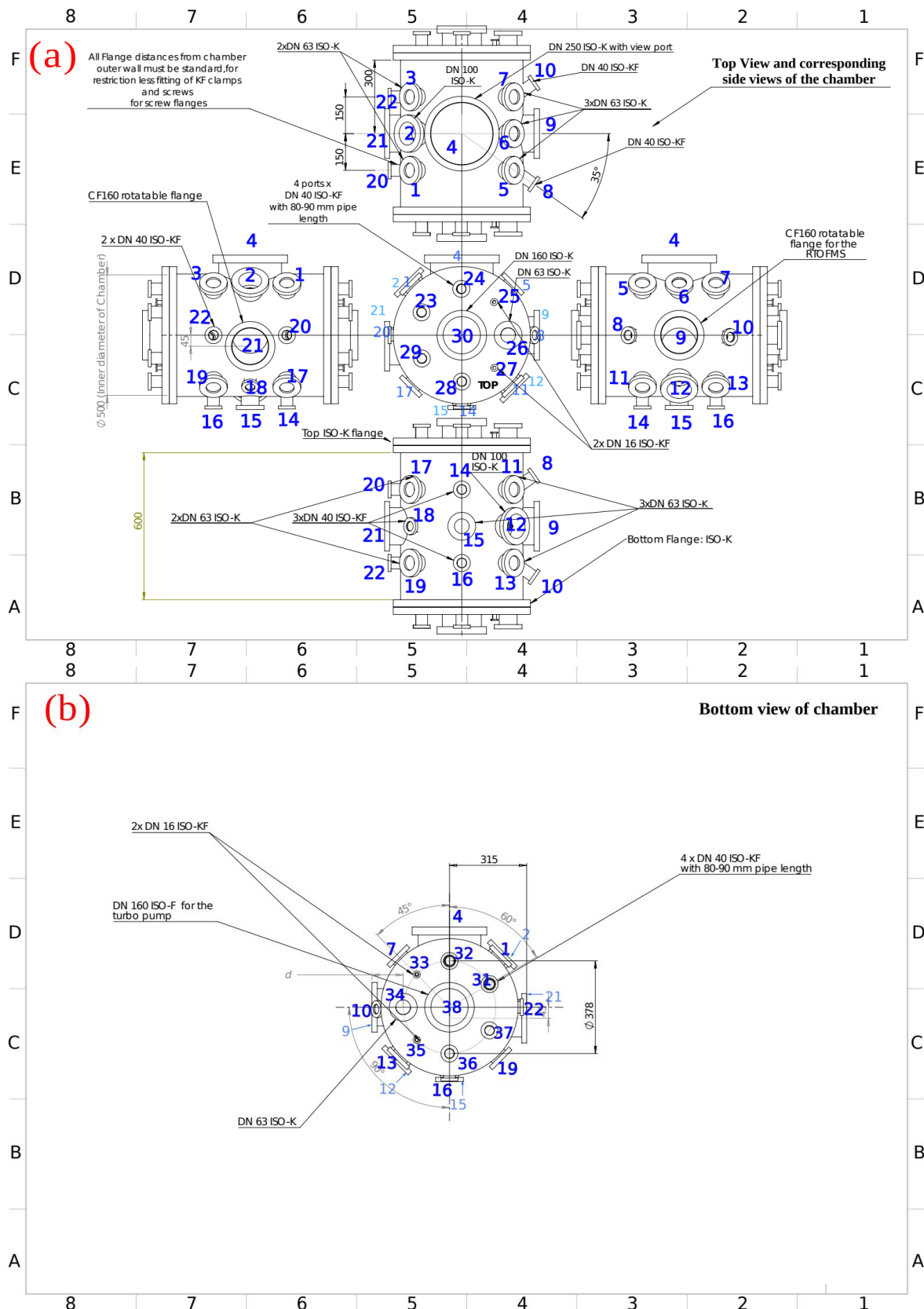


Fig. 1: (a) Top and corresponding side views of a preliminary technical diagram of the vacuum chamber (b) bottom view. Port numbering according to table 1. Dimensions indicated in mm. It is emphasized that the length of the port #38 may be longer than displayed in order the gate valve not to hinder access to other ports on the bottom flange. Also the length of the port #9 must be as in Fig. 2 (distance  $d$  shown in figure (b) must be  $d=174\text{mm}$ ). Note the offset of 45 mm of the port #21. If the figures contain references to standards or technical documents the Contracting Authority allows the use of other, qualitatively and technically equivalent solution.

\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.

Port #	Flange diameter	Type of connections	Planned purpose
<b>On side wall</b>			
1	DN 63*	ISO K*	Blank flange for the moment
2	DN 100*	ISO K*	Blank flange for the moment
3	DN 63*	ISO K*	Blank flange for the moment
4	DN 250*	ISO K*	Flange with viewport
5	DN 63*	ISO K*	Blank flange for the moment
6	DN 63*	ISO K*	Viewport
7	DN 63*	ISO K*	Viewport
8	DN 40*	ISO KF* at an angle	Viewport UV grade fused silica
9	DN 160*	CF rotatable	Connection to time of flight mass spectrometer which will have its own frame.
10	DN 40*	ISO KF* at an angle	Viewport UV grade fused silica
11	DN 63*	ISO K*	Blank flange for the moment
12	DN 100*	ISO K*	Blank flange for the moment
13	DN 63*	ISO K*	Blank flange for the moment
14	DN 40*	ISO KF*	Feedthrough (coaxial, electrical or thermocouple)
15	DN 63*	ISO K*	Blank flange for the moment
16	DN 40*	ISO KF*	Feedthrough (coaxial, electrical or thermocouple)
17	DN 63*	ISO K*	Blank flange for the moment
18	DN 40*	ISO KF*	Possible connection of the magnetically coupled motorized rotary feedthrough
19	DN 63*	ISO K*	Blank flange for the moment
20	DN 40*	ISO KF*	Feedthrough (coaxial, electrical or thermocouple)
21	DN 160*	CF* rotatable <b>with 45 mm offset</b>	Future Target manipulator, bank flange for the moment.
22	DN 40*	ISO KF*	Feedthrough (coaxial, electrical or thermocouple)
<b>On the top</b>			
23	DN 40*	ISO KF* with adaptation for gas flow	Connection to tubing/MFC
24	DN 40*	ISO KF* with adaptation for gas flow	Connection to tubing/MFC
25	DN 16*	ISO KF*	Blank flange for the moment
26	DN 63*	ISO K*	Viewport UV grade fused silica

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27	DN 16*	ISO KF*	Blank flange for the moment
28	DN 40*	ISO KF*	Blank flange for the moment
29	DN 40*	ISO KF* with adaptation for gas flow	Connection to tubing/needle valve
30	DN 160*	ISO K*	Viewport
<b>On the bottom</b>			
31	DN 40*	ISO KF*	Connection for the roughing pump
32	DN 40*	ISO KF*	Feedthrough (coaxial, electrical or thermocouple)
33	DN 16*	ISO KF*	Connection for Capacitance gauge
34	DN 63*	ISO K*	Blank flange for the moment
35	DN 16*	ISO KF*	Blank flange for the moment
36	DN 40*	ISO KF*	Feedthrough (coaxial, electrical or thermocouple)
37	DN 40*	ISO KF*	Connection for full range gauge
38	DN 160*	ISO F*	Connection for the gate and turbomolecular pump

Table 1 – Port identification.

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

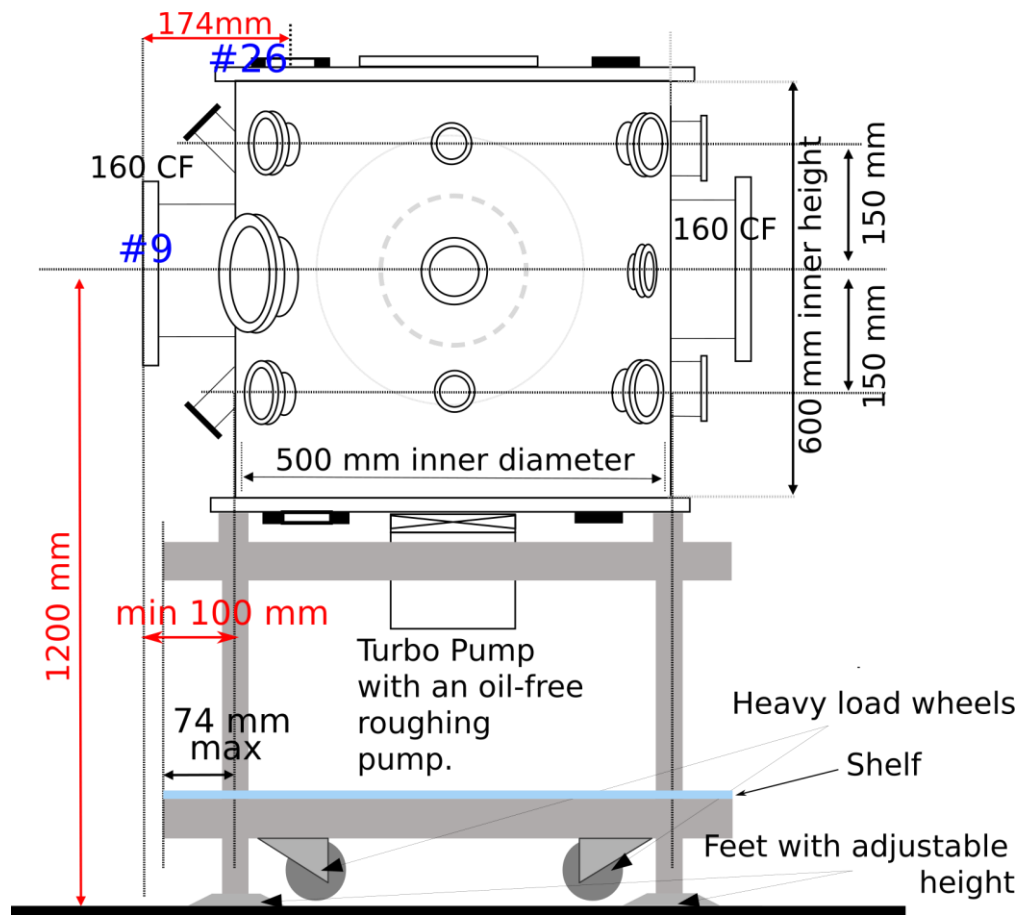
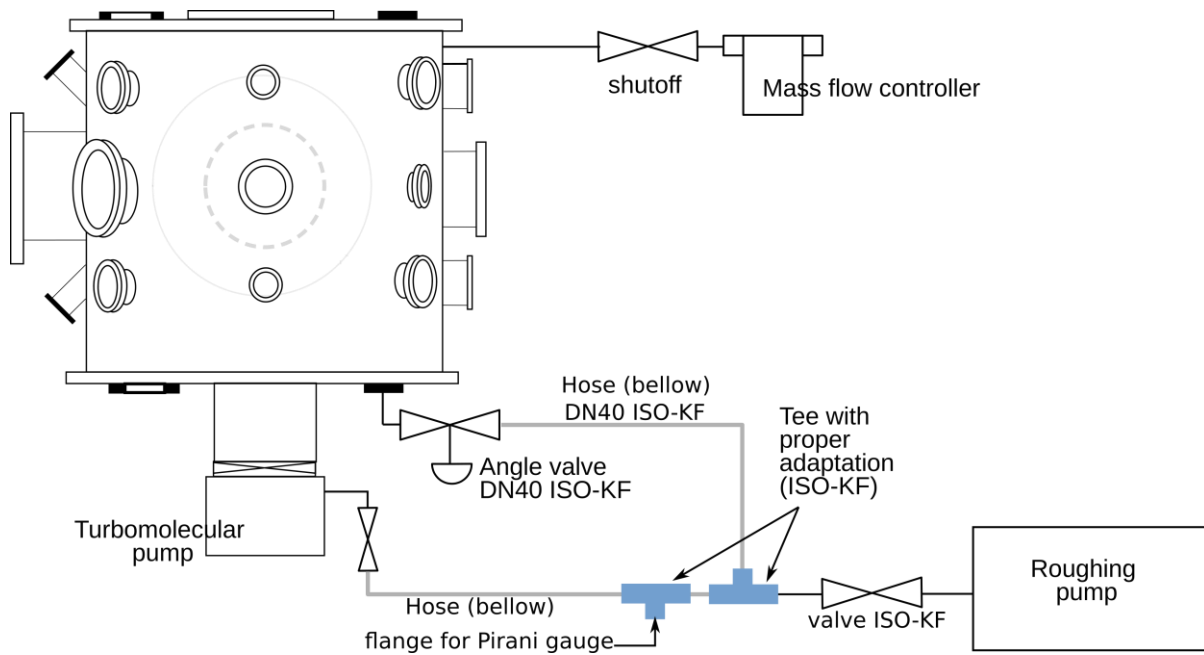
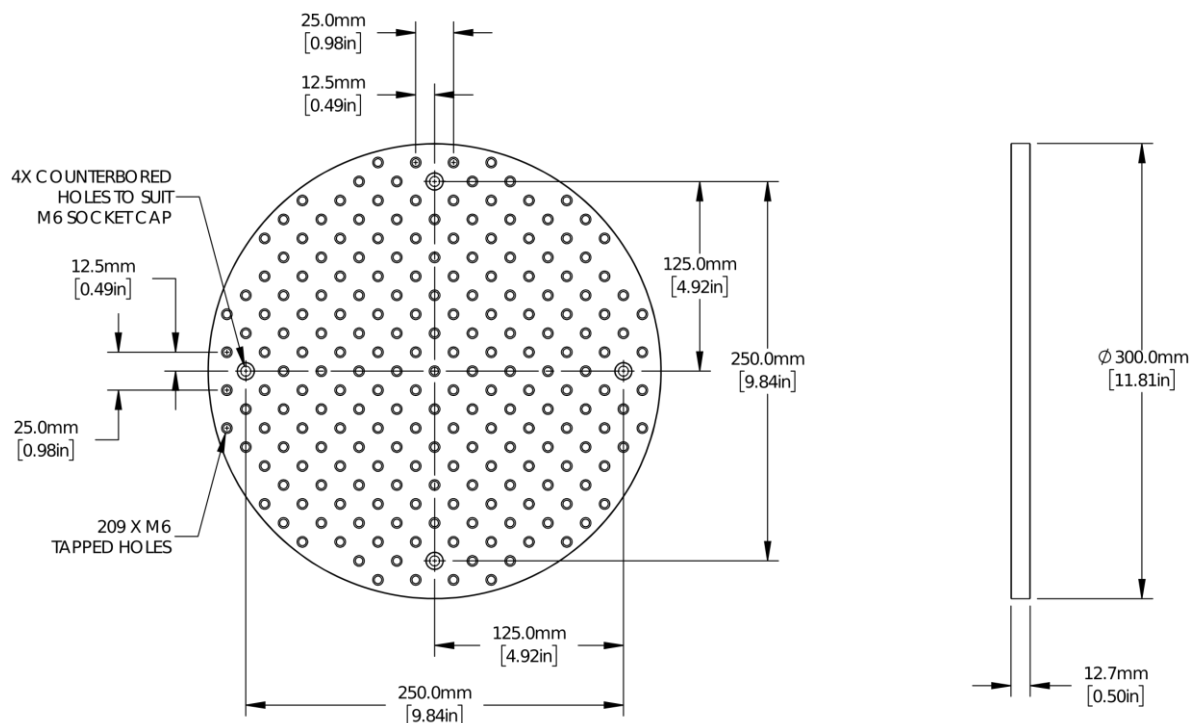


Fig. 2: Schematic diagram of the vacuum chamber and its stand. Note the minimum distance of 100 mm between the outer wall of the chamber and the end of the flange of port #9, while the distance to the center of port #26 must be 174 mm. If the figure contains references to standards or technical documents the Contracting Authority allows the use of other, qualitatively and technically equivalent solution.

\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.



*Fig. 3: Schematic of the pumping system with connections. If the figure contains references to standards or technical documents the Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*



*Fig. 4: Drawing of the circular breadboard (not to be provided) planned to be installed in the vacuum chamber. If the figures contain references to standards or technical documents the Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*

*\*The Contracting Authority allows the use of other, qualitatively and technically equivalent solution.*



EUROPEAN UNION  
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## **ANNEX 2**

