

Purchase Contract

(hereafter the “Contract”)

1. CONTRACTUAL PARTIES

1.1 Fyzikální ústav AV ČR, v. v. i.,

with seat: Na Slovance 1999/2, 182 21 Praha 8,
represented by: RNDr. Michael Prouza, Ph.D., Director,
Registered in the Register of public research institutions of the Ministry of Education, Youth and
Sports of the Czech Republic.

Bank: [REDACTED]
Account No. IBAN: [REDACTED]; SWIFT (BIC): [REDACTED]
ID No.: 68378271
Tax ID No.: CZ68378271

(hereinafter the “Buyer”)

and

1.2 Hositrad Holland BV,

with seat: De Wel 44 - 3871 MV - Hoewelaken - The Netherlands,
represented by: J.L.J. Tomassen, Director,
registered in The Netherlands.

Bank: [REDACTED]
Account No. IBAN: [REDACTED]
ID No.: 32084750
Tax ID No.: NL809569024B01

(hereinafter the “Seller”),

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

2. FUNDAMENTAL PROVISIONS

- 2.1 The Buyer is a public research institution whose primary activity is scientific research in the area of physics, especially elementary particles physics, condensed systems, plasma and optics.
- 2.2 The Buyer wishes to acquire the subject of performance hereof in order to ensure that he will be able to perform microwave temperature measurements down to 10 K.
- 2.3 The Seller was selected as the winner of a public procurement procedure announced by the Buyer for the public contract called "**Cryostat for high-frequency dielectric and magnetic measurements - repeated procurement procedure**" (hereinafter the "**Procurement Procedure**").

2.4 The documentation necessary for the execution of the subject of performance hereof consist of

- 2.4.1 Technical specifications of the subject of performance hereof attached as **Annex No. 1** hereto.
- 2.4.2 The Seller's bid submitted within the Procurement Procedure in its parts which describe the subject of performance in technical detail (hereinafter the "**Sellers's Bid**"); the Sellers's Bid forms **Annex No. 2** to this Contract and is an integral part hereof.

In the event of a conflict between the Contract's Annexes the technical specification / requirement of the higher level / quality shall prevail.

- 2.5 The Seller declares that he has all the professional prerequisites required for the supply of the subject of performance under this Contract, is authorised to supply the subject of performance and there exist no obstacles on the part of the Seller that would prevent him from supplying the subject of this Contract to the Buyer.
- 2.6 The Seller acknowledges that the Buyer considers the Seller's participation in the Procurement Procedure, provided that the Seller complies with all qualification requirements, as a confirmation of the fact that the Seller is capable of providing performance under the Contract with such knowledge, diligence and care that is associated and expected of the Seller's profession, and that the Seller's potential performance lacking such professional care would give rise to corresponding liability on the Seller's part. The Seller is prohibited from misusing his qualities as the expert or his economic position in order to create or exploit dependency of the weaker Party or to establish an unjustified imbalance in the mutual rights and obligation of the Parties.
- 2.7 The Seller acknowledges that the Buyer is not in connection to the subject of this Contract an entrepreneur and also that the subject of this Contract is not related to any business activities of the Buyer.
- 2.8 The Seller acknowledges that the production and delivery of the subject of performance within the specified time and of the specified quality, as shown in Annexes No. 1 and 2 of this Contract (including invoicing), is essential for the Buyer. If the Seller fails to meet contractual requirements, it may incur damage of the Buyer.
- 2.9 The Parties declare that they shall maintain confidentiality with respect to all facts and information, which they learn in connection herewith and / or during performance hereunder, and whose disclosure could cause damage to either Party. Confidentiality provisions do not prejudice obligations on the part of the Buyer arising from valid legislation.