### **SELLER'S BID**

List of supplies items		
Description	Product No.	Quantity
<b>Vacuum chamber with gas inlet</b>		
Customized cylindrical chamber DN500	TR-8880-00462	1
Viewport DN 250 ISO-K, Stainless steel/Borosilicate glass	TR-9990-02432	1
Viewport, DN 160 ISO-K, Stainless steel/Borosilicate	322GSG160	1
Viewport, DN 63 CF Stainless, steel/Fused Silica, UV	420GSG063-silica-uv	1
Adapter, DN 63 CF DN 63 CF/, DN 63 ISO-K, stainless steel, l=90 mm	420rug063-063-90	1
Copper Gasket, DN 63 CF OFHC, Copper vacuum-annealed, 5, pieces per package	490DFL063-G-S5	1
Hexagon Head Screw Set, DN 63, CF Stainless steel A2, M8x45, 8 pieces per set	420BSC063-45	1
Viewport, DN 63 ISO-K, Stainless steel/Borosilicate	322GSG063	1
Viewport Retainer, DN 63, ISO-K Stainless steel	320GAG063-50	1
Optical Glass Fused Silica, (synthetic amorphous quartz)	GSG050-silica-uv	1
Viewport, ISO-KF NW 40, 304, SS / Fused Silica, UV	120GSG040-silica-uv	2
Viewport Retainer, DN 63, ISO-K Stainless steel	320GAG063-50	1
Viewport Retainer, DN 40, ISO-KF Stainless steel	120GAG040-25	1
Centering Ring with Outer, Ring, DN 250 ISO-K, Aluminum/O-Ring FKM/Stainless, Steel 316Ti/1.4571	322ZRA250	1
Centering Ring with Outer, Ring, DN 160 ISO-K, Aluminum/O-Ring FKM/Stainless, Steel 316Ti/1.4571	322ZRA160	1
Centering Ring with Outer, Ring, DN 63 ISO-K, Aluminum/O-Ring FKM/Stainless, Steel 316Ti/1.4571	322ZRA063	3
Double Claw Clamp, DN 63-250, ISO-K Zinc-plated steel	350BKL250	22
Centering ring, DN 40 ISO-KF, Stainless steel 304/1.4301, O-Ring FKM	122ZRG040	2
Clamping Ring, DN 32 / 40, ISO-KF Aluminum ADC 12, for Elastomer Seal	110BSR040	2
MFC Gas inlet set	see attached description	1
Gas dosing valve EVN 116	PF I32 031	1
Centering ring, DN 16 ISO-KF, Stainless steel 304/1.4301, O-Ring FKM	122ZRG016	1
Clamping Ring, DN 10 / 16, ISO-KF Aluminum ADC 12, for Elastomer Seal	110BSR016	1
Swagelok®-Adapter, DN 16 ISO-KF Stainless steel, tube external diameter 1/4"	120ASW016-0250	1
<b>Pumping system</b>		
HiPace 700, Turbo-drag-pump, DN 160 ISO-F, TC 400, 48V DC	PM P03 935	1
DCU 400, Display control unit, 100-240 V AC / 48 V DC, for HiPace 400/700/800	PM C01 823 A	1
Connection cable, length: 3 m, TC 400 - TPS/DCU 310/400	PM 061 352 -T	1
Air cooling kit, 24V DC, M12, for HiPace 700/TC 400	PM Z01 303 A	1
Mounting materials, DN 160 ISO-F, inclusive, centering ring coated, hexagonal bolts	PM 016 460 -T	1
Mounting materials, DN 160 ISO-F, inclusive, centering ring coated with, splinter shield, hex. bolts	PM 016 461 -T	1
ACP28 STD V2 MANUAL ON/OFF, WO CABLE	V6SATSZFZMF	1
Sound enclosure kit for, ACP28/40	114379	1
External silencer ES 25 S, DN 25	109873	1
SVV 160 HA, DN 160 ISO-F HV, gate valve, manual	PF E31 001	1
AVC 025 SA, DN 25 ISO-KF, Angle valve, manual	PF A41 003	1
AVC 040 SA, DN 40 ISO-KF, Angle valve, manual	PF A51 003	2
Reducing Tee, DN 40 ISO-KF DN, 40-16 ISO-KF, Stainless Steel, 304/1.4301	120RTR040-016	1
Tee, DN 40 ISO-KF Aluminum EN, AW-6082/3.2315, length 130 mm	110RTS040	1
Corrugated Hose, DN 40 ISO-KF, Stainless steel, flexible, length 1500 mm	120SWN040-1500	2
Conical Reducer, DN 40 ISO-KF, DN 40-25 ISO-KF, stainless, Steel, length 40 mm	120RRK040-025-40	2
Centering ring, DN 25 ISO-KF, Stainless steel 304/1.4301, O-Ring FKM	122ZRG025	3
Clamping Ring, DN 20 / 25, ISO-KF Aluminum ADC 12, for, Elastomer Seal	110BSR025	3
Centering ring, DN 40 ISO-KF, Stainless steel 304/1.4301, O-Ring FKM	122ZRG040	8
Clamping Ring, DN 32 / 40, ISO-KF Aluminum ADC 12, for, Elastomer Seal	110BSR040	8
<b>Vacuum gauges</b>		
PKR 361, Active Pirani/, Cold cathode gauge, DN 40 ISO-KF, high current	PT T03 150 010	1
Centering ring, DN 40 ISO-KF, Stainless steel 304/1.4301, O-Ring FKM	122ZRG040	1
Clamping Ring, DN 32 / 40, ISO-KF Aluminum ADC 12, for, Elastomer Seal	110BSR040	1
PKR 361, Active Pirani/, Cold cathode gauge, DN 40 CF-F, high current	PT T03 350 010	1
Copper Gasket, DN 40 CF OFHC, Copper (Oxygen Free), 10, pieces per package	490DFL040-S10	1
Hexagon Screw Set, DN 40 CF, Stainless steel A2, M6x35, 6, pieces per set	420BSC040-35	1
TPR 270, Active Pirani Gauge, DN 16 ISO-KF	PT R26 770 B	1
CMR 374, Active, Capacitance Transmitter, DN 16 ISO-KF, 0,0001 - 1,1 mbar	PT R25 131	1
Centering Ring, DN 16 ISO-KF, Stainless Steel 304/1.4301, O-Ring FKM	122ZRG016	2
Clamping Ring, DN 10 / 16, ISO-KF Aluminum ADC 12, for, Elastomer Seal	110BSR016	2
TPG 361, SingleGauge, Display and control unit, for one gauge, 100-250 V AC, 50/60 Hz	PT G28 040	2
TPG 362, DualGauge, Display and control unit, for two gauges, 100-250 V AC, 50/60 Hz	PT G28 290	1
Sensor cable CG, for Single/Dual/MaxiGauge, length: 3 m	PT 448 250 -T	4
<b>Set of flanges</b>		
Coaxial Feedthrough, BNC, DN, 40 ISO-KF Flange: stainless, steel, grounded shield, 2 pins	120XBG040-2	1
Centering ring, DN 40 ISO-KF, Stainless steel 304/1.4301, O-Ring FKM	122ZRG040	10
Clamping Ring, DN 32 / 40, ISO-KF Aluminum ADC 12, for, Elastomer Seal	110BSR040	10
Coaxial Feedthrough, SHV-5, DN 40 KF Flange: stainless, steel, grounded shield, 1 pin	120XSG040-1	1
Electrical Feedthrough, DN 40, ISO-KF Copper-conductor, 4, pins, 1 kV DC, 20 A	120XST040-1-20-4	2
Electrical Feedthrough, DN 40, ISO-KF Copper-conductor, 2, pins, 5 kV DC, 15 A	120XST040-5-15-2	1
Thermocouple Feedthrough, Type K, DN 40 KF 2 wire pairs, incl. plug, atmosphere side	120XTK040-2	1
Multilogger M1200, 4-channel temperature reader for thermocouples	M1200	1
Rotary Feedthrough, DN 40 CF, Motorized, high precision, with magnetic coupling	420MRM040-hm	1
Adapter, DN 40 CF DN 40 CF/, DN 40 ISO-KF, stainless steel, l=50 mm	420RUG040-040-50	1
Hexagon Screw Set, DN 40 CF, Stainless steel A2, M6x35, 6, pieces per set	420BSC040-35	1
Swagelok®-Adapter, DN 40, ISO-KF Stainless steel, tube, external diameter 1/4"	120ASW040-0250	2
Reducing Piece, Straight, DN, 40 ISO-KF DN 40-16 ISO-KF,, stainless steel, length 40 mm	120RRG040-016-40	1
CF-Blank Flange for Ports, DN, 160 Stainless steel, with, copper gasket and screws	820KBC160	1
ISO-K-Blank Flange for Ports, DN 100 Stainless steel, with, centering ring and clamps	820KBI100	2
ISO-K-Blank Flange for Ports, DN 63 Stainless steel, with, centering ring and clamps	820KBI063	9
ISO-KF-Blank Flange for Ports, DN 40 Stainless steel, 304/1.4301	820KBI040	9
ISO-KF-Blank Flange for Ports, DN 16 Stainless steel, 304/1.4301	820KBI016	3
<b>Metallic stand</b>		
Chamber frame	included in TR-8880-00462	1

TR-8880-00462

Customized cylindrical chamber DN 500 Incl. frame

**Please provide 3D-model ( STEP ) together with the order.**

**Chamber shape:**

- ID 500mm and 600 mm inner height
- 38 ports see Fig. 1 and table 1
- Port (#21) DN 160CF offset from the center 45mm
- Port #8 und #10 angle 35 degrees

**Top flange** of the vacuum chamber based on DN500 ISO-K

- 3 lifting eyes
- on the inner side of the top flange, 4 blind M6 tapped holes

**Bottom flange** of the vacuum chamber based on DN500 ISO-K

- 4 blind M6 tapped holes located on a diameter of 250 mm

**Frame feet and wheels:**

Chamber center 1200mm from the floor

four (4) heavy load wheels

adjustable range of  $\pm 50$  mm.

Shelves 750x400 mm as a working table

- Incl. drawing for approval
- Vacuum test local
- Tightness  $< 1 \cdot 10^{-10}$  Pa·m<sup>3</sup>/s ( $< 1 \cdot 10^{-9}$  mbar·l/s), excl. gas permeation
- Helium leak test report
- Tolerances :
- General tolerances for welded constructions: EN ISO 13920 B
- Materials:
- ISO-KF und ISO-K/F flanges 1.4301 (304), CF flanges 1.4307 (304L)
- Tubes and chamber components 1.4301 (304) or higher-valued
- Surfaces:
- Inside: glass bead blasted
- Outside: glass bead blasted
- Edges: laser or water jet cut
- Operating pressure: 0 hPa (mbar) to ambient pressure
- Operating temperature:
- (-15)°C to 150°C with FKM seals (temporarily up to 200°C)
- (-196)°C to 200°C with Cu-gaskets (silver plated up to 300°C)
- Magnetic permeability not specified
- A rating plate will be fixed to the chamber (Please let us know if you prefer a particular position.)

TR-9990-02432

Viewport DN 250 ISO-K,

Stainless steel / Borosilicate

- Ø Free View: ca. 260 mm

- Vacuum test local

Tightness  $< 1 \cdot 10^{-10}$  Pa·m<sup>3</sup>/s ( $< 1 \cdot 10^{-9}$  mbar·l/s), excl. gas permeation

- Materials:
- Flange: Stainless Steel
- Glass: Borofloat (surface chemically hardened)
- Operating pressure: 0 hPa (mbar) to ambient pressure
- Operating temperature: -15°C to 60°C
- Thermal gradient: 5°C per minute
- Magnetic permeability not specified

## MFC GAS INLET SET

<b>1</b>	<b>F-201CV-020-RAD-22-V</b>	<b>1,00 ks</b>
Bronkhorst EL-FLOW Select, Mass Flow Controller		
Plyn: N2		
Rozsah regulace: 0,4...20 sccm		
Vstupní tlak: 2 bar (a)		
Tlak na výstupu regulátoru: 0...1 bar (a)		
Teplota: 20 °C		
Ventil v klidové pozici: uzavřený (normally-closed)		
Orifice: 0,07 mm		
Funkce Multi fluid/Multi range: aktivní (multigas)		
Procesní připojení: kompresní na trubčku s vnějším průměrem 1/4" (Swagelok)		
Komunikace: analogová 0...5 Vdc + digitální RS232 a RS485 Flowbus		
Nastavení žádané hodnoty: digitálně Flowbus		
Tesnění: Viton		
Napájení: +15...24 Vdc		
<b>2</b>	<b>F-201CV-100-RAD-22-V</b>	<b>1,00 ks</b>
Bronkhorst EL-FLOW Select, Mass Flow Controller		
Plyn: N2		
Rozsah regulace: 2...100 sccm		
Vstupní tlak: 2 bar (a)		
Tlak na výstupu regulátoru: 0...1 bar (a)		
Teplota: 20 °C		
Ventil v klidové pozici: uzavřený (normally-closed)		
Orifice: 0,14 mm		
Funkce Multi fluid/Multi range: aktivní (multigas)		
Procesní připojení: kompresní na trubčku s vnějším průměrem 1/4" (Swagelok)		
Komunikace: analogová 0...5 Vdc + digitální RS232 a RS485 Flowbus		
Nastavení žádané hodnoty: digitálně Flowbus		
Tesnění: Viton		
Napájení: +15...24 Vdc		
<b>3</b>	<b>E-8501-R-10</b>	<b>1,00 ks</b>
Napájecí a řídicí jednotka Bronkhorst		
1x display		
Komunikace FLOW-BUS		
Možnost připojit až 4 MFC Bronkhorst		
<b>4</b>	<b>7.03.297</b>	<b>1,00 ks</b>
RJ45 begin terminator		
<b>5</b>	<b>7.03.298</b>	<b>1,00 ks</b>
RJ45 bus end terminator		
<b>6</b>	<b>9.09.122</b>	<b>1,00 ks</b>
RS-232 to USB2.0 converter		
<b>7</b>	<b>7.03.241</b>	<b>2,00 ks</b>
Modular Y-adapter 30 cm length (T-part to connect a digital instrument)		
<b>8</b>	<b>7.03.542</b>	<b>1,00 ks</b>
0.15 m RJ45 (F)TP patchcable		
<b>9</b>	<b>7.03.236</b>	<b>1,00 ks</b>
0.5 m RJ45 (F)TP patchcable		
<b>10</b>	<b>7.03.367</b>	<b>1,00 ks</b>
RS232 cable for FLOW-BUS, length 3 m		
<b>11</b>	<b>3203112</b>	<b>2,00 ks</b>
Ham-Let H-800M-SS-L-1/4		
Uzavírací ventil		
Vstup/výstup: kompresní šroubení na trubčku s vnějším průměrem 1/4 " (manual shut-off valve)		

# Datasheet F-201CV

## Mass Flow Controller for Gases

### > Introduction

Bronkhorst® model F-201CV Mass Flow Controllers (MFCs) are suited for precise control of virtually all conventional process gases. The MFC consists of a thermal mass flow sensor, a precise control valve and a microprocessor based PID controller with signal and fieldbus conversion. As a function of a setpoint value, the flow controller swiftly adjusts the desired flow rate. The mass flow, expressed in normal litres or millilitres per minute or per hour, is provided as analog signal or digitally via RS232 or fieldbus. The flow range, wetted materials and orifice size for the control valve are determined depending of the type of gas and the process conditions of the application.

Although all specifications in this datasheet are believed to be accurate, the right is reserved to make changes without notice or obligation.



EL-FLOW **Select** Mass Flow Controller model F-201CV

### > Technical specifications

#### Measurement / control system

Accuracy (incl. linearity) (Based on actual calibration)	: $\pm 0,5\%$ Rd plus $\pm 0,1\%$ FS
Turndown	: 1 : 50 (in digital mode up to 1:187,5)
Multiple fluid capability	: • storage of max. 8 calibration curves • optional Multi Gas / Multi Range functionality up to 10 bar
Repeatability	: $\leq \pm 0,2\%$ Rd
Settling time (controller)	: 1...2 seconds; option: down to 500 msec
Control stability	: $\leq \pm 0,1\%$ FS (typical for 1 l <sub>n</sub> /min N <sub>2</sub> )
Max. Kv-value	: $6,6 \times 10^{-2}$
Temperature range	: -10...+70°C
Temperature sensitivity (nominal range)	: zero: $\leq \pm 0,05\%$ FS/°C; span: $\leq \pm 0,05\%$ Rd/°C
Leak integrity (outboard)	: $< 2 \times 10^{-9}$ mbar l/s He
Attitude sensitivity	: max. error at 90° off horizontal 0,2% FS at 1 bar, typical N <sub>2</sub>
Warm-up time	: 30 min. for optimum accuracy 2 min. for accuracy $\pm 2\%$ FS

#### Mechanical parts

Material (wetted parts)	: stainless steel 316L or comparable
Pressure rating	: 64 bar abs
Process connections	: compression type or face seal male
Seals	: standard : Viton; options: EPDM, Kalrez
Ingress protection (housing)	: IP40

#### Electrical properties

Power supply	: +15...24 Vdc $\pm 10\%$		
Power consumption (based on N/C valve)	: Supply	at voltage I/O	at current I/O
	15 V	290 mA	320 mA
	24 V	200 mA	215 mA
Extra for fieldbus:	PROFIBUS DP: add 53 mA (15 V supply) or 30 mA (24 V supply)		
(if applicable)	EtherCAT®: add 66 mA (15 V supply) or 41 mA (24 V supply)		
	PROFINET: add 77 mA (15 V supply) or 48 mA (24 V supply)		
	DeviceNet™: add 48 mA (24 V supply)		
Analog output (0...100%)	: 0...5 (10) Vdc, min. load impedance $> 2$ k $\Omega$ ; 0 (4)...20 mA (sourcing), max. load impedance $< 375$ $\Omega$		
Analog setpoint (0...100%)	: 0...5 (10) Vdc, min. load impedance $> 100$ k $\Omega$ ; 0 (4)...20 mA, load impedance $\sim 250$ $\Omega$		
Digital communication	: standard RS232; options: PROFIBUS DP, DeviceNet™, EtherCAT®, Modbus RTU/ASCII, PROFINET, FLOW-BUS		

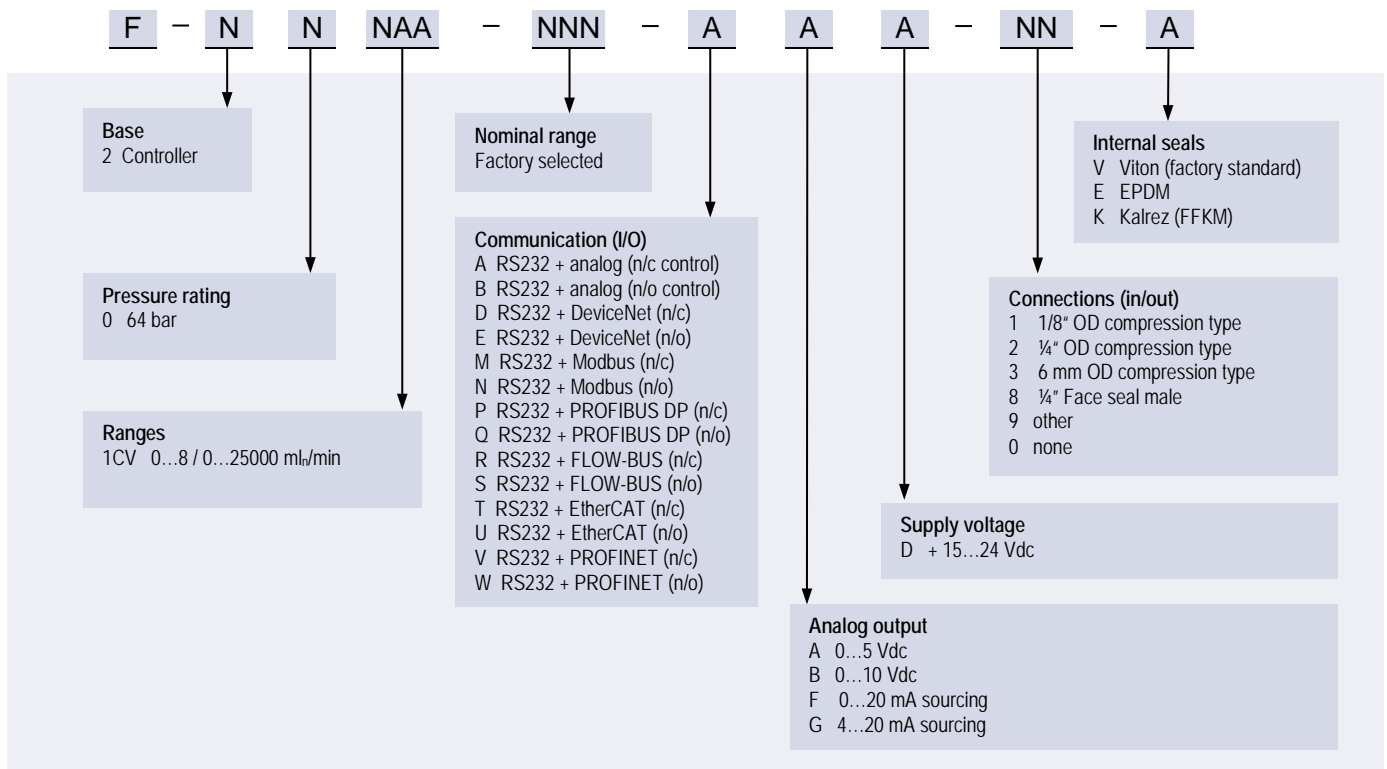
### > Ranges (based on Air)