3. SUBJECT-MATTER OF THE CONTRACT

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

the Cryostat for high-frequency dielectric and magnetic measurements (hereafter the "**Equipment**")

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

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

3.2.1 Preliminary testing of the functionality of the Equipment at the place of manufacture,

3.2.2 Transport of the Equipment incl. all accessories specified in Annexes 1 and 2 of the Contract to the place of delivery,

3.2.3 Telephone or email assistance with the installation of the Equipment at the site,

3.2.4 Delivery of instructions and operating and repair manuals to the Equipment in Czech or English language to the Buyer, in electronic and hardcopy (printed) versions,

3.2.5 Free-of-charge warranty service,

3.2.6 Ensuring out-of-warranty and post-warranty service,

3.2.7 Provision of technical support in the form of consultations.

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

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

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

4. PERFORMANCE PERIOD

4.1 The Seller undertakes to manufacture and deliver the Equipment to the address specified in Section 7.1 hereof within 5 months of the conclusion of this Contract.

4.2 The performance period shall be extended for a period during which the Seller could not perform due to obstacles on the part of the Buyer.

5. PURCHASE PRICE, INVOICING, PAYMENTS

5.1 The purchase price is based on the Seller's submitted bid and amounts to **35.575,00 € (in words: thirty five thousand and five hundred seventy five Euros)** excluding VAT (hereinafter the "**Price**"). VAT shall be paid by the Buyer and settled in accordance with the valid Czech regulation.

5.2 The Price represents the maximum binding offer by the Seller and includes any and all performance provided by the Seller in connection with meeting the Buyer's requirements for the proper and

complete delivery of the Equipment hereunder, as well as all costs that the Seller may incur in connection with the testing and delivery, and including all other costs of expenses that may arise in connection with creation of an intellectual property creation and its protection.

5.3 The Parties agreed that the Price shall be invoiced after the acceptance protocol in accordance with Section 10.5 will have been signed. In case the Equipment will be delivered with minor defects and / or unfinished work, the Price will be invoiced after removal of these minor defects and / or unfinished work.

5.4 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:

5.4.1 name and registered office of the Buyer,

5.4.2 tax identification number of the Buyer,

5.4.3 name and registered office of the Seller,

5.4.4 tax identification number of the Seller,

5.4.5 registration number of the tax document,

5.4.6 scope of the performance (including the reference to this Contract),

5.4.7 the date of the issue of the tax document,

5.4.8 the date of the fulfilment of the Contract,

5.4.9 purchase Price,

5.4.10 registration number of this Contract, which the Buyer shall communicate to the Seller based on Seller's request before the issuance of the invoice

and must comply with the double taxation agreements, if applicable.

5.5 The Buyer prefers electronic invoicing, with the invoices being delivered to efaktury@fzu.cz. All issued invoices shall comply with any international double taxation agreements, if applicable.

5.6 Invoices shall be payable within thirty (30) days of the date of their delivery to the Buyer. Payment of the invoiced amount means the date of its remittance to the Seller's account.

5.7 If an invoice is not issued in conformity with the payment terms stipulated by the Contract or if it does not comply with the requirements stipulated by law, the Buyer shall be entitled to return the invoice to the Seller as incomplete, or incorrectly issued, for correction or issue of a new invoice, as appropriate, within five (5) business days of the date of its delivery to the Buyer. In such a case, the Buyer shall not be in delay with the payment of the Price or part thereof and the Seller shall issue a corrected invoice with a new and identical maturity period commencing on the date of delivery of the corrected or newly issued invoice to the Buyer.

5.8 The Buyer shall be entitled to unilaterally set off any of his payments against any receivables claimed by the Seller due to:

5.8.1 damages caused by the Seller,

5.8.2 contractual penalties.

5.9 The Seller shall not be entitled to set off any of his receivables against any part of the Buyer's receivable hereunder.

6. OWNERSHIP TITLE

6.1 The ownership right to the Equipment shall pass to the Buyer by acceptance. Acceptance shall be understood as delivery and acceptance of the Equipment duly confirmed by the Buyer on the acceptance protocol in accordance with Section 10.5.

7. PLACE OF DELIVERY OF THE EQUIPMENT

7.1 The place of delivery of the Equipment shall be the premises of the Buyer at Na Slovance 1999/2, 182 21 Praha 8, Czech Republic.

8. COOPERATION OF THE PARTIES

8.1 The Seller undertakes to notify the Buyer of any obstacles on his part, which may negatively influence proper and timely delivery of the Equipment.

9. TESTING AT THE PLACE OF MANUFACTURE

9.1 The preliminary testing of the Equipment shall take place at Seller's premises prior to shipping of the Equipment to the Buyer.

9.2 The Seller shall execute a protocol in case the preliminary testing of the Equipment confirms that the Equipment is functional and complies to technical specifications according to Annexes No. 1 and No. 2 hereof. The Seller shall deliver this protocol together with the Equipment to the Buyer.

10. DELIVERY, INSTALLATION AND ACCEPTANCE

10.1 The Seller shall transport the Equipment at its own cost to the place of delivery. If the shipment is intact, the Buyer shall issue delivery note for the Seller.

10.2 The Buyer shall perform the installation of the Equipment and verify whether the Equipment is functional and meets the technical requirements of Annexes No. 1 and 2 hereof.

10.3 The Buyer undertakes to perform the installation of the Equipment and verification whether the Equipment is functional and meets the technical requirements within 2 weeks of the delivery of the Equipment.

10.4 The delivery shall include all technical documentation pertaining to the Equipment, the protocol about the preliminary testing of the Equipment, user manuals and certificate of compliance of the Equipment and all its parts and accessories with approved standards.

10.5 The procedure shall be completed by acceptance of the Equipment confirmed by the acceptance protocol containing specifications of all performed tests. The protocol shall contain the following information:

10.5.1 Information about the Seller, the Buyer and any subcontractors,

- 10.5.2 Description of the Equipment including description of all components and serial numbers,
- 10.5.3 Description of performed tests including achieved parameters; in case the parameters achieved are different from the parameters achieved at the place of manufacture during the testing according to Article 9. hereof, the parameters measured by the Buyer shall be decisive,
- 10.5.4 List of technical documentation including the manuals,
- 10.5.5 Date and signature of the representative of the Buyer specified in 12.2 hereof.
- 10.6 Acceptance of the Equipment does not release the Seller from liability for defects that were not detected during the acceptance procedure.
- 10.7 The Buyer shall not be obliged to accept Equipment which would show defects or unfinished work and which would otherwise not form a barrier, on their own or in connection with other defects, to using the Equipment. In this case, the Buyer shall issue a record containing the reason for his refusal to accept the Equipment.

11. TECHNICAL ASSISTANCE – CONSULTATIONS

- 11.1 The Seller shall be obliged to provide to the Buyer free-of-charge technical assistance by phone or e-mail relating to the subject-matter hereof during the entire term of the warranty period. The Seller undertakes to provide to the Buyer paid consultations and technical assistance relating to the subject-matter hereof also after the warranty period expires.

12. REPRESENTATIVES, NOTICES:

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

[REDACTED]
e-mail:

tel. [REDACTED]

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

[REDACTED]
e-mail:

tel. [REDACTED]

- 12.3 All notifications to be made between the Parties hereunder must be made out in writing and delivered to the other Party by hand (with confirmed receipt) or by registered post (to the Buyer's or Seller's address), or in some other form of registered post or electronic delivery incorporating electronic signature (qualified certificate) to epodatelna@fzu.cz in case of the Buyer and to info@hositrاد.com in case of the Seller.
- 12.4 In all technical and expert matters (discussions on the Equipment testing and demonstration, notification of the need to provide warranty or post-warranty service, technical assistance etc.) electronic communication between technical representatives of the Parties will be acceptable using e-mail addresses defined in Sections 12.1 and 12.2.