Model	minimum	nominal	maximum
F-201CV-020	0,16...8 ml <sub>n</sub> /min	0,16...20 ml <sub>n</sub> /min	0,16...30 ml <sub>n</sub> /min
F-201CV-050	0,4...20 ml <sub>n</sub> /min	0,4...50 ml <sub>n</sub> /min	0,4...75 ml <sub>n</sub> /min
F-201CV-100	0,8...40 ml <sub>n</sub> /min	0,8...100 ml <sub>n</sub> /min	0,8...150 ml <sub>n</sub> /min
F-201CV-200	1,6...80 ml <sub>n</sub> /min	1,6...200 ml <sub>n</sub> /min	1,6...300 ml <sub>n</sub> /min
F-201CV-500	4...200 ml <sub>n</sub> /min	4...500 ml <sub>n</sub> /min	4...750 ml <sub>n</sub> /min
F-201CV-1K0	8...400 ml <sub>n</sub> /min	8...1000 ml <sub>n</sub> /min	8...1500 ml <sub>n</sub> /min
F-201CV-2K0	16...800 ml <sub>n</sub> /min	16...2000 ml <sub>n</sub> /min	16...3000 ml <sub>n</sub> /min
F-201CV-5K0	0,04...2 l <sub>n</sub> /min	0,04...5 l <sub>n</sub> /min	0,04...7,5 l <sub>n</sub> /min
F-201CV-10K	0,08...4 l <sub>n</sub> /min	0,08...10 l <sub>n</sub> /min	0,08...15 l <sub>n</sub> /min
F-201CV-20K	0,16...8 l <sub>n</sub> /min	0,16...20 l <sub>n</sub> /min	0,16...25 l <sub>n</sub> /min

Intermediate ranges are available

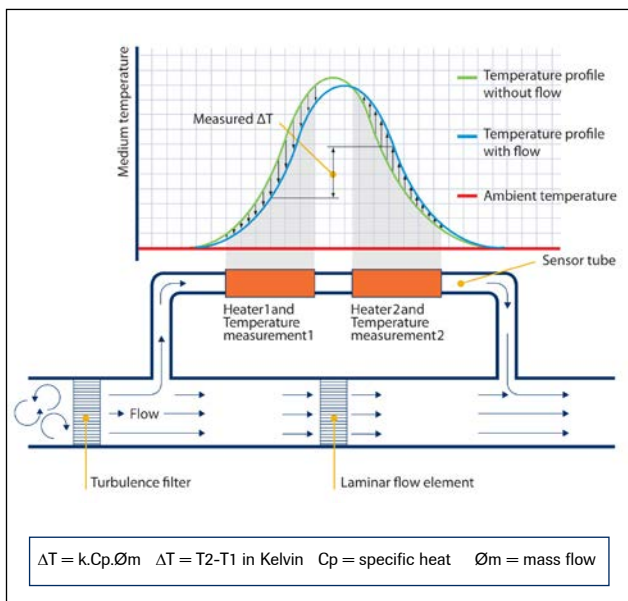


## > Model number identification



## > Thermal mass flow measuring principle

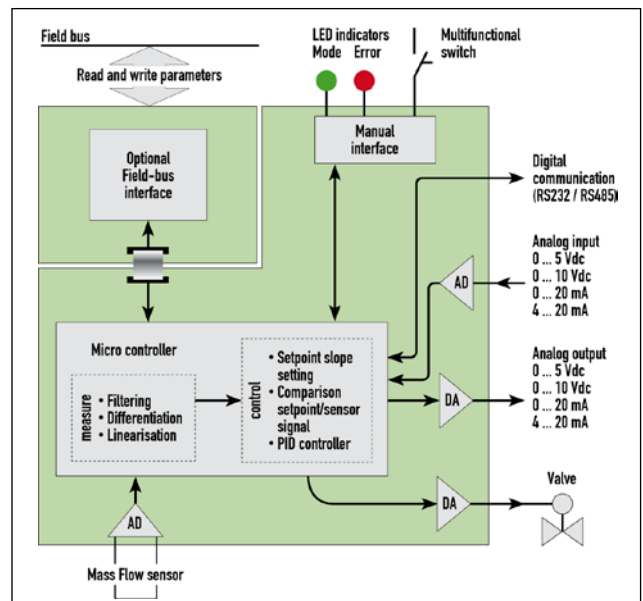
The heart of the thermal mass flow meter/controller is the sensor, that consists of a stainless steel capillary tube with resistance thermometer elements. A part of the gas flows through this bypass sensor, and is warmed up heating elements. Consequently the measured temperatures  $T_1$  and  $T_2$  drift apart. The temperature difference is directly proportional to mass flow through the sensor. In the main channel Bronkhorst applies a patented laminar flow element consisting of a stack of stainless steel discs with precision-etched flow channels. Thanks to the perfect flow-split the sensor output is proportional to the total mass flow rate.



Functional scheme of the thermal mass flow sensor

## > State of the art digital design

Today's EL-FLOW<sup>®</sup> series are equipped with a digital pc-board, offering high accuracy, excellent temperature stability and fast response (settling times  $t_{98}$  down to 500 msec). The basic digital pc-board contains all of the general functions needed for measurement and control. In addition to the standard RS232 output the instruments also offer analog I/O. Furthermore, an integrated interface board provides DeviceNet<sup>™</sup>, PROFIBUS DP, PROFINET, Modbus RTU/ASCII or FLOW-BUS protocols.



Functional scheme of the digital PC-board

# SERIES E-8000

## Digital Readout / Control Systems



### > Single and Dual Channel Modules

Bronkhorst High-Tech B.V., manufacturers of advanced mass flow metering and control systems, offer digital Readout/Control Modules for use with digital Mass Flow Meters/Controllers, Pressure Meters/Controllers and other transmitters and transducers with RS232 communication. The E-8000 Series have one or two colour TFT displays per module for indication of measured/totalised values and a push button menu to easily enable the user to change the setpoint, reset the counter value, select other fluids and many functions more.

### > Multi Channel Configurations

Based on the modular technique of the E-8000 series, it is easy to assemble multi channel configurations in ½ 19" and 19" housings, either for rack mount or table top. The exact number of channels to be served with one (½ 19") or two (19") power supplies, depends on the type of instruments (meters/controllers) to be connected. For most applications one power supply can serve at least four channels.



### > CEM, Ex-Proof and PID controller configurations

For Controlled Evaporation Mixing (CEM) systems a single channel module for temperature control can be integrated into a 1-channel cassette and ½ 19" or 19" housings. Also for Ex-Proof instruments and configurations with third party sensors or actuators requiring a PID controller, Bronkhorst developed dedicated modules. These modules are all available with or without display and with various fieldbus options.

### > Features

- ◆ Bright, wide angle, 1.8" display (TFT technology)
- ◆ User friendly operation, menu driven with 4 push buttons
- ◆ Indication/operation/configuration of
  - measured value (direct or %)
  - setpoint
  - totalised flow
  - fluid / tag number
  - control characteristics
  - fieldbus settings
  - alarm functions (min/max, response, counter)
  - fluid selection (up to 8 fluids/curves stored in MFM/MFC)

### > Specifications

#### Mechanical:

- ◆ 1- or 2-channel table top housing (1 module)
- ◆ 1- or 2-channel cassette for panel mounting (1 module)
- ◆ ½ 19" table top housing (max. 3 modules)
- ◆ ½ 19" rack housing (max. 3 modules)
- ◆ 19" table top housing (max. 6 modules)
- ◆ 19" rack housing (max. 6 modules)
- ◆ As an option, ½ 19" and 19" housings can be supply with front handles or carrying handles
- ◆ An overview of the dimensions can be found on the last page

#### Electrical:

- ◆ Mains voltage 100...240 Vac (50...60 Hz)
- ◆ Output signal/setpoint signal: Digital: FLOW-BUS (RS-485) or RS-232
- ◆ Option for CEM, Ex-Proof and PID controller modules: PROFIBUS DP, PROFINET, DeviceNet™, Modbus or EtherCAT® interface
- ◆ Subminiature D-connector socket for RS-232 instrument connection
- ◆ RJ45-connection for connection with FLOW-BUS communication
- ◆ Power Supply capacity +24 Vdc, 1.25 A (30 W)



**Bronkhorst®**

## > Model number identification

### I) Model key housing, mains supply and bus options

E-8	N	N	N	-	A	-	N	A	....
					Code			Bus options	
					0			no external communication	
					A			RS232	
					R			FLOW-BUS	
					Z			specified	
					Code			Mains and instrument power supply	
					0			n.a.	
					1			<sup>1) 2)</sup> 100...240Vac / 24Vdc instrument/FLOW-BUS single supply	
					2			<sup>3)</sup> 100...240Vac / 24Vdc instrument/FLOW-BUS dual supply	
					3			<sup>1) 2)</sup> 220...240Vac / 24Vdc instrument/FLOW-BUS single supply	
					4			<sup>3)</sup> 220...240Vac / 24Vdc instrument/FLOW-BUS dual supply	
					5			<sup>1) 2)</sup> 110...120Vac / 24Vdc instrument/FLOW-BUS single supply	
					6			<sup>3)</sup> 110...120Vac / 24Vdc instrument/FLOW-BUS dual supply	
					7			<sup>4)</sup> 220...240Vac Mains supply	
					8			<sup>4)</sup> 110...120Vac Mains supply	
					9			special	
					Code			Handles	
					0			no handles	
					1			front handles	
					2			carrying handle	
					Code			Housing	
					1			½ 19" tabletop housing	
					2			19" tabletop housing	
					3			½ 19" rack housing	
					4			19" rack housing	
					5			tabletop cassette	
					6			panelmount cassette	
					9			special	

<sup>1)</sup> Single supply in cassette or ½ 19" housing, max. load: 30 Watt  
<sup>2)</sup> Dual supply in 19" housing, max. load: 2x30 Watt  
<sup>3)</sup> Mains supply for CEM only

### II) Model key power supply modules

E-8	N	N	N	-	A	-	N	A	....
					Code			Rear panel	
					0			FLOW-BUS Power Supply (only at 1 <sup>st</sup> or 2 <sup>nd</sup> Supply unit)	
					A			2x 9pSub Instrument Power Supply	
					Code			Front panel	
					0			blind	

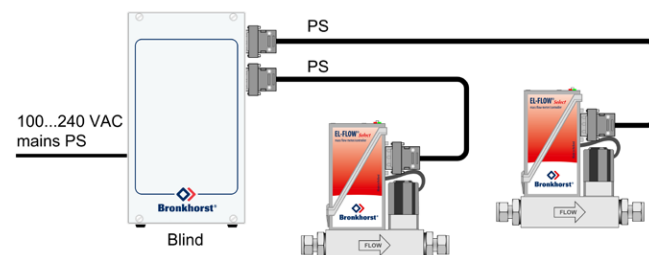
### III) Model key readout/control modules

E-8	N	N	N	-	A	-	N	A	....
					Code			Rear panel	
					0			none, FLOW-BUS terminal only	
					A			RS232 instrument readout	
					Code			Front panel	
					0			blind	
					1			1 display	
					2			2 displays	

## > Examples of typical CEM configurations

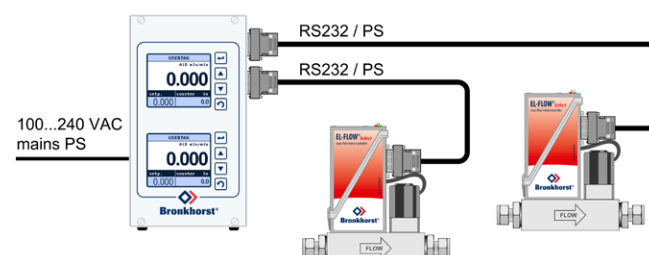
### Blind power supply

By means of a blind power supply module one or two instruments can be powered (total power consumption max. 30 W). The model key for this typical example is **E-8501-0-0A**



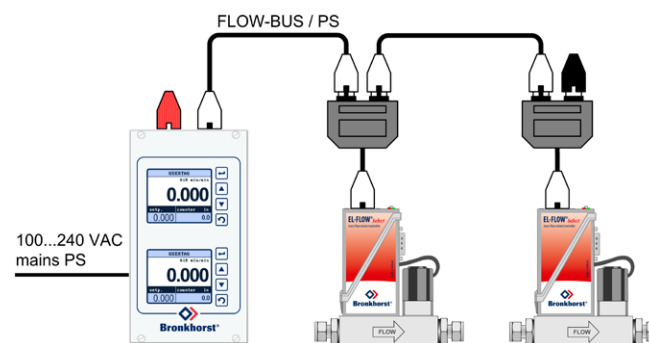
### Instrument terminal

Via RS232 one or two instruments can be hooked up per module. The model key for this typical example is **E-8501-0-2A**

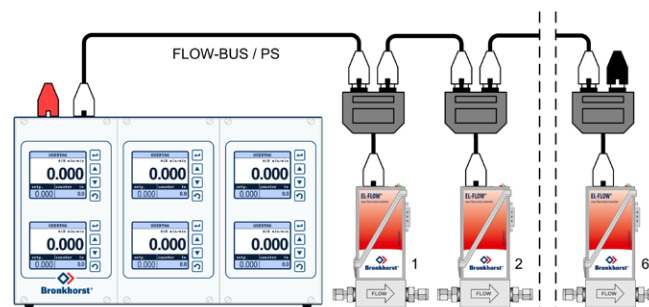


### FLOW-BUS terminal

FLOW-BUS is a field bus, designed by Bronkhorst, based on RS485 technology, for digital communication between digital devices, offering the possibility of host-control by PC or digital R/C-module (E-8000 or BRIGHT). Below example shows two instruments with integrated FLOW-BUS interface in a bus configuration with an E-8000 module. The model key for this typical example is **E-8501-R-20**



Below you will find a FLOW-BUS set-up with 6 Mass Flow Meters. The model key for this example is **E-8101-R-20-20-20**



Alternatively only one display can be used to readout these instruments sequentially; model key for this option is **E-8101-R-10-00-00**

# Multilogger - teploměr se 4 termočláňkovými vstupy a Ethernetovým portem

Kód: M1200



Multi  
LOGGER

Univerzální datalogger se 4 vstupy pro termočláňky K, J, S, B, T, N. Může pracovat jako pevně instalovaný připojený do Ethernetové sítě nebo jako přenosný.

Kalibrační list vycházející z požadavků normy ČSN ISO/IEC17025.

Multilogger je přístroj kombinující hlavní výhody ručních bateriových zařízení s vícekanalovými měřicími ústřednami a možností sledovat online naměřené hodnoty nebo naopak pracovat s historickými daty. Přístroj je určen pro měření a záznam fyzikálních a elektrických veličin.

## Dodávka obsahuje:

- Multilogger M1200
- 3x dobíjecí baterie AA, napájecí adaptér, držák na zeď, kabel USB
- Stručný návod k použití
- [Kalibrační list od výrobce](#)
- Technická podpora v českém jazyce na [diskuzním fóru](#)
- [Analytický software COMET Vision ZDARMA](#)

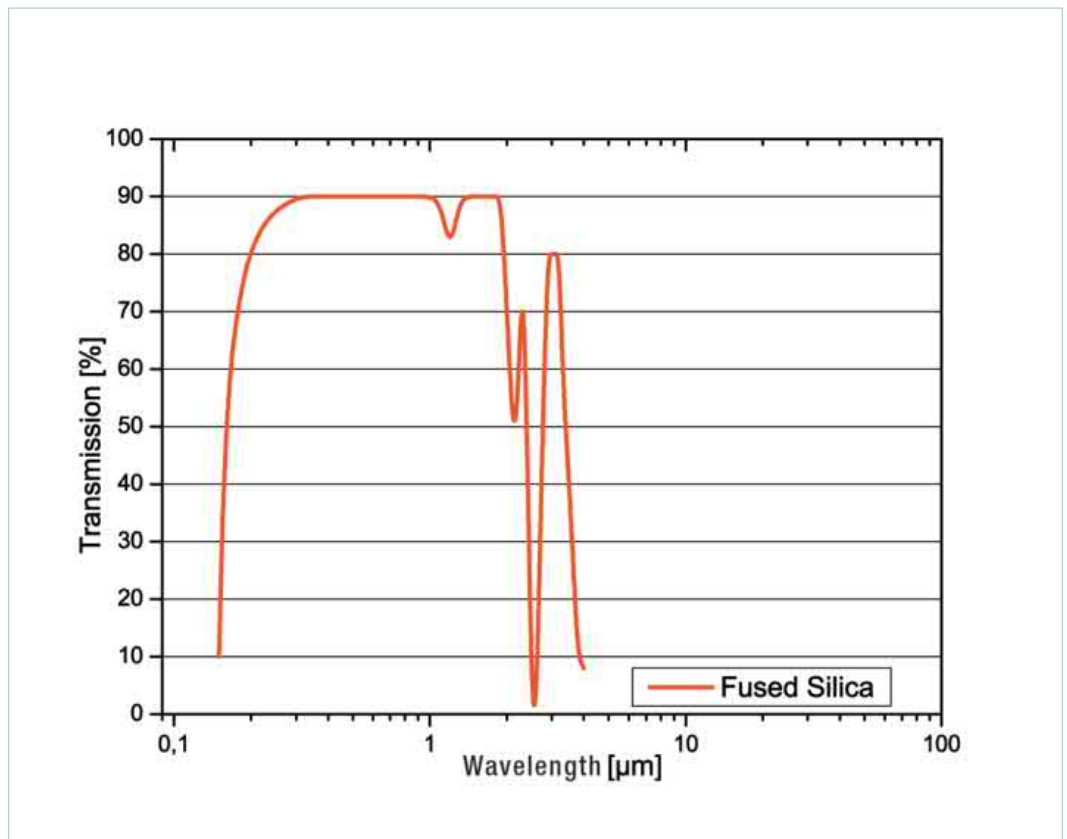
## Technická data

TEPLOTNÍ SENZOR - termočlánek typ K, N	
Měřicí rozsah	-200 až +1300 °C
Přesnost	± 0,3 % z měřené hodnoty + 1,5 °C
Rozlišení	0,1 °C
TEPLOTNÍ SENZOR - termočlánek typ J	
Měřicí rozsah	-200 až +750 °C
Přesnost	± 0,3 % z měřené hodnoty + 1,5 °C
Rozlišení	0,1 °C
TEPLOTNÍ SENZOR - termočlánek typ S	
Měřicí rozsah	0 až +1700 °C
Přesnost	± 0,3 % z měřené hodnoty + 1,5 °C
Rozlišení	0,1 °C
TEPLOTNÍ SENZOR - termočlánek typ B	
Měřicí rozsah	100 až +1800 °C
Přesnost	± 0,3 % z měřené hodnoty + 1 °C v rozsahu +300 až +1800 °C
Rozlišení	0,1 °C
TEPLOTNÍ SENZOR - termočlánek typ T	
Měřicí rozsah	-200 až +400 °C
Přesnost	± 0,3 % z měřené hodnoty + 1,5 °C
Rozlišení	0,1 °C
STEJNOSMĚRNÉ NAPĚTÍ	
Měřicí rozsah	-60 až +140 mV; -18 až +18 mV
Přesnost	±100 µV; ±20 µV
Rozlišení	0,1 µV

HLAVNÍ TECHNICKÁ DATA	
Rozsah provozní teploty přístroje	-10 až +60 °C
Kanály	4x externí čidlo teploty
Celková kapacita paměti	1 000 000 hodnot (necyklický záznam), 600 000 hodnot (cyklický záznam)
Interval záznamu	nastavitelný od 1 sekundy do 24 hodin
Obnovení displeje a stavu alarmů	každých 10 s
Volby typu záznamu	necyklický - po zaplnění paměti se záznam zastaví;  cyklický - po zaplnění se nejstarší hodnoty nahrazují novými
Podporované jednotky teploty	stupně Celsia, stupně Fahrenheita
Komunikační rozhraní	Ethernet, USB, RS232
Ethernetové komunikační protokoly	WWW, SNMPv1, XML, DATALINK
Protokoly pro alarmy	E-Mail
Napájení	3x AA NiMH 1900 mAh, 1,2 V; adaptér 230Vac/5Vdc (pro ethernetové rozhraní nutnost)
Životnost baterie	3 - 4 týdny
Krytí	IP20
Rozměry bez konektorů	178 x 95 x 37mm, bez připojených sond
Hmotnost včetně baterií	cca 380 g
Záruka	3 roky

## Optical Glass, Fused Silica (Synthetic Amorphous Quartz)

- Transmission range: 0.2 to 2  $\mu\text{m}$
- Parallelism: 3 arc minutes
- Planarity: 1 wavelength at 633 nm
- Surface quality: 40/20 scratch/dig



Technical Data	Optical Glass, Fused Silica (Synthetic Amorphous Quartz)
Glass diameter	50.8 mm   2 inch
Glass thickness	5 mm
Material	Fused Silica (Synthetic Amorphous Quartz)
Temperature range	up to 350 °C

Order number	
Optical Glass	GSG050-Silica-UV

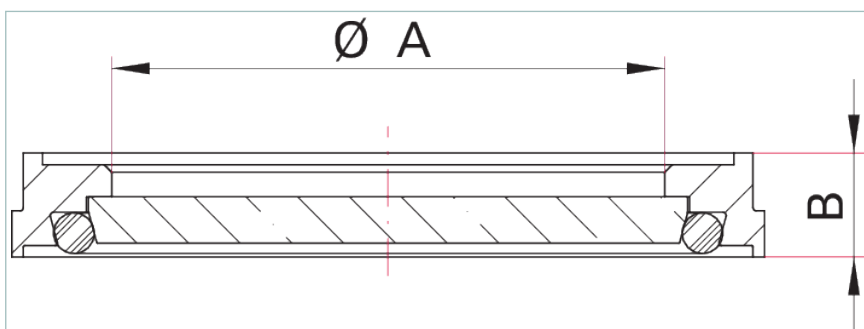


Similar Image

## Sight Glass, Stainless Steel/Borosilicate, DN 63 ISO-K

- Frame with integrated FKM O-ring, installation without additional seal
- Circumferential rim for outer centering on the ISO-K counterflange
- Not suitable for mounting on base plate or with ISO-F flange

### Dimensions



A	72 mm
B	13.5 mm

Technical Data	Sight Glass, Stainless Steel/Borosilicate, DN 63 ISO-K
Heat up and cool down speed	max. 5 K/min
Material	Stainless Steel/Borosilicate
Nominal diameter	DN 63 ISO-K
Pressure range	$1 \cdot 10^{-8}$ hPa to 500 hPa over pressure
Temperature range	-15 to 150 °C

Order number	
Sight Glass	322GSG063

Accessories	
<b>Stainless Steel 316/1.4401</b>	
Bracket screw, Stainless Steel 316/1.4401, DN 63-250 ISO-K	320BKL250
<b>Zinc-plated Steel</b>	
Bracket Screw, Zinc-Plated Steel, DN 63-250 ISO-K	350BKL250

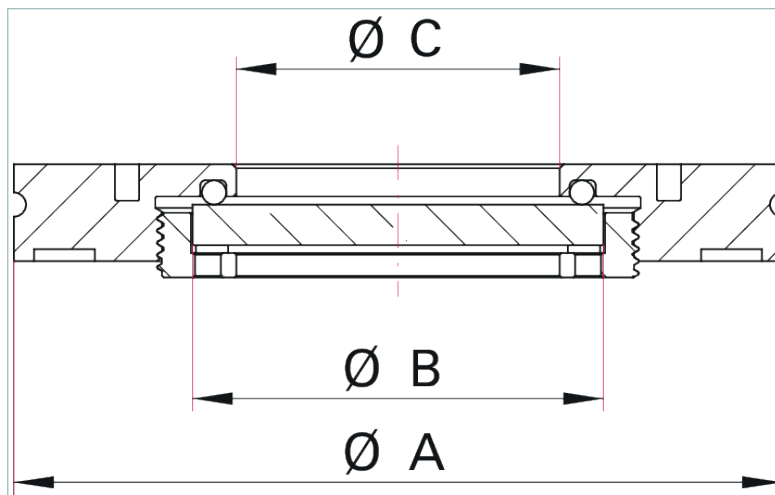


Similar Image

## Sight Glass Retainer for Optical Glasses, K-Flange with Sight Glass Retainer, DN 63 ISO-K

- Simple replacement of glasses
- Accessories: Face wrench, optical glasses
- Glass not included

### Dimensions



A	95 mm
B	49.8 mm - 51 mm
C	40 mm

Technical Data	Sight Glass Retainer for Optical Glasses, K-Flange with Sight Glass Retainer, DN 63 ISO-K
Glass thickness	3.8 – 8 mm
Nominal diameter	DN 63 ISO-K
Pressure range	$1 \cdot 10^{-8}$ hPa to 500 hPa over pressure
Temperature range	-15 to 150 °C

Order number	
Sight Glass Retainer	320GAG063-50

Accessories	
<b>Borosilicate Float Glass</b>	
Optical Glass, Borosilicate Float Glass	GSG050-Boroflo
<b>Calcium Fluoride</b>	
Optical Glass, Calcium Fluoride	GSG050-CaF2
<b>Optical Glass, Fused Silica (Synthetic Amorphous Quartz)</b>	
Optical Glass, Fused Silica (Synthetic Amorphous Quartz)	GSG050-Silica-UV
<b>Tools Face Wrenchs</b>	
Face Spanner for Glass Retainers	GAG-SLS
<b>Zinc Selenide</b>	
Optical Glass, Zinc Selenide	GSG050-ZnSe



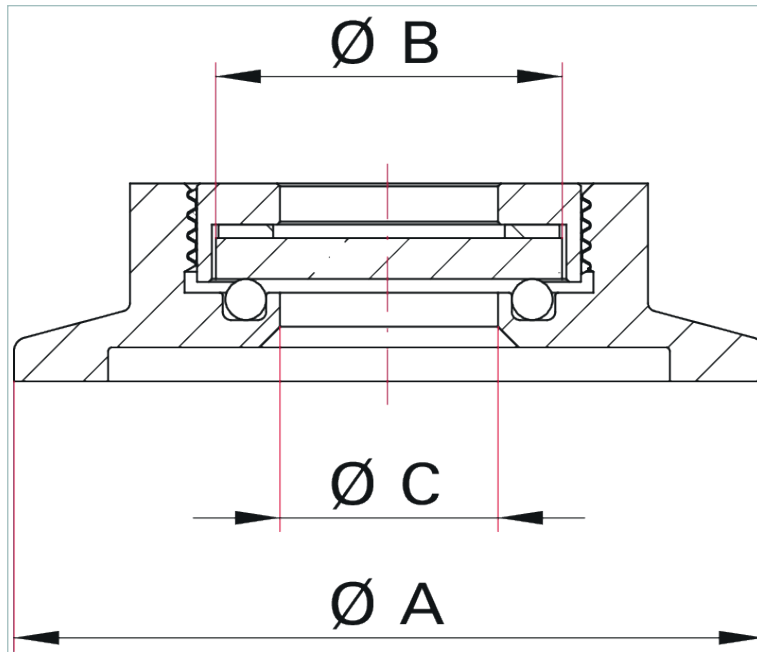


Similar Image

## Retainer for Optical Glasses, KF-Flange with Sight Glass Retainer, DN 40 ISO-KF

- Simple replacement of glasses
- Accessories: Face wrench, optical glasses
- Glass not included

### Dimensions



A	55 mm
B	24.8 mm - 25.8 mm
C	16 mm

Technical Data	Retainer for Optical Glasses, KF-Flange with Sight Glass Retainer, DN 40 ISO-KF
Glass thickness	3 – 7 mm
Nominal diameter	DN 40 ISO-KF
Pressure range	1 · 10 <sup>-8</sup> hPa to 500 hPa over pressure
Temperature range	-15 to 150 °C

Order number	
Sight Glass Retainer	120GAG040-25

Accessories	
<b>Borosilicate Float Glass</b>	
Optical Glass, Borosilicate Float Glass	GSG025-Boroflo
<b>Calcium Fluoride</b>	
Optical Glass, Calcium Fluoride	GSG025-CaF2
<b>Optical Glass, Fused Silica (Synthetic Amorphous Quartz)</b>	
Optical Glass, Fused Silica (Synthetic Amorphous Quartz)	GSG025-Silica-UV
<b>Tools Face Wrenchs</b>	
Face Spanner for Glass Retainers	GAG-SLS
<b>Zinc Selenide</b>	
Optical Glass, Zinc Selenide	GSG025-ZnSe

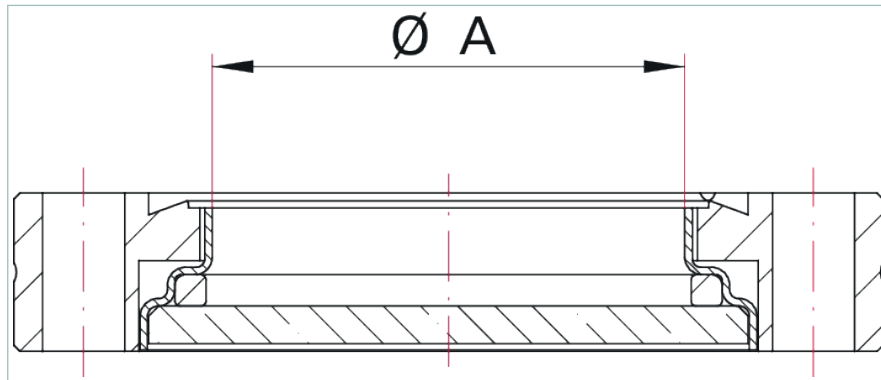


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## Sight Glass, Stainless Steel/Fused Silica, UV, DN 63 CF

- Always use washers for installation

### Dimensions



A 68 mm

Technical Data	Sight Glass, Stainless Steel/Fused Silica, UV, DN 63 CF
Heat up and cool down speed	max. 5 K/min
Material	Stainless Steel/Fused Silica (Synthetic Amorphous Quartz), UV
Nominal diameter	DN 63 CF
Pressure range	$1 \cdot 10^{-11}$ hPa to ambient pressure
Temperature range	-100 to 200 °C
Order number	
Sight Glass	420GSG063-silica-uv

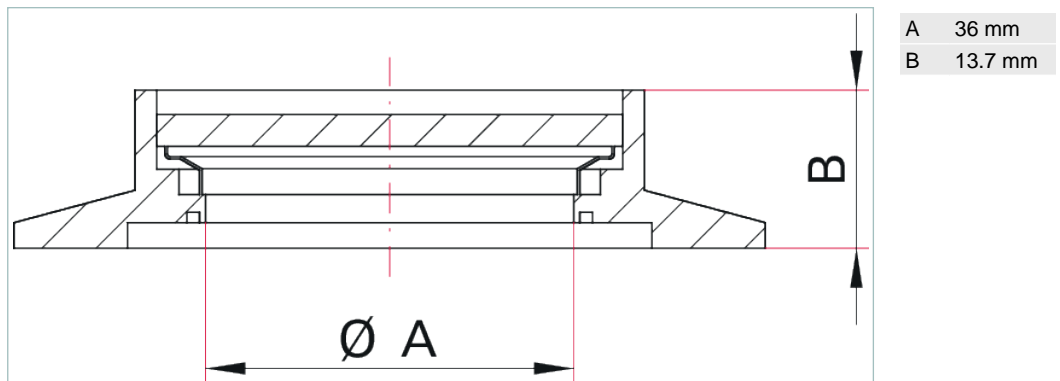


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## Sight Glass, Stainless Steel/Fused Silica (Synthetic Amorphous Quartz), UV, DN 40 ISO-KF

- Stainless Steel frame; glass soldered
- Transmission in UV spectrum to 200 nm

### Dimensions



Technical Data	Sight Glass, Stainless Steel/Fused Silica (Synthetic Amorphous Quartz), UV, DN 40 ISO-KF
Flange, Material	Stainless steel 1.4301
Heat up and cool down speed	max. 5 K/min
Nominal diameter	DN 40 ISO-KF
Pressure range	$1 \cdot 10^{-8}$ hPa to 500 hPa over pressure
Sight glass	Fused Silica (synthetic amorphous quartz), UV
Temperature range	-100 to 200 °C

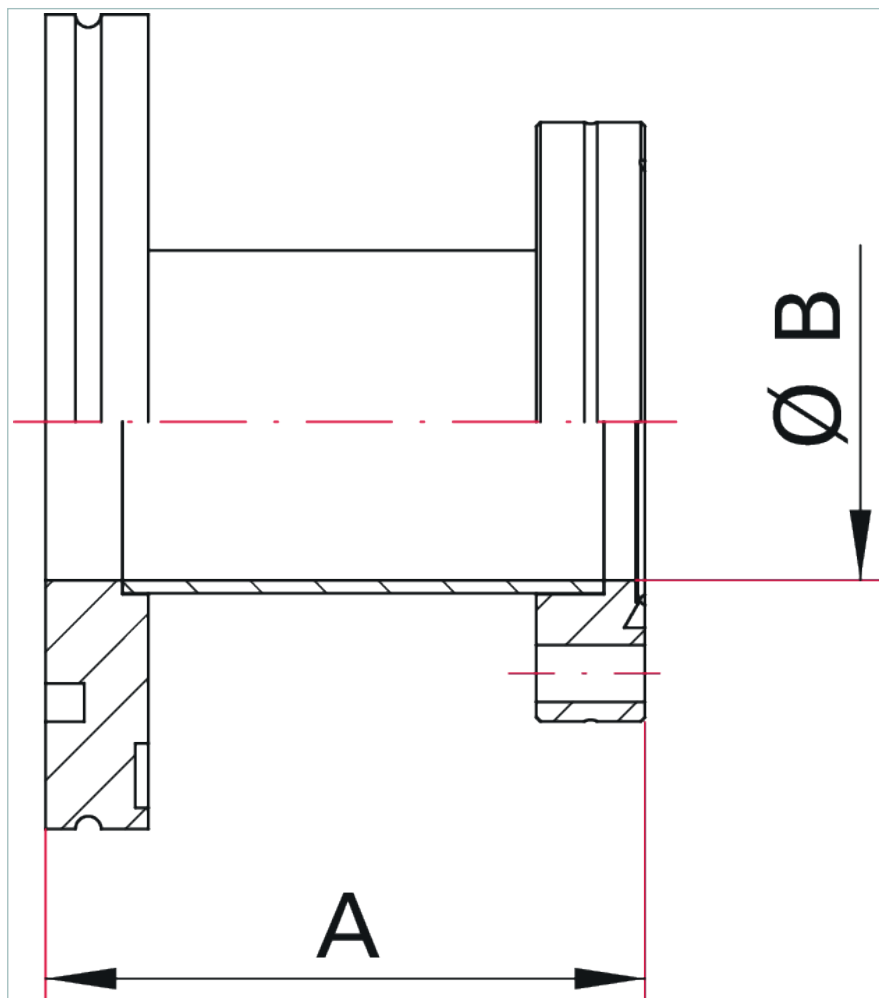
Order number	
Sight Glass	120GSG040-silica-uv



Similar Image

## Adapter, Stainless Steel 304/1.4301, CF Flange 304L, DN 63 CF/ DN 63 ISO-K

### Dimensions



A	90 mm
B	66 mm

### Technical Data

### Adapter, Stainless Steel 304/1.4301, CF Flange 304L, DN 63 CF/ DN 63 ISO-K

Material	Stainless Steel 304/1.4301, CF Flange 304L
Nominal diameter	DN 63 CF
Nominal diameter reduced	DN 63 ISO-K
Pressure range	$1 \cdot 10^{-8}$ hPa to 500 hPa over pressure (elastomer seal); $1 \cdot 10^{-9}$ hPa to 500 hPa over pressure (metal seal)
Temperature range	-196 to 300 °C

### Order number

Adapter	420RUG063-063-90
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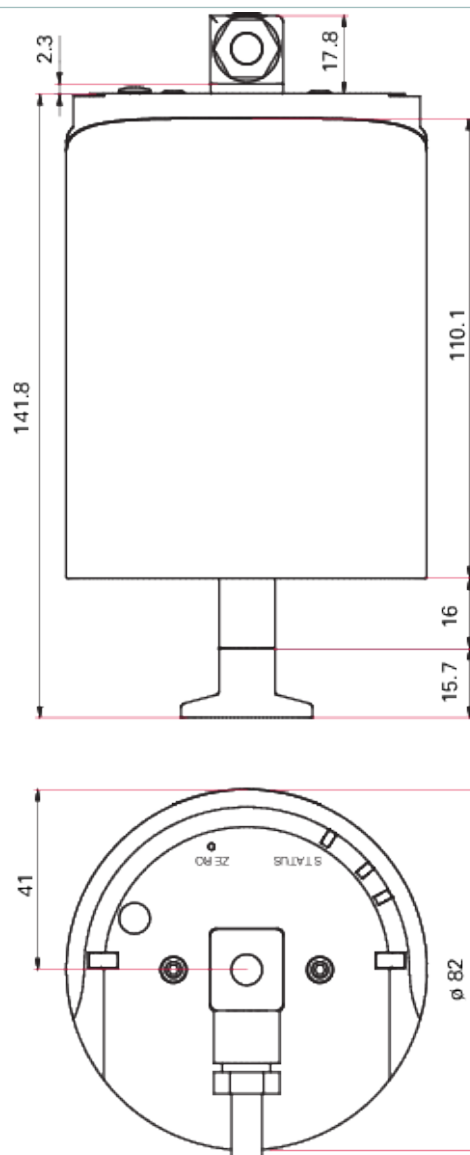


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## CMR 374, 1 hPa F.S., DN 16 ISO-KF

- Measurement range from  $1 \cdot 10^{-4}$  to 1.1 hPa
- Excellent zero stability
- Sensor in ceramic technology
- No memory effects
- Materials employed have identical temperature coefficients
- Outstanding long-term and temperature stability
- Additional protection against pollution by sensor shield
- Calibration test report included in delivery

### Dimensions



www.pfeiffer-vacuum.net

Technical Data	CMR 374, 1 hPa F.S., DN 16 ISO-KF
Accuracy: % of measurement	0.15 %
Ambient temperature	10-40 °C   50-104 °F   283-313 K
Bakeout temperature at the flange	110 °C   230 °F   383 K
Full scale	1 hPa   0.75 Torr   1 mbar
Measurement range	1 · 10 <sup>-4</sup> – 1.1E0 hPa
Membrane and measuring chamber	Ceramics (Al <sub>2</sub> O <sub>3</sub> = 99.5 %)
Nominal diameter	DN 16 ISO-KF
Output signal: Measurement range	1–9.8 V
Output signal: Minimum load	10 kΩ
Pipe and flange	Stainless steel
Pressure max.	2,000 hPa   1,500 Torr   2,000 mbar
Protection category	IP40
Resolution	0.003 % F.S.
Response time	30 ms
Supply: Power consumption max.	≤ 12 W
Supply: Voltage V DC	14 – 30 V DC
Temperature: Operating	45 °C   113 °F   318 K
Temperature: Storage	-40-65 °C   -40-149 °F   233-338 K
Temperature effect: on span	0.01 % of reading/°C
Temperature effect: on zero	0.0025 % F.S./°C
Volume	≤ 4.2 cm <sup>3</sup>
Weight	900 g