13. TERMINATION

- 13.1 This Contract may be terminated early by agreement of the Parties or withdrawal from the Contract on the grounds stipulated by law or in the Contract.
- 13.2 The Buyer is entitled to withdraw from the Contract without any penalty from Seller in any of the following events:
- 13.2.1 The Seller is in delay with the delivery of the Equipment longer than 4 weeks after the date pursuant to Section 4.1 hereof.
 - 13.2.2 Technical parameters or other conditions required in the technical specification defined in Annex No. 1 and 2 hereto and in the relevant valid technical standards will not be achieved by the Equipment at acceptance,
 - 13.2.3 Facts emerge bearing evidence that the Seller will not be able to deliver the Equipment.
 - 13.2.4 The Seller will not meet the qualification criteria within the Procurement Procedure.
- 13.3 The Seller is entitled to withdraw from the Contract in the event of the Buyer being in default with the payment for more than 2 months with the exception of the cases when the Buyer refused invoice due to defect on the delivered Equipment or due to breach of the Contract by the Seller.
- 13.4 Withdrawal from the Contract becomes effective on the day the written notification to that effect is delivered to the other Party. The Party which had received performance from the other Party prior to such withdrawal shall duly return such performance.

14. INSURANCE

- 14.1 The Seller undertakes to insure the Equipment against all risks, in the amount of the Price of the Equipment for the entire period commencing when transport of the Equipment starts until duly accepted by the Buyer. In case of breach of this obligation, the Seller shall be liable to the Buyer for any damage that may arise.
- 14.2 The Seller is liable for the damage that he has caused. The Seller is also liable for damage caused by third parties undertaken to carry out performance or his part under this Contract.

15. WARRANTY TERMS

- 15.1 The Seller shall provide warranty for the quality of the Equipment for a period of 24 months. The warranty term shall commence on the day following the date of signing of the acceptance protocol pursuant to Section 10.5 hereof. The warranty does not cover consumable things.
- 15.2 Should the Buyer discover a defect, he shall notify the Seller to rectify such defect using the email address info@hositrad.com.
- 15.3 During the warranty period the Seller shall be obliged to rectify any claimed defects within 1 month from receipt of the Buyer's notification. In cases of unusual defects, the Seller shall be obliged to rectify the defect in the period corresponding to the nature of the defect and to define the deadline for the handover of the rectified Equipment.
- 15.4 During the warranty period any and all costs associated with defect rectification / repair including transport and travel expenses shall be always borne by the Seller.

- 15.5 The repaired Equipment shall be handed over by the Seller to the Buyer on the basis of a protocol confirming removal of the defect (hereinafter the “**Repair Protocol**”) containing confirmations of both Parties that the Equipment was duly repaired and is defect-free.
- 15.6 The repaired portion of the Equipment shall be subject to a new warranty term in accordance with Section 15.1, which commences to run on the day following the date when the Repair Protocol was executed.
- 15.7 The Seller declares that he shall ensure post-warranty [out-of-warranty] service for the period of 5 years after the warranty term expires; the service terms shall be identical with provisions of Sections 15.2 and 15.3.
- 15.8 The Seller undertakes to provide the Buyer with updates of the software controlling the Equipment for the entire term of warranty service.

16. CONTRACTUAL PENALTIES

- 16.1 The Buyer shall have the right to a penalty in the amount of 0.1 % of the Price for each commenced day of delay with the performance pursuant to Section 4.1 hereof.
- 16.2 The Buyer shall have the right to a penalty in the amount of 0.1 % of the Price for each commenced day of delay with rectifying of claimed defects.
- 16.3 In case of default in payment of any due receivables (monetary debt) under the Contract, the defaulting Buyer or Seller (the debtor) shall be obliged to pay a contractual penalty in the amount of 0.1 % of the owed amount for each commenced day of delay with the payment.
- 16.4 Contractual penalties are payable within 30 days of notification demanding payment thereof.
- 16.5 Payment of the contractual penalty does not prejudice the rights of the Parties to claim damages.

17. DISPUTES

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

18. FINAL PROVISIONS

- 18.1 This Contract represents the entire agreement between the Buyer and the Seller. The relationships between the Parties not regulated in this Contract shall be governed by the Act No. 89/2012 Coll., the Civil Code, as amended.
- 18.2 In the event that any of the provisions of this Contract shall later be shown or determined to be invalid, ineffective or unenforceable, then such invalidity, ineffectiveness or unenforceability shall not cause invalidity, ineffectiveness or unenforceability of the Contract as a whole. In such event the Parties undertake without undue delay to subsequently clarify any such provision or replace after mutual agreement such invalid, ineffective or unenforceable provision of the Contract by a new provision, that in the extent permitted by the laws and regulations of the Czech Republic, relates as

closely as possible to the intentions of the Parties to the Contract at the time of creation hereof.

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

In Prague on 4. 5. 2018

In Hoevelaken on 25. 4. 2018

For the Buyer:

For the Seller:

RNDr. Michael Prouza, Ph.D.
Director

J.L.J. Tomassem
Director

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

The Equipment has to be a cryostat usable for high-frequency dielectric and magnetic measurements. It must have the following features:

	Description and minimum specification of the Equipment as defined by the Buyer	Description and specification of the Equipment offered by the Seller	Complies YES/NO
1.	Closed helium circulation (closed cycle helium cryostat), with radiation shield	Item 1 and Item 2 of Annex No. 2 Separately Product Information Cold Edge Technologies	Yes
2.	Temperature range at least 10-420 K (achievable with measuring cells inside the cryostat)	Item 2 of Annex No. 2	Yes
3.	Sufficient cooling power to cool down massive measuring cells (up to 300 g). Initial cooldown time to 10 K: max. 5 hours	Item 1 and Item 2 of Annex No. 2 Separately Product Information Cold Edge Technologies	Yes
4.	Equipment includes water-cooled compressor with full charge of high-purity helium gas and 3-meter helium flexible lines between compressor and cryostat	Item 1 and Item 2 of Annex No. 2 Separately Product Information Cold Edge Technologies	Yes
5.	Equipment includes temperature controller, able to set temperature rate from 0.5 to 2 K/min	Item 4 of Annex No. 2 Separately Product Information Lakeshore	Yes
6.	Diameter of the "cold plate" min. 10 cm. <i>Additional small modifications of the cold plate before conclusion of the contract (small holes, cuts, etc.)</i>	Item 2 of Annex No. 2 ARO and Approval Drawing Sign off after Order confirmation	Yes
7.	3 semirigid microwave coaxial cables with K-connectors (SMA) on each end with an o-ring compression seal feedthrough with attenuation test to 40 GHz	Item 3 of Annex No. 2 Separately Product Information CeramTec	Yes
8.	3 temperature sensors: for regulation, on the "cold plate" and attachable to measuring cells (on a flexible cable)	Item 3 of Annex No. 2	Yes
9.	Evacuation valve with NW-25 flange	Item 2 of Annex No. 2	Yes
10.	Cryostat without optical windows; cooler mounted below sample	Item 2 of Annex No. 2	Yes
11.	Vertical distance between cold plate and top of radiation shield min. 10 cm	Item 2 of Annex No. 2	Yes

Annex No. 2**The Seller's bid in the extent it describes technical parameters of the Equipment****Non optical closed cycle 10K cryostat with 10cm cold plate**

Item 1 , Qty 1

Sumitomo CH-204 6.5K Cryocooler system

- CH-204N cold head
- 6.5K to 350K temperature range, Cooling capacity* 3W @ 10K & 8.8 W @ 20K
- HC-4 Compressor water cooled, 220/230V 1 phase, 50/60Hz
- 3m gas line set & head power cable
- Cool down <70 minutes, Cold tip displacement <10 microns
- 500K high temp adapter

Item 2 , Qty 1

Interface, Non Optical

- Vacuum Shroud with 150mm diameter tail OD
- NW25 vacuum port, Vacuum valve, RV and 2 instrumentation ports
- Sample plate