Order number
CMR 374 PT R25 131

Accessories	
Adapters (electrical) Adapter Measurement	
Mating connector	B 4707 283 MA
Cables Measurement cables	
Measurement Cable, 3 m	PT 448 250 -T
Protection Inlet filters	
Centering ring with protection filter, pore size 20 µm, FPM/stainless steel	PF 117 216 -T
Centering ring with metal mesh-fine filter, pore size 4 µm. FPM/stainless steel	PT 120 132 -T

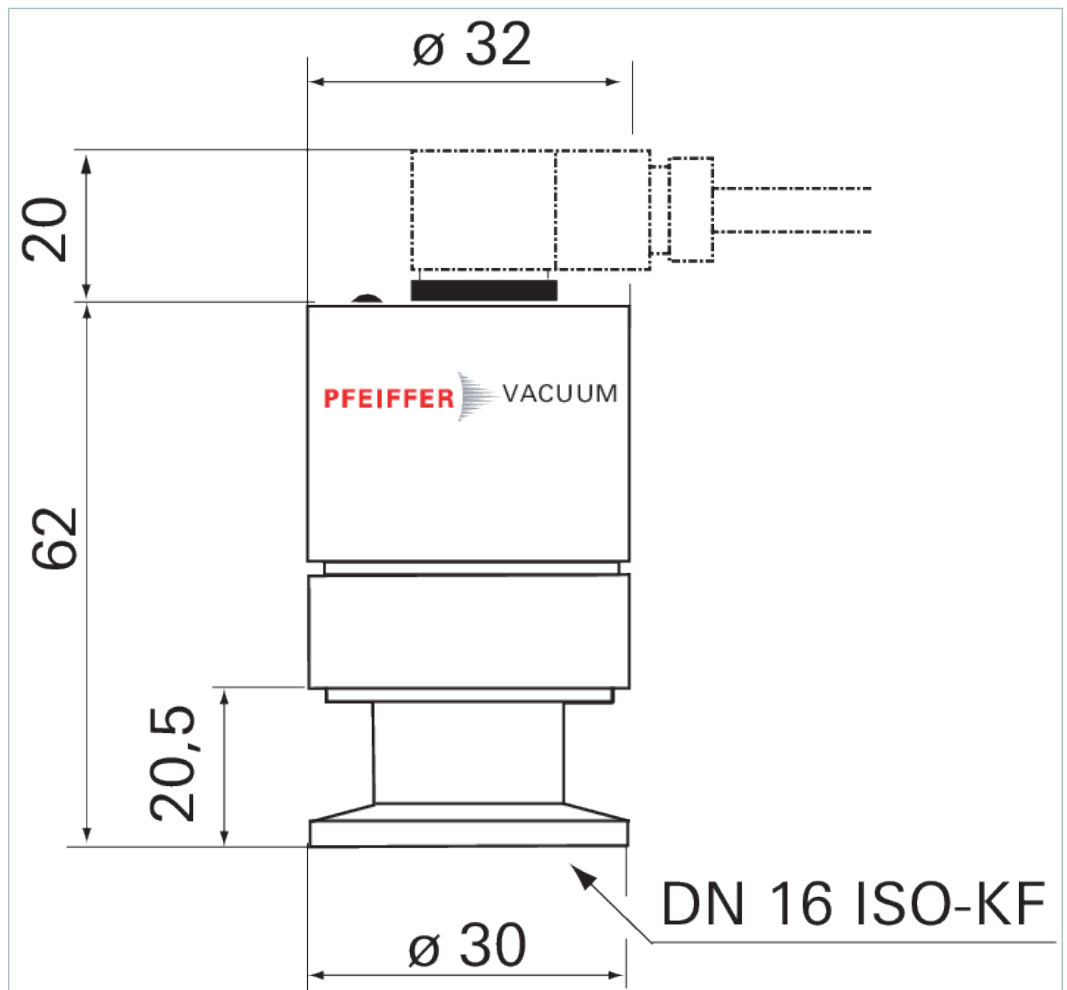


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## TPR 270, DN 16 ISO-KF

- Flange size: DN 16 ISO-KF
- For general vacuum applications
- Compact and rugged
- Maximum pressure refers to inert gases
- Ultimate pressure applies to inert gases

### Dimensions



Technical Data	TPR 270, DN 16 ISO-KF
Accuracy	$\pm 2 \cdot 10^{-3}$ hPa: $\pm$ factor 2
Accuracy: $2 \cdot 10^{-3} - 20$ hPa	$\pm 10 \%$
Accuracy: $20 - 1000$ hPa	$\pm 30 \%$
Ambient temperature	5-60 °C   41-140 °F   278-333 K
Bakeout temperature at the flange	80 °C   176 °F   353 K
Feature	Stainless steel, metal sealed
Feedthrough	Glass
Filament	Tungsten
Flange, Material	Stainless steel
Materials in contact with media	Tungsten, stainless steel 1.4307, nickel
Measurement range	$1 \cdot 10^{-4} - 1 \cdot 10^3$ hPa
Nominal diameter	DN 16 ISO-KF

Technical Data	TPR 270, DN 16 ISO-KF
Output signal: Measurement range	1.5–8.5 V
Pressure max.	4,000 hPa   3,000 Torr   4,000 mbar
Protection category	IP40
Repeatability: $2 \cdot 10^{-3}$ – 20 hPa	± 2 %
Seal	Metal
Sensor cable length min.	200 m
Supply: Power consumption max.	1 W
Supply: Voltage V DC	15 – 30 V DC
Temperature: Storage	-40-70 °C   -40-158 °F   233-343 K
Weight	105 g

Order number	
TPR 270	PT R26 770

Accessories	
<b>Adapters (electrical) Adapter Measurement</b>	
Mating connector	B 4707 283 MA
<b>Cables Measurement cables</b>	
Measurement Cable, 3 m	PT 448 250 -T
Measurement Cable, 6 m	PT 448 251 -T
Measurement Cable, 10 m	PT 448 252 -T
<b>Protection Inlet filters</b>	
Centering ring with protection filter, pore size 20 µm, FPM/stainless steel	PF 117 216 -T
Centering ring with metal mesh-fine filter, pore size 4 µm, FPM/stainless steel	PT 120 132 -T



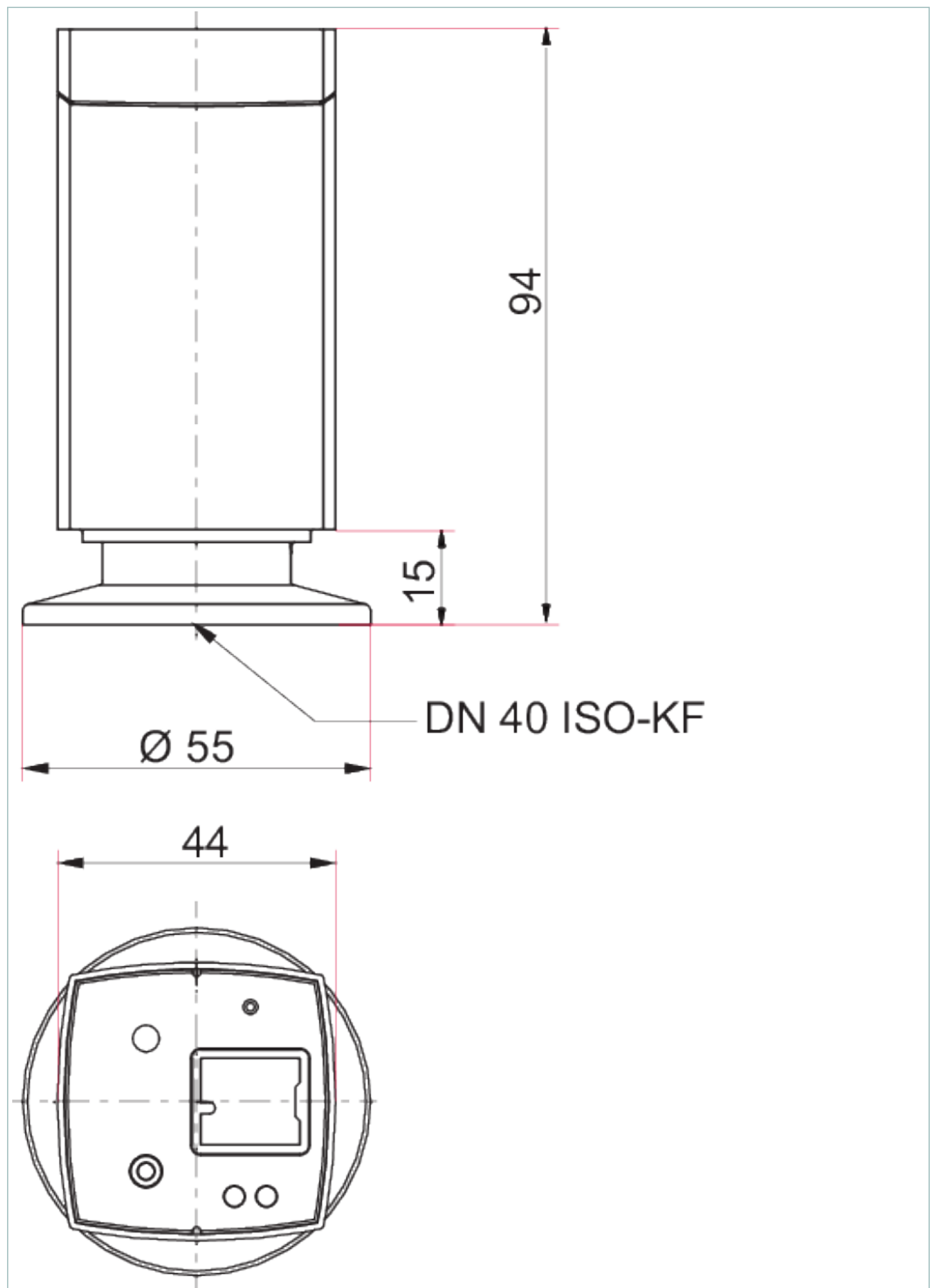


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### PKR® 361, high current, 40 ISO-KF

- Maximum pressure refers to inert gases and temperatures of less than 55 °C
- Rugged and dependable
- Insensitive to air ingress
- Without elastomer seal
- High current version optimized for high vacuum applications

#### Dimensions



Technical Data	PKR® 361, high current, 40 ISO-KF
Accuracy: $1 \cdot 10^{-8} - 1 \cdot 100$ hPa	$\pm 30$ %
Ambient temperature	5-55 °C   41-131 °F   278-328 K
Anode	Molybdenum
Bakeout temperature	Electronics removed, $\leq 150$ °C
Feedthrough	Glass
Filament	Tungsten
Flange, Material	Stainless Steel 1.4435
Measurement range	$1 \cdot 10^{-9} - 1 \cdot 10^3$ hPa
Method of measurement	Pirani/Cold Cathode
Nominal diameter	DN 40 ISO-KF
Output signal: Measurement range	2-8.6 V
Output signal: Minimum load	10 k $\Omega$
Pressure max.	10,000 hPa   7,500 Torr   10,000 mbar
Repeatability: $1 \cdot 10^{-8} - 100$ hPa	$\pm 5$ %
Sensor cable length min.	300 m
Supply: Power consumption max.	2 W
Supply: Voltage V DC	14.5 – 30 V DC
Temperature: Storage	-40-70 °C   -40-158 °F   233-343 K
Volume	20.9 cm <sup>3</sup>
Weight	320 g

Order number
PKT 361 PT T03 150 010

Accessories	
<b>Adapters (electrical) Adapter Measurement</b>	
Mating connector	B 4707 283 MA
<b>Cables Measurement cables</b>	
Measurement Cable, 3 m	PT 448 250 -T

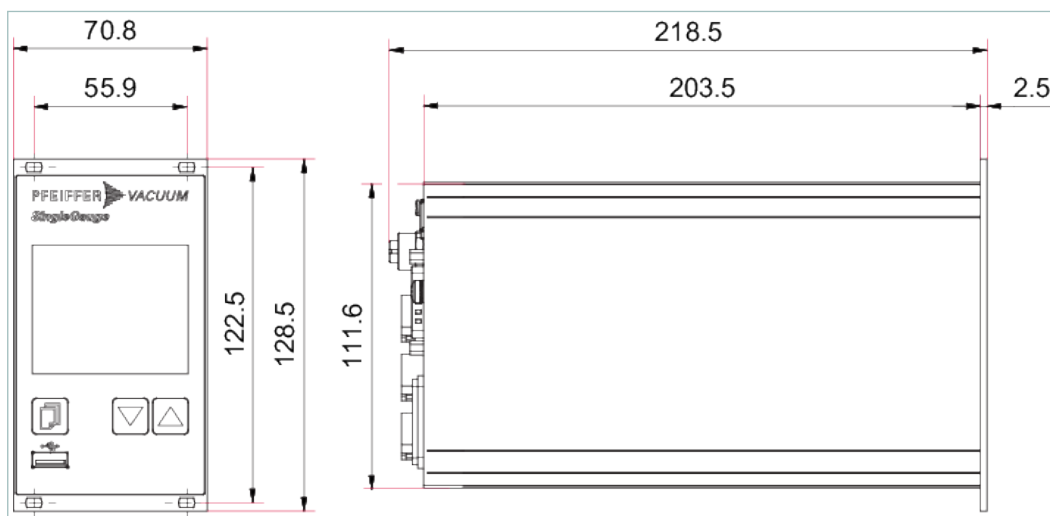


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## TPG 361 Controller for 1 Gauge

- For operation of one gauge with analog output signal
- Brilliant display
- Simultaneous display of all three values of pressure
- Two configurable relay set points
- Versatile connectivity: USB, RS-485, Ethernet
- Direct data storage on USB flash memory (data and settings)
- Can be used as table top or as rack mount unit

### Dimensions



Technical Data	TPG 361 Controller for 1 Gauge
Ambient temperature	5-50 °C   41-122 °F   278-323 K
Connection for gauge	1
Display rate	≥ 10 Hz
Error signal: Working contact, potential-free	1 Pcs.
Filter time constant, rapid/normal/slow	0.02 s/0.15 s/0.75 s
I/O interfaces	USB, RS-485, Ethernet
Mains requirement: frequency (range)	50/60 Hz
Mains requirement: power consumption	45 VA
Mains requirement: voltage (range)	100–240 V
Measurement range	$5 \cdot 10^{-11} - 5.5 \cdot 10^4$ hPa
Measurement rate	≥ 100 Hz
Measuring channel	1 Pcs.
Protection category	IP20
Safety	CE, UL
Set point: Changeover contact, potential-free	2 Pcs.
Set point: Current AC	1 A
Set point: Current DC	0.5 A
Set point: Voltage AC	30 V AC
Set point: Voltage DC	60 V DC
Signal output: Measuring value, analog	0 – 10 V
Temperature: Storage	-20-60 °C   -4-140 °F   253-333 K
Weight	1.1 kg   2.43 lb

### Order number

TPG 361

PT G28 040

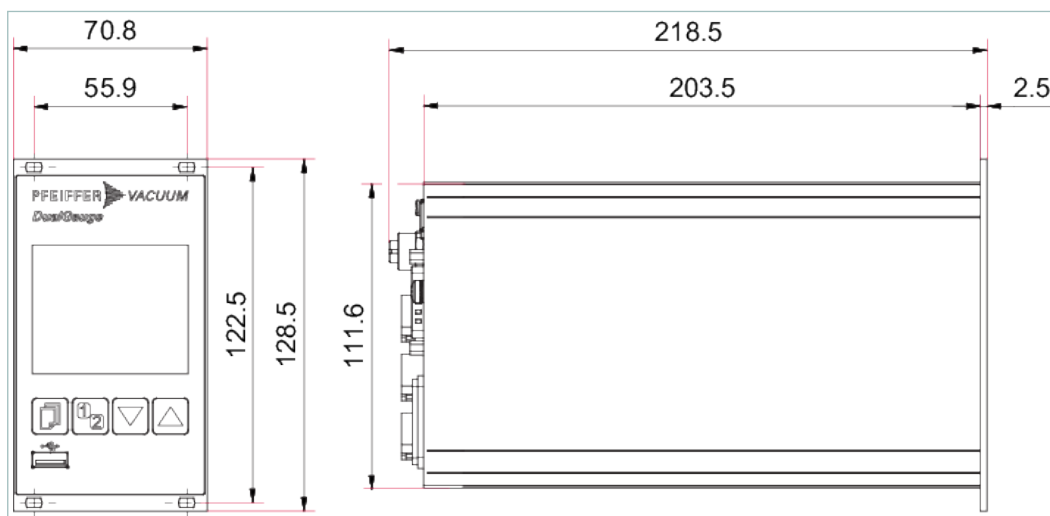


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## TPG 362 Controller for 2 Gauges

- For operation of two gauges with analog output signal
- Brilliant display
- Simultaneous display of both pressure readings
- Four freely configurable relay set points
- Versatile connectivity: USB, RS-485, Ethernet
- Direct data storage on USB flash memory (data and settings)
- Can be used as table top or as rack mount unit

### Dimensions



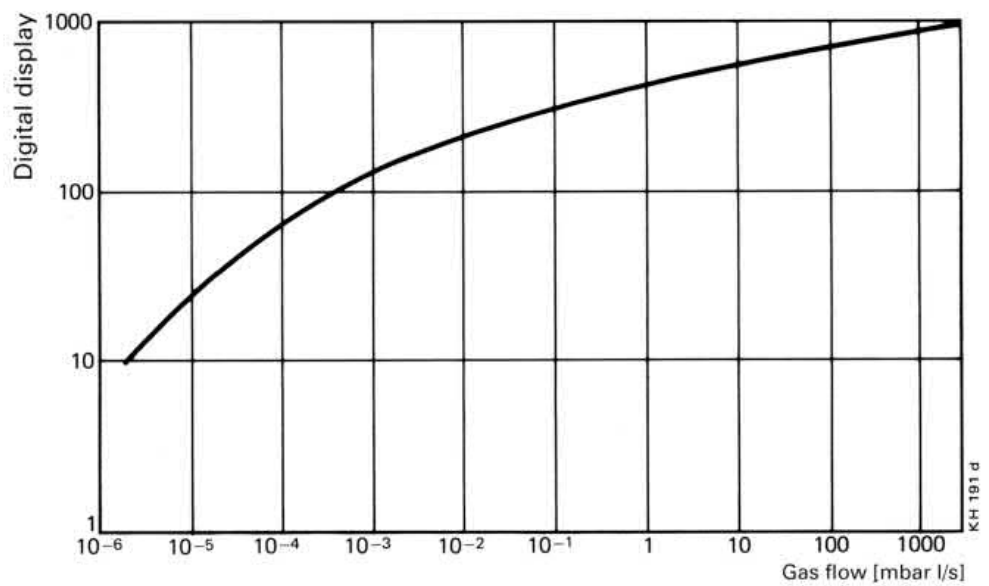
Technical Data	TPG 362 Controller for 2 Gauges
Ambient temperature	5-50 °C   41-122 °F   278-323 K
Automatic changeover: Pirani-cold cathode	Configurable
Connection for gauge	2
Display rate	≥ 10 Hz
Error signal: Working contact, potential-free	1 Pcs.
Filter time constant, rapid/normal/slow	0.02 s/0.15 s/0.75 s
I/O interfaces	USB, RS-485, Ethernet
Mains requirement: frequency (range)	50/60 Hz
Mains requirement: power consumption	65 VA
Mains requirement: voltage (range)	100-240 V
Measurement range	5 · 10 <sup>-11</sup> – 5.5 · 10 <sup>4</sup> hPa
Measurement rate	≥ 100 Hz
Measuring channel	2 Pcs.
Protection category	IP20
Safety	CE, UL
Set point: Changeover contact, potential-free	4 Pcs.
Set point: Current AC	1 A
Set point: Current DC	0.5 A
Set point: Voltage AC	30 V AC
Set point: Voltage DC	60 V DC
Signal output: Measuring value, analog	0 – 10 V
Temperature: Storage	-20-60 °C   -4-140 °F   253-333 K
Weight	1.1 kg   2.43 lb



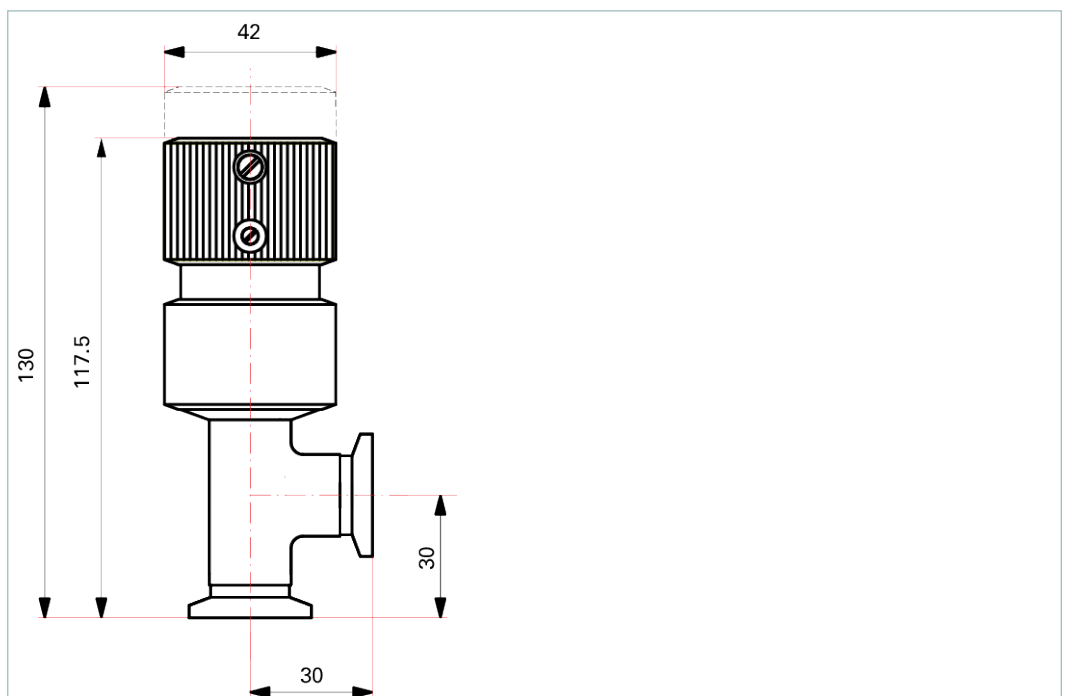
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## EVN 116, Gas Dosing Valve with Separate Isolation Valve, Manually Actuated

- Closable without changing the gas flow setting
- Optimum characteristic
- Digital position display
- Excellent reproducibility
- Extremely small dead volume
- Very broad regulating range



### Dimensions



Technical Data		EVN 116, Gas Dosing Valve with Separate Isolation Valve, Manually Actuated	
Bakeout temperature: flanges		150 °C	302 °F   423 K
Dead volume		0.032	cm <sup>3</sup>
Differential pressure		2500	hPa
Dosing sleeve		Fluorplastomer	
Gas flow max. controllable		1 · 10 <sup>3</sup>	hPa·l/s
Gas flow min. controllable		5 · 10 <sup>-6</sup>	hPa·l/s
Housing		Stainless steel	
Housing/needle/filter		Stainless steel	
Nominal diameter		DN 16	ISO-KF
Scope of delivery		With separate shut-off valve	
Seal		FKM	
Tightness		1 · 10 <sup>-10</sup> Pa m <sup>3</sup> /s	7.5 · 10 <sup>-10</sup> Torr l/s
		1 · 10 <sup>-9</sup>	mbar l/s
Type		Gas dosing valve	
Weight		0.4 kg	0.88 lb
Order number			
EVN 116		PF I32 031	

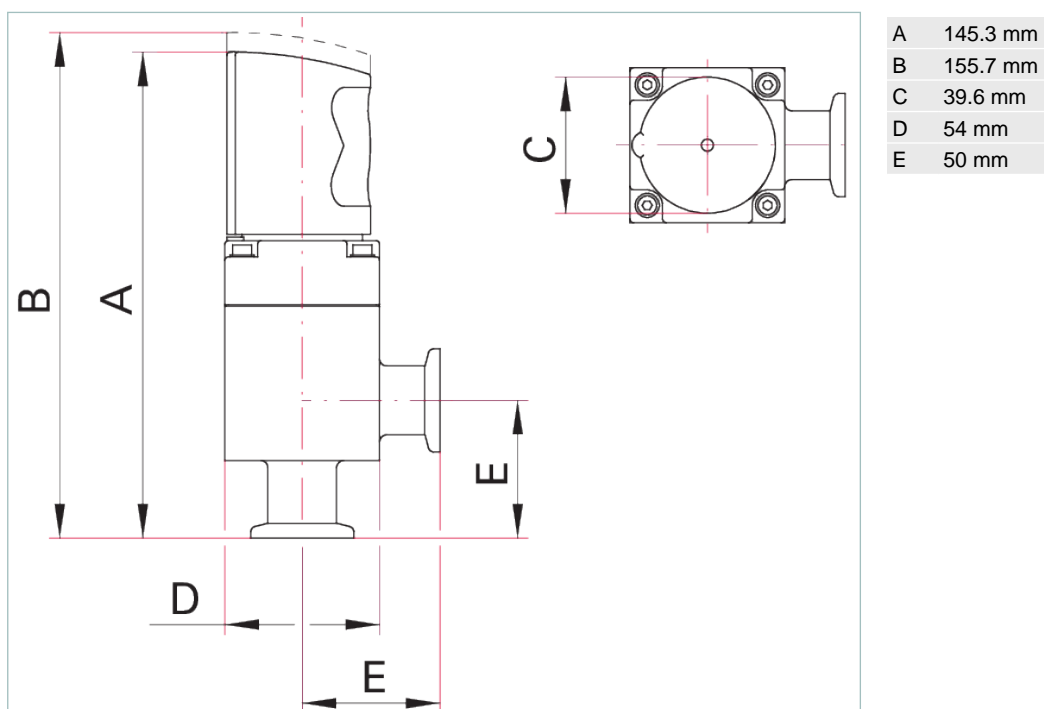


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## AVC 025 SA, Angle Valve, Manually Actuated

- Quick opening by partly turning the rotary knob
- Bellows-sealed
- With visual indication of open and closed positions
- Service life: 10000 operating cycles

### Dimensions



Technical Data	AVC 025 SA, Angle Valve, Manually Actuated
Actuator	Rotary knob
Bakeout temperature: actuator	50 °C   122 °F   323 K
Bakeout temperature: housing	80 °C   176 °F   353 K
Conductance for molecular flow	14 l/s
Differential pressure in closing direction	4,000 hPa   3,000 Torr   4,000 mbar
Differential pressure in opening direction	2,000 hPa   1,500 Torr   2,000 mbar
Feedthrough	Bellows, stainless steel
Housing	Aluminum
Nominal diameter	DN 25 ISO-KF
Operating pressure min.	$1 \cdot 10^{-8}$ hPa   $7.5 \cdot 10^{-9}$ Torr   $1 \cdot 10^{-8}$ mbar
Pressure max. (absolute)	2,000 hPa   1,500 Torr   2,000 mbar
Seal	FKM
Service life	10000 cycles
Tightness	$1 \cdot 10^{-10}$ Pa m <sup>3</sup> /s   $7.5 \cdot 10^{-10}$ Torr l/s   $1 \cdot 10^{-9}$ mbar l/s
Type	Angle valve
Weight	0.42 kg   0.93 lb

### Order number

AVC 025 SA

PF A41 003

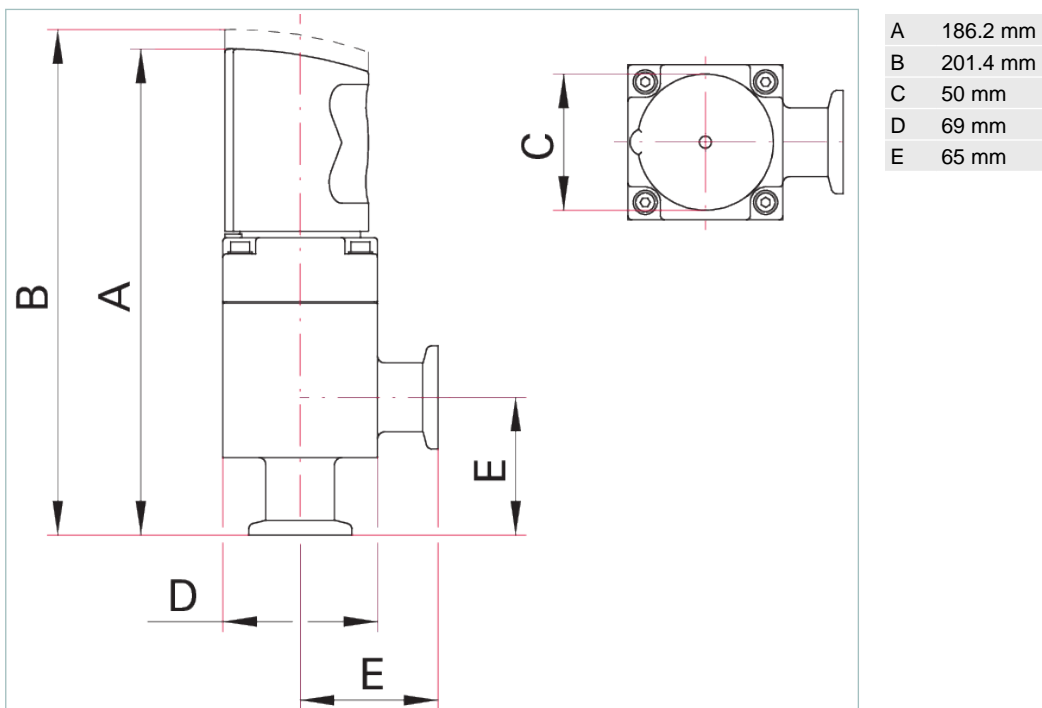


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## AVC 040 SA, Angle Valve, Manually Actuated

- Quick opening by partly turning the rotary knob
- Bellows-sealed
- With visual indication of open and closed positions
- Service life: 10000 operating cycles

### Dimensions



Technical Data	AVC 040 SA, Angle Valve, Manually Actuated
Actuator	Rotary knob
Bakeout temperature: actuator	50 °C   122 °F   323 K
Bakeout temperature: housing	80 °C   176 °F   353 K
Conductance for molecular flow	45 l/s
Differential pressure in closing direction	2,000 hPa   1,500 Torr   2,000 mbar
Differential pressure in opening direction	1,500 hPa   1,125 Torr   1,500 mbar
Feedthrough	Bellows, stainless steel
Housing	Aluminum
Nominal diameter	DN 40 ISO-KF
Operating pressure min.	$1 \cdot 10^{-8}$ hPa   $7.5 \cdot 10^{-9}$ Torr   $1 \cdot 10^{-8}$ mbar
Pressure max. (absolute)	1,500 hPa   1,125 Torr   1,500 mbar
Seal	FKM
Service life	10000 cycles
Tightness	$1 \cdot 10^{-10}$ Pa m <sup>3</sup> /s   $7.5 \cdot 10^{-10}$ Torr l/s   $1 \cdot 10^{-9}$ mbar l/s
Type	Angle valve
Weight	0.85 kg   1.87 lb

### Order number

AVC 040 SA

PF A51 003





- High conductance due to free clearance
- Service life: up to 200000 operating cycles

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### Connecting rod

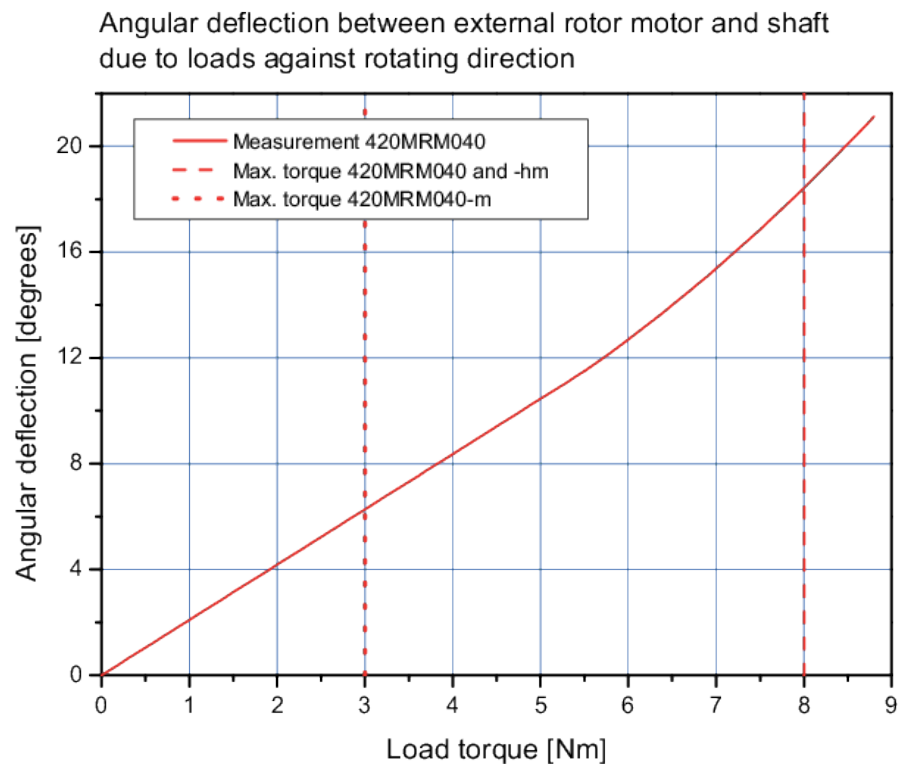
Technical Data	SVV 160 HA, HV Gate Valve, Manually Actuated
Bakeout temperature: actuator	80 °C   176 °F   353 K
Bakeout temperature: housing	120 °C   248 °F   393 K
Conductance for molecular flow	6000 l/s
Differential pressure in closing direction	1,600 hPa   1,200 Torr   1,600 mbar
Differential pressure in opening direction	1,600 hPa   1,200 Torr   1,600 mbar
Feedthrough	Shaft feedthrough
Housing	Aluminum
Nominal diameter	DN 160 ISO-F
Opens to a pressure difference of	30 hPa
Pressure max. (absolute)	1,600 hPa   1,200 Torr   1,600 mbar
Pressure min.	$1 \cdot 10^{-7}$ hPa   $7.5 \cdot 10^{-8}$ Torr   $1 \cdot 10^{-7}$ mbar
Seal: Housing	FKM
Seal: Valve seat	FKM
Service life	100000 cycles
Tightness	$1 \cdot 10^{-10}$ Pa m <sup>3</sup> /s   $7.5 \cdot 10^{-10}$ Torr l/s   $1 \cdot 10^{-9}$ mbar l/s
Type	HV gate valve
Valve plate	Stainless steel
Weight	9 kg   19.84 lb
Order number	
SVV 160 HA	PF E31 001



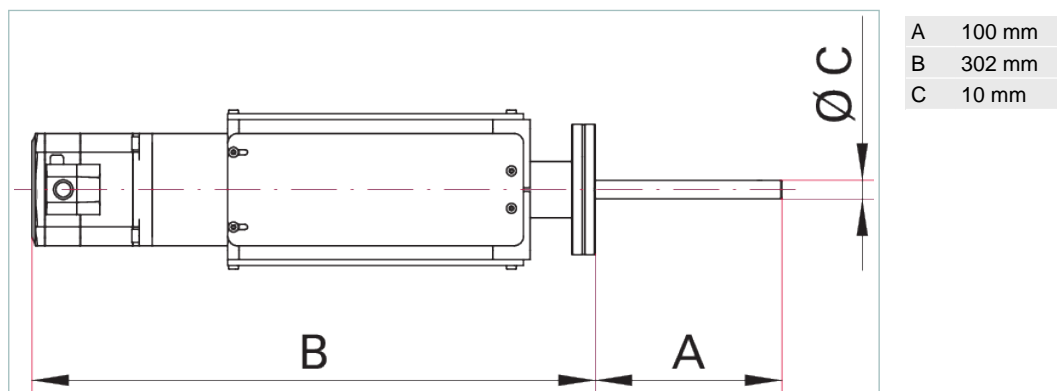
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## Magnetically coupled rotary feedthrough, motorized, high resolution, DN 40 CF

- Magnetic coupling with samarium-cobalt magnets
- Stainless steel ball bearing with dry lubrication, suitable for UHV
- Hermetically sealed, suitable for UHV



### Dimensions



### Technical Data

Magnetically coupled rotary feedthrough, motorized, high resolution, DN 40 CF

Ambient temperature  
Angle of rotation

-10-50 °C | 14-122 °F | 263-323 K  
360 °

Technical Data	Magnetically coupled rotary feedthrough, motorized, high resolution, DN 40 CF
Angle of rotation backlash	backlash-free without torsional load
Angular deflection	See diagram in datasheet
Bakeout temperature with electric parts	80 °C   176 °F   353 K
Bakeout temperature without electric parts	200 °C   392 °F   473 K
Cable length	3 m
Control	Including driver and controller
Current max.	3.1 A (controller)
I/O interfaces	USB, RS-232, I/O-port and CANopen®
Lowest angular resolution	0.004 °
Material	1.4301 Stainless steel; Aluminum blank and anodized
Max. load perpendicular to the axis (at end of shaft)	200 N
Nominal diameter	DN 40 CF
Operating temperature max.	60 °C   140 °F   333 K
Pressure range	1 · 10 <sup>-10</sup> hPa to 500 hPa over pressure
Rotation speed	max. 30 rpm   max. 30 min <sup>-1</sup>
Shaft connection	with threaded hole, vented: M5x10
Supply: Voltage V DC	28 – 48 V DC
Tightness	1 · 10 <sup>-11</sup> Pa m <sup>3</sup> /s   7.5 · 10 <sup>-11</sup> Torr l/s   1 · 10 <sup>-10</sup> mbar l/s
Torque	max. 8 Nm
Transmission	backlash-free Harmonic Drive® gear (gear reduction 100:1)
Weight	5 kg   11.02 lb

Order number	
Rotary Feedthrough	420MRM040-hm

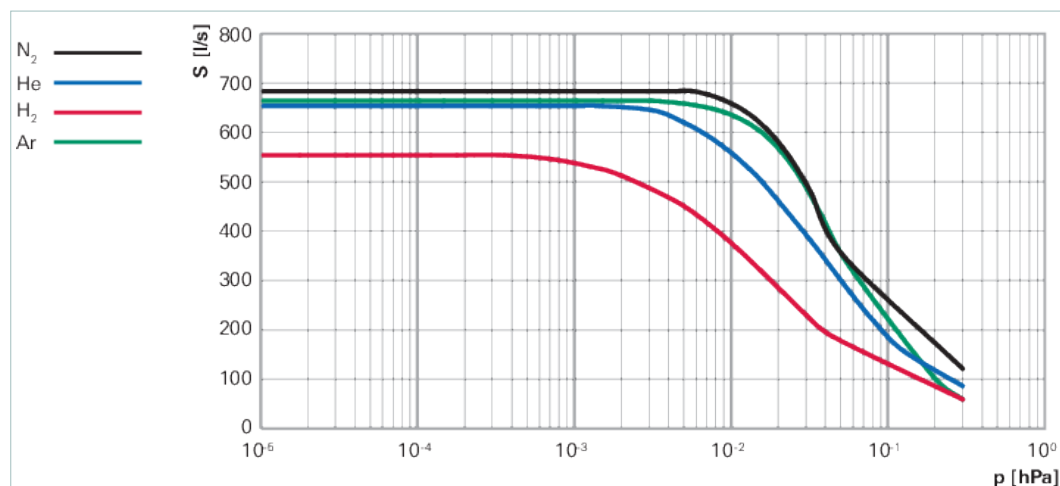
Accessories	
<b>OFHC Copper (Oxygen Free)</b>	
Copper Gasket, OFHC-copper, DN 40 CF	490DFL040-S10



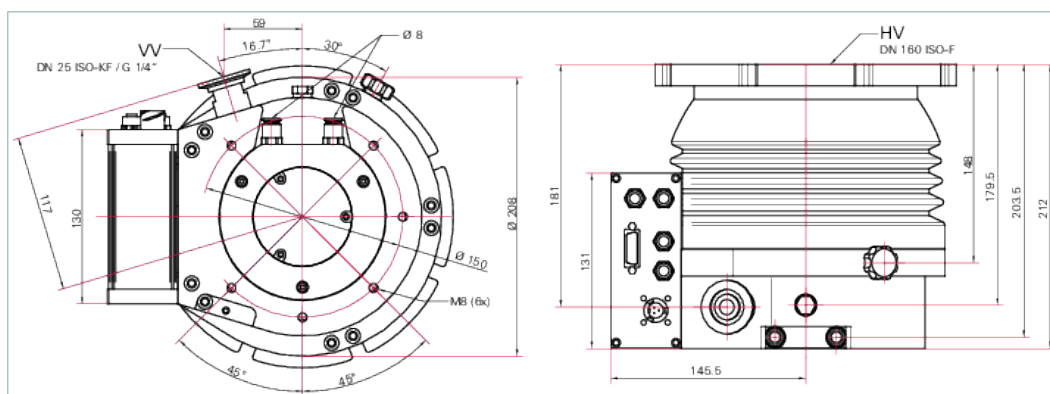
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## HiPace® 700 with TC 400, DN 160 ISO-F

- Compact yet powerful turbopump with a pumping speed of up to 685 l/s for N<sub>2</sub>
- Maximum vacuum performance with minimum power consumption
- For installation in any orientation
- Integrated TC 400 drive electronics
- Integrated, powerful cooling system



### Dimensions



Technical Data	HiPace® 700 with TC 400, DN 160 ISO-F
Bearing	Hybrid
Compression ratio for Ar	$> 1 \cdot 10^{11}$
Compression ratio for H <sub>2</sub>	$4 \cdot 10^5$
Compression ratio for He	$3 \cdot 10^7$
Compression ratio for N <sub>2</sub>	$> 1 \cdot 10^{11}$
Cooling method, optional	Air
Cooling method, standard	Water
Cooling water flow	100 l/h
Cooling water flow, max	100 l/h
Cooling water flow, min	100 l/h
Cooling water temperature	15-35 °C   59-95 °F   288-308 K
Current max.	8,4 A
Electronic drive unit	with TC 400
Flange (in)	DN 160 ISO-F
Flange (out)	DN 25 ISO-KF/G 1/4"

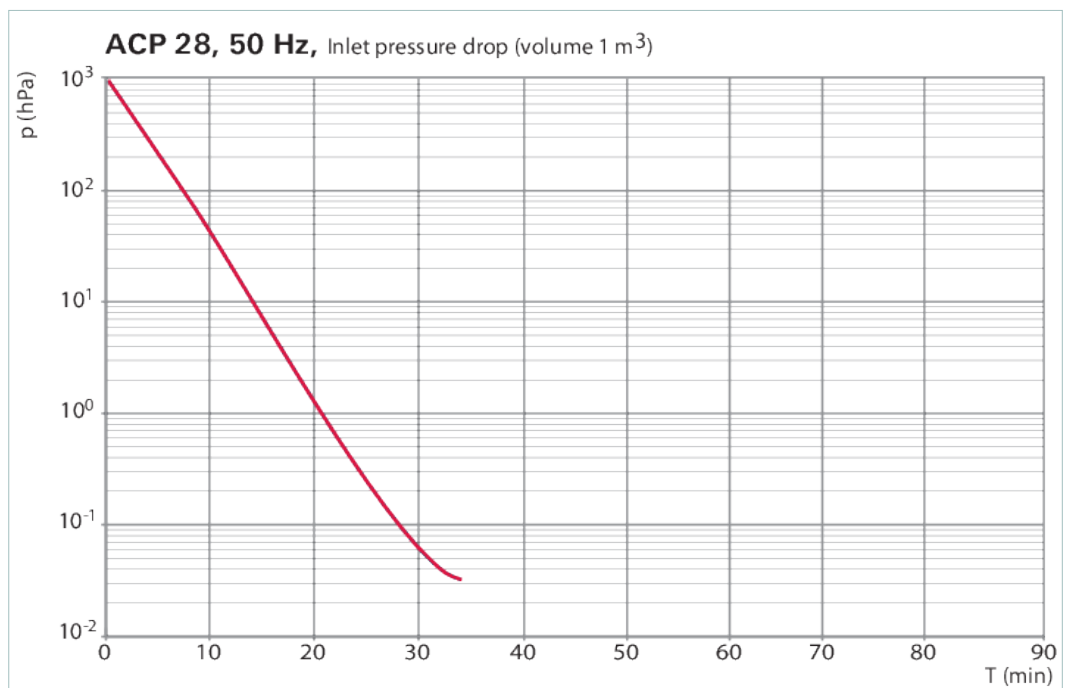
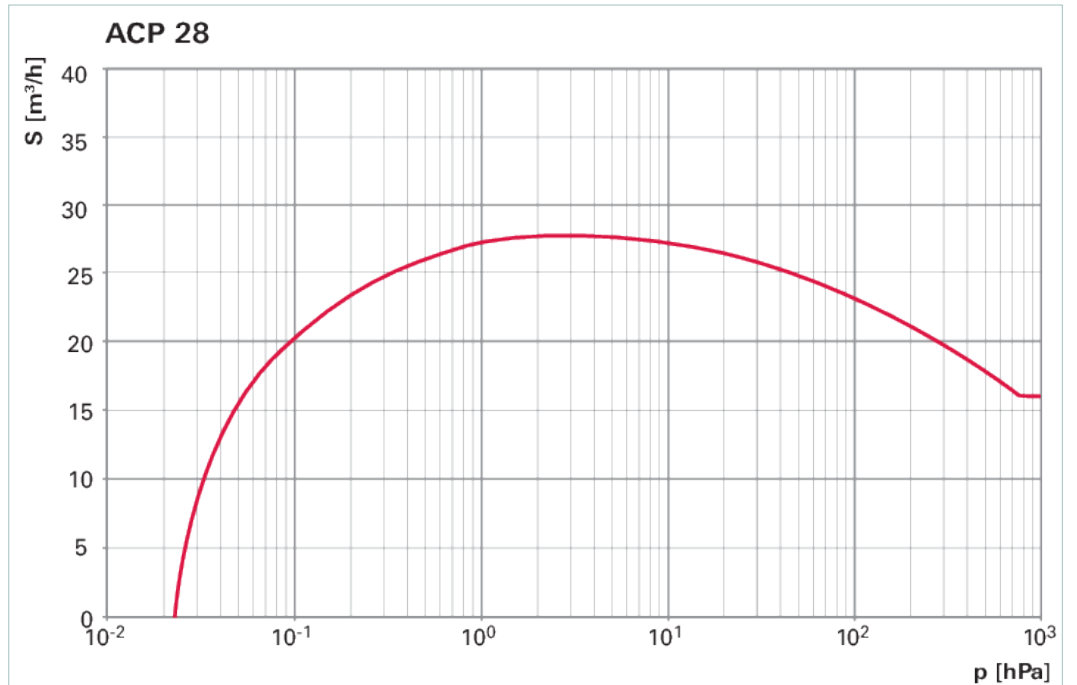
Technical Data	HiPace® 700 with TC 400, DN 160 ISO-F
Fore-vacuum max. for N <sub>2</sub>	11 hPa   8.25 Torr   11 mbar
Gas throughput at full rotational speed for Ar	3.5 hPa·l/s
Gas throughput at full rotational speed for H <sub>2</sub>	> 14 hPa·l/s
Gas throughput at full rotational speed for He	20 hPa·l/s
Gas throughput at full rotational speed for N <sub>2</sub>	6.5 hPa·l/s
I/O interfaces	RS-485, Remote
Interface, extended	Profibus, DeviceNet, E74
Mounting orientation	Any
Permissible magnetic field max.	6 mT
Power consumption max.	420 W
Protection category	IP54
Pumping speed for Ar	665 l/s
Pumping speed for H <sub>2</sub>	555 l/s
Pumping speed for He	655 l/s
Pumping speed for N <sub>2</sub>	685 l/s
Rotation speed ± 2 %	49,200 rpm   49,200 min <sup>-1</sup>
Rotation speed variable	60 – 100 %
Run-up time	2 min
Sound pressure level	≤50 dB(A)
Ultimate pressure	1 · 10 <sup>-7</sup> hPa   7.5 · 10 <sup>-8</sup> Torr   1 · 10 <sup>-7</sup> mbar
Ultimate pressure without gas ballast	1 · 10 <sup>-7</sup> hPa   7.5 · 10 <sup>-8</sup> Torr   1 · 10 <sup>-7</sup> mbar
Venting connection	G 1/8"
Weight	12.1 kg   26.68 lb

Order number	
HiPace® 700	PM P03 935

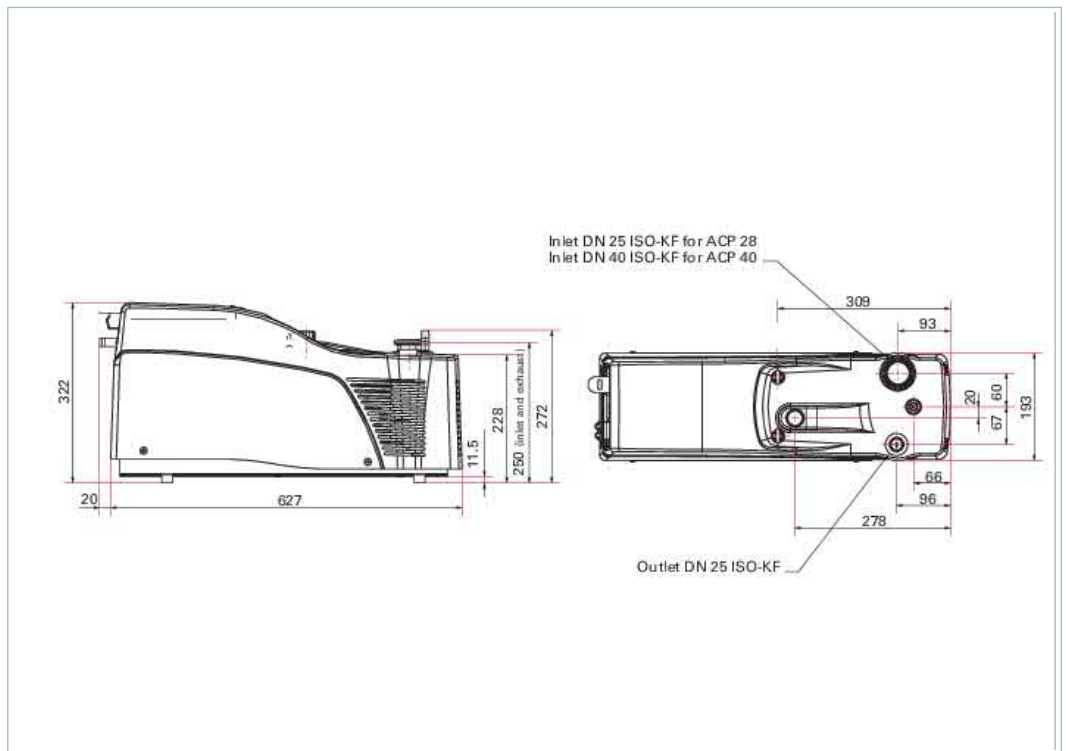


Similar Image

## ACP 28, Standard, single phase, manual gas ballast



## Dimensions



Technical Data	ACP 28, Standard, single phase, manual gas ballast
Ambient temperature	12-40 °C   53.6-104 °F   285-313 K
Continuous inlet pressure, max.	1,013 hPa   759.75 Torr   1,013 mbar
Cooling	Air
Dimensions (L x W x H)	647 x 193 x 322 mm   25.47 x 7.6 x 12.68 inch
Emission sound pressure level without gas ballast or purge	< 70 dB(A)
Exhaust pressure, max.	1,200 hPa   900 Torr   1,200 mbar
Flange (in)	DN 25 ISO-KF
Flange (out)	DN 25 ISO-KF
Helium leak rate, max.	5 · 10 <sup>-7</sup> Pa m <sup>3</sup> /s   3.75 · 10 <sup>-6</sup> Torr l/s   5 · 10 <sup>-6</sup> mbar l/s
Mains requirement	110 – 230 (±10%) V AC 50/60 Hz
Mains requirement: frequency (range)	50/60 Hz
Max. pumping capacity of pure water vapor at 20°C	120 g/h
Power consumption at ultimate pressure	700 W
Processes	Light Duty Applications
Pumping speed	27 m <sup>3</sup> /h   15.89 cfm   450 l/min
Typical ultimate pressure with gas ballast	1 · 10 <sup>-1</sup> hPa   7.5 · 10 <sup>-2</sup> Torr   1 · 10 <sup>-1</sup> mbar
Typical ultimate pressure without gas ballast or purge	3 · 10 <sup>-2</sup> hPa   2.25 · 10 <sup>-2</sup> Torr   3 · 10 <sup>-2</sup> mbar
Version	Standard
Weight	30 kg   66.14 lb

Order number	
ACP 28, Standard	V6SATSFEMF



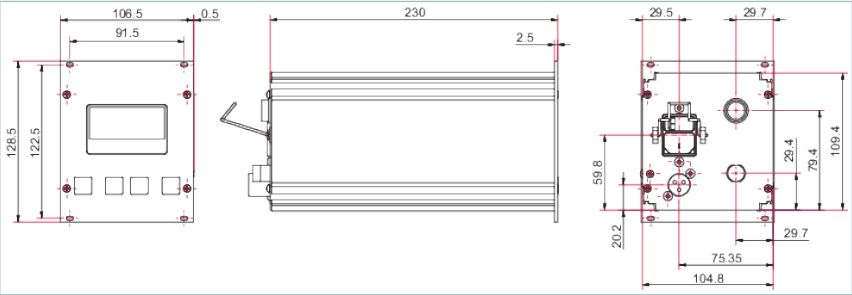


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## DCU 400, Display control unit incl. power supply pack 19"

- For power supply, control and operation of appropriate Pfeiffer Vacuum products
- With integrated power supply
- Ideal for use with HiPace 400–800 with TC 400 and HiPace 300–800 M with TM 700
- Connection of Pfeiffer Vacuum ActiveLine gauges possible
- Interface cable (3 m) for drive electronics included in scope of delivery

### Dimensions



A	227.5 mm
B	230 mm
C	128.5 mm
D	111.2 mm
E	106 mm
F	106.4 mm

Technical Data	DCU 400, Display control unit incl. power supply pack 19"
Ambient temperature	5-50 °C   41-122 °F   278-323 K
Mains requirement: frequency (range)	50/60 Hz
Mains requirement: power consumption	450 VA
Mains requirement: voltage (range)	115–230 (-20-+15 %) V AC
Output current	8.4 A
Output voltage	48 (± 2 %) V DC
Power supply	DCU 400
Protection category	IP20
Weight	2.3 kg   5.07 lb

Order number	
DCU 400	PM C01 823

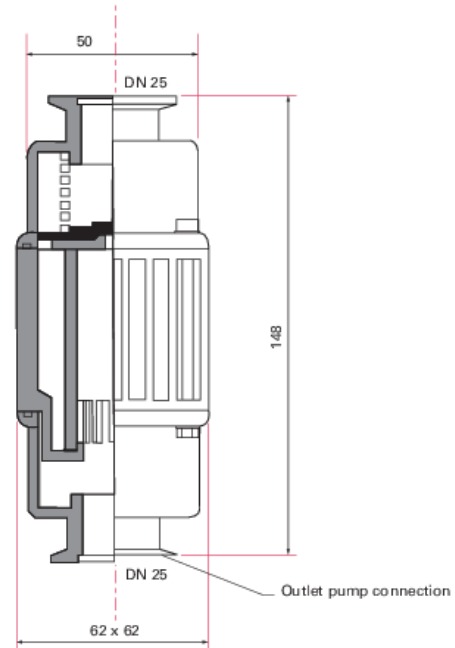
Accessories	
<b>Cables Mains cables / Power cords</b>	
Mains cable 208 V AC, NEMA 6-15 to C13, 3 m	P 4564 309 ZF
<b>Turbopumps</b>	
Mains cable 230 V AC, CEE 7/7 to C13, 3 m	P 4564 309 ZA
Mains cable 115 V AC, NEMA 5-15 to C13, 3 m	P 4564 309 ZE



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## External silencer ES 25 S, DN 25

### Dimensions



### Order number

ES 25 S

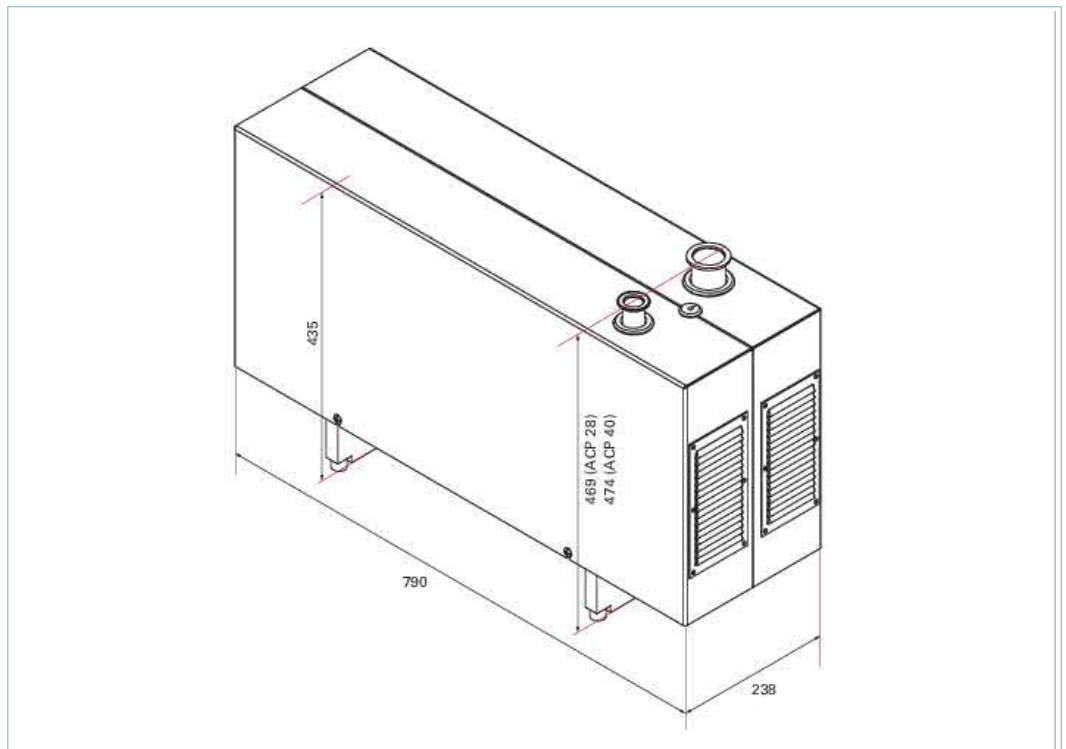
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## Sound enclosure kit SEK 28/40, for ACP 28 and ACP 40 pumps

### Dimensions



### Order number

SEK 28/40

114379

## Noise reduction covers

NRC 15 and NRC 28/40 reduce ACP noise levels significantly.

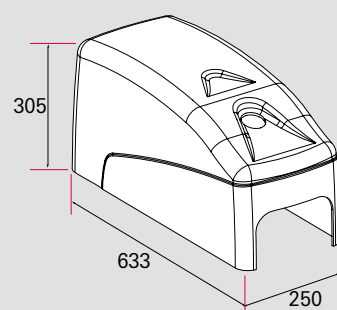
Noise level reduction from 5 to 6 dBA:

- NRC 15 for ACP 15
- NRC 28/40 for ACP 28 and ACP 40
- Max. ambient temperature: 35 °C

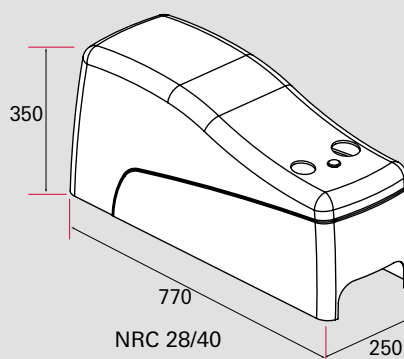
An additional pipe extension is required for each port to connect accessories when NRC is mounted.<sup>1)</sup>

<sup>1)</sup> Pipe extension, centering rings and clamping rings have to be ordered separately.

Noise reduction covers	Order number
NRC 15	111968
NRC 28/40	112637
Pipe extension DN 25 ISO-KF	A462855
Pipe extension DN 40 ISO-KF	303024



NRC 15



NRC 28/40

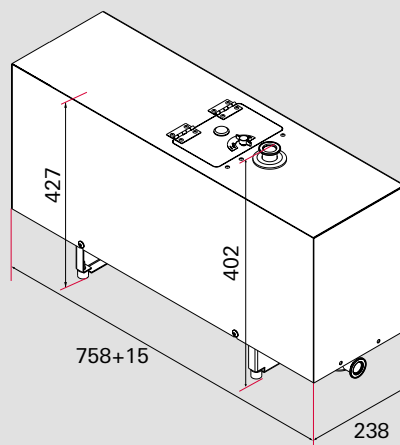
## Sound enclosure kit

Sound enclosure kits are the appropriate solution for operating ACP pumps in even the most quiet environments.

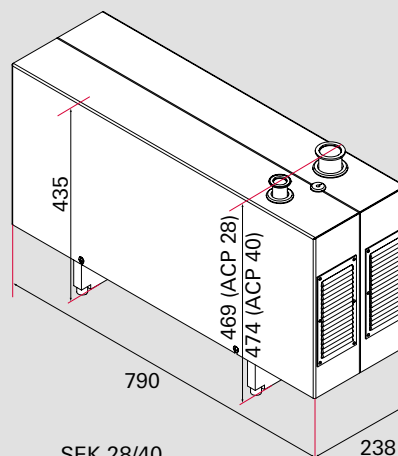
Noise reduction of 10 dBA.

- Max. ambient temperature: 30 °C
- SEK 15 includes dedicated DN 25 exhaust silencer

Sound enclosure kit	Order number
SEK 15	122480
SEK 28/40	114379



SEK 15



SEK 28/40

Dimensions in mm

## 12 Technical data and dimensions

### 12.1 General

Basic principles for the Technical Data of Pfeiffer Vacuum dry compact multi-stage Roots pumps:

- Recommendations of PNEUROP committee PN5
- ISO 21360; 2007: "Vacuum technology - Standard methods for measuring vacuum-pump performance - General description"
- Sound pressure level at ultimate pressure according to EN ISO 2151

### 12.2 Technical data

Technical data	Units	ACP 28	ACP 28 G	ACP 28 CV	ACP 40	ACP 40 G	ACP 40 CV
Inlet flange (ISO-KF)		DN 25	DN 25	DN 25	DN 40	DN 40	DN 40
Exhaust flange (ISO-KF)		DN 25	DN 25	DN 25	DN 25	DN 25	DN 25
Pumping speed max.	m <sup>3</sup> /h	27	27	27	37	37	37
Typical ultimate pressure (without purge nor gas ballast)	hPa	3·10 <sup>-2</sup>	3·10 <sup>-2</sup>	3·10 <sup>-2</sup>	3·10 <sup>-2</sup>	3·10 <sup>-2</sup>	3·10 <sup>-2</sup>
Typical ultimate pressure (with gas ballast open)	hPa	1·10 <sup>-1</sup>	-	2·10 <sup>-1</sup>	1·10 <sup>-1</sup>	-	2·10 <sup>-1</sup>
Typical ultimate pressure (with purge) <sup>(3)</sup>	hPa	-	1·10 <sup>-1</sup>	1·10 <sup>-1</sup>	-	1·10 <sup>-1</sup>	1·10 <sup>-1</sup>
Typical ultimate pressure (with purge <sup>(3)</sup> and gas ballast open)	hPa	-	-	2·10 <sup>-1</sup>	-	-	2·10 <sup>-1</sup>
Maximum ultimate pressure (without purge nor gas ballast)	hPa	4·10 <sup>-2</sup>	4·10 <sup>-2</sup>	4·10 <sup>-2</sup>	4·10 <sup>-2</sup>	4·10 <sup>-2</sup>	4·10 <sup>-2</sup>
Maximum ultimate pressure (with gas ballast open)	hPa	2·10 <sup>-1</sup>	-	3·10 <sup>-1</sup>	2·10 <sup>-1</sup>	-	3·10 <sup>-1</sup>
Maximum ultimate pressure (with purge) <sup>(3)</sup>	hPa	-	2·10 <sup>-1</sup>	2·10 <sup>-1</sup>	-	2·10 <sup>-1</sup>	2·10 <sup>-1</sup>
Maximum ultimate pressure (with purge <sup>(3)</sup> and gas ballast open)	hPa	-	-	3·10 <sup>-1</sup>	-	-	3·10 <sup>-1</sup>
Max. pumping capacity of pure water vapor (gas ballast open) <sup>(2)</sup>	g/h	120	-	700	120	-	700
Continuous inlet pressure, Max.	hPa	1013	1013	1013	1013	1013	1013
Maximum exhaust pressure	hPa	1200	1200	1200	1200	1200	1200
N <sub>2</sub> Purge flow <sup>(3)</sup>	slm	-	3.7	40	-	3.7	40
Gas ballast flow at atmospheric pressure	m <sup>3</sup> /h	1.2	-	2,4	1,2	-	2,4
Sound level (gas ballast and purge closed)	dB(A)	< 70	< 70	< 70	< 70	< 70	< 70
Helium leak rate <sup>(4)</sup>	hPa l/s	<5·10 <sup>-7</sup>	<5·10 <sup>-7</sup>	<5·10 <sup>-7</sup>	<5·10 <sup>-7</sup>	<5·10 <sup>-7</sup>	<5·10 <sup>-7</sup>
Power supply <sup>(1)</sup> (according to ordering guide)	V	110-230 V- 1- phase or 200- 440 V- 3-phase					
Power consumption at ultimate pressure	W	700	700	700	700	700	700
Power consumption at atmospheric pressure	W	1050	1050	1050	1050	1050	1050
Dimensions		(see 12.4)	(see 12.4)	(see 12.4)	(see 12.4)	(see 12.4)	(see 12.4)
Weight	kg	30	30	30	32	32	32

(1) In accordance with EC regulations, the pumps can withstand a voltage variation of ± 10%.

(2) at ambient temperature: 20°C.

(3) Inert gas flushing 300 hPa relative pressure.

(4) Test by Helium spray.

#### Conversion table: pressure units

	mbar	bar	Pa	hPa	kPa	Torr mm Hg
mbar	1	1 · 10 <sup>-3</sup>	100	1	0.1	0.75
bar	1000	1	1 · 10 <sup>5</sup>	1000	100	750
Pa	0.01	1 · 10 <sup>-5</sup>	1	0.01	1 · 10 <sup>-3</sup>	7.5 · 10 <sup>-3</sup>



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## **Annex No. 3**

### **Price Sheet**

Annex No. 3 is subject to trade secret.



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## **ANNEX 4**

### **OFFERED PARAMETERS: PARTIAL CRITERION QUALITY AND PERFORMANCE**



## Annex No. 5

### Offered parameters: Partial criterion Quality and Performance

Quality and Performance sub-criterion	Points	Maximum points	Offered value
Material of the Cylindrical Vacuum Chamber	<ul style="list-style-type: none"> <li>Stainless steel 304/1.4301: 0 points</li> <li>Stainless steel 304L/1.4307 or 316L/1.4404 : 1 point</li> </ul>	1	Stainless steel 304/1.4301
Flow rate accuracy of each Mass Flow Controller (MFC) <sup>(1)</sup>	<ul style="list-style-type: none"> <li>Between 1.5% and 2% of the full scale flow: 0 points</li> <li>&lt; 1.5% of the full scale flow: 1 point</li> </ul>	1	0.6% FS
Entry for the capacitance gauge on the readout-controller for the MFCs	<ul style="list-style-type: none"> <li>No entry for the capacitance gauge: 0 points</li> <li>Entry for capacitance gauge <b>with possibility<sup>(2)</sup> to self-regulate the MFCs</b> for pressure control: 1 point</li> </ul>	1	No entry for the capacitance gauge
Window diameter on the viewport of port #4 of the chamber	<ul style="list-style-type: none"> <li>135 mm ≤ Window diameter &lt; 160 mm: 0 points</li> <li>160 mm ≤ Window diameter &lt; 175 mm: 1 point</li> <li>175 mm ≤ Window diameter &lt; 180 mm: 2 points</li> <li>Window diameter ≥ 180 mm: 3 points</li> </ul>	3	260 mm
Window material of the port #6 of the chamber (DN 63 ISO-K)	<ul style="list-style-type: none"> <li>Borosilicate glass: 0 points</li> <li>UV fused silica with transmission better than 80%, at least from 250 nm to 2000 nm wavelength, with surface quality: 40/20 scratch/dig or better, with flatness deviations ≤1268nm: 1 point</li> <li>Calcium Fluoride with optical transmission ≥90% at least</li> </ul>	2	UV fused silica with transmission better than 80%, at least from 250 nm to 2000 nm wavelength, with surface quality: 40/20 scratch/dig, with flatness deviations 633 nm





	from 200 nm to 5000 nm wavelength, surface quality: 40/20 scratch/dig or better, flatness deviations $\leq 1268\text{nm}$ : 2 points		
Window material of the port #7 of the chamber (DN 63 ISO-K)	<ul style="list-style-type: none"><li>• Borosilicate glass: 0 points</li><li>• Sapphire with optical transmission <math>\geq 80\%</math> at least from 300 nm to 4000 nm wavelength, surface quality: 40/20 scratch/dig or better, flatness deviations <math>\leq 1268\text{nm}</math>: 1 point</li><li>• Calcium Fluoride with optical transmission <math>\geq 90\%</math> at least from 200 nm to 5000 nm wavelength, surface quality: 40/20 scratch/dig or better, flatness deviations <math>\leq 1268\text{nm}</math>: 2 points</li></ul>	2	Borosilicate glass
Extra viewport DN63 ISO-K with changeable window (window must not be included)	<ul style="list-style-type: none"><li>• No extra DN63 ISO-K viewport: 0 points</li><li>• 1 extra DN63 ISO-K viewport with changeable circular window (flange with glass retainer for optical glasses) accepting window diameters ranging at least from 49.9 mm to 50.9 mm and thicknesses ranging at least from 4.0 mm to 8.0 mm: 1 point</li></ul>	1	1 extra DN63 ISO-K viewport with changeable circular window (flange with glass retainer for optical glasses) accepting window diameters ranging at least from 49.8 mm to 51 mm and thicknesses ranging at least from 3.8 mm to 8.0 mm
Extra viewport DN40 ISO-KF with changeable window (window must not be included)	<ul style="list-style-type: none"><li>• No extra DN40 ISO-KF viewport: 0 points</li><li>• 1 DN40 ISO-KF viewport with changeable circular window (flange with glass retainer for optical glasses) accepting window diameters ranging at least from 24.9 mm to 25.8 mm and thicknesses ranging at least from 3.0 mm to 7.0 mm: 1 point</li></ul>	1	1 DN40 ISO-KF viewport with changeable circular window (flange with glass retainer for optical glasses) accepting window diameters ranging at least from 24.8 mm to 25.8 mm and thicknesses ranging at least from 3.0 mm to 7.0 mm



Adjustment range of the height of the frame around the 1200mm height position (position of the center of the port #9 of the chamber)	<ul style="list-style-type: none"><li>Adjustment range of <math>\pm 30</math> mm: 0 points</li><li><math>\pm 30</math> mm &lt; Adjustment range &lt; <math>\pm 50</math> mm: 1 point</li><li>Adjustment range <math>\geq \pm 50</math> mm: 2 points</li></ul>	2	$\pm 50$ mm
Capacitance gauge accuracy from $10^{-4}$ mbar to 1 mbar	<ul style="list-style-type: none"><li><math>\pm 0.20\% \leq \text{accuracy} &lt; \pm 0.18\%</math>: 0 points</li><li>Accuracy <math>\leq \pm 0.18\%</math>: 1 point</li></ul>	1	0.15%

<sup>(1)</sup> with N2. In case the accuracy is not the same for all the MFCs, the MCF with the worse accuracy shall be considered.

<sup>(2)</sup> This must remain an option when using the readout and control unit. It must be possible to readout simultaneously the MFCs and the capacitance gauge on the readout unit and to use them also independently (gauge connection shall not be needed for readout of MFCs on the unit and MFCs connection shall not be needed for readout of the capacitance gauge on the unit).



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## **ANNEX 5**

### **OFFERED PARAMETERS: PARTIAL CRITERION WARRANTY LENGTHS**



## Annex No. 6

### Offered parameters: Partial criterion Warranty Lengths

#### A- Warranty lengths for the full VS

Warranty length for the subject matter of the public contract is: 12 calendar months

#### B- Warranty lengths for specific parts of the VS

Warranty length subcriterion	Offered value in calendar months (min. 12, max. 60)
Warranty length 1 for the cylindrical vacuum chamber itself and its supporting frame	12
warranty length 2 for the pumping system (turbomolecular pump, roughing pump, gate valve, bellows and connection valves)	12
warranty length 3 for the set of 4 gauges and the 3 control/display units required in the tender specifications	12
warranty length 4 for the set of mass flow controllers with their control/display units as required in the tender specifications	12
warranty length 5 for the following set of feedthroughs: the thermocouple feedthrough with reader, all electrical feedthroughs required in the tender specification, all coaxial feedthroughs required in the tender specifications and the rotary feedthrough with motorization and controller	12

Pfeiffer Vacuum Austria GmbH · Novodvorská 1062/12 · CZ-142 00 Praha

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AT 1150 Vienna

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**Pobočka Praha**

Novodvorská 1062/12  
142 00 Praha 4

**Re: Response to the REQUEST TO PARTICIPANT**

**Public Contract Name:** VACUUM CHAMBER WITH PUMPING SYSTEM, GAS INLET SYSTEM, VACUUM GAUGES, FLANGES AND STAND

**Contracting Authority:** Fyzikální ústav AV ČR, v.v.i., Na Slovance 2, 182 21 Prague 8

*In response to your Request to Participant we are sending you additional information to our Bid for the above mentioned Public Contract.*

**Your request:**

1) Within your Bid in the document "Bid\_PVA\_final\_signed" you stipulated "CF-Blank Flange for Ports, DN, 160 Stainless steel, with, copper gasket and screws (Product No. 820KBC160)" in quantity: 1.

Within the Annex No. 2 Technical Specification which is also part of the Bid as an Annex to the Purchase Contract is the "flanges" required in the quantity: 2.

Based on this discrepancy we would like to ask you to clarify which information is correct. Contracting Authority states that the Bid price cannot be changed and in case that the Bid does not meets all the technical requirement the Participant shall be excluded from the procurement procedure.

**Our declaration:**

The "quantity: 1" of the "DN 160 FC Blank flanges" in our Bid is a misprint. The correct quantity is "2" in accordance with the Annex No. 2 Technical specification. The Bid price was calculated with the DN 160 FC Blank flange quantity of 2 pcs.

**Your request:**

2) Within the Annex No. 2 Technical Specification, we stipulated on the page. 3 for the Cylindrical Vacuum Chamber a parameter for the Hooks (lifting eye bosses): at least 4 lifting eye bosses affixed (welded) to the upper part of the cylinder vessel outer wall to make it possible to lift just the upper lid (top flange), or the whole chamber for its installation on the mechanical stand and for lifting it when installed.

We would like to ask you to confirm, that this parameter is part of your Bid.

**Our declaration:**

We confirm that the above mentioned parameter is a part of our Bid.

**Your request:**

3) As part of your Bid you have presented Mr. Radan Salomonovič's power of attorney (Plná moc, Vollmacht).

We would like to ask you to submit this power of attorney in original form (electronic original – converted to electronic form by authority authorized to perform certified conversion of documents).

**Our declaration:**

The original of Mr. Radan Salomonovič's power of attorney (Plná moc, Vollmacht) converted to electronic form by authorized authority is in the attachment.

**Your request:**

4) Within the Annex No. 2 Technical Specification, we stipulated on the page. 12 for parameter Shelf: The frame must have a shelf at the bottom. Within your Bid you stipulated on page 33 of the document "Bid\_PVA\_final\_signed" in section Frame feet and wheels following:

We would like to ask you to clarify, that this parameter corresponds with the technical specification.

**Our declaration:**

Yes, the "shelf at the bottom" as required in the Technical specification, part Mechanical stand, is included in "Shelves 750x400 mm as a working table".

**Your request:**

5) We would also like to ask you to confirm that you accept all the requirements set out



*in the technical specification.*

***Our declaration:***

*We accept all the requirements set out in the Technical specification. The optional requirements mentioned in the Technical specification are fulfilled in our Bid to the extent as we have stated in the Annex No.5 "Offered parameters: Partial criterion Quality and Performance".*

*In Prague, 21.1.2020*

*PFEIFFER Vacuum Austria GmbH*

*Dr. Ing. R. Salomonovič*

***Attachment:*** *Mr. Radan Salomonovič's power of attorney (Plná moc, Vollmacht) in certified converted electronic form.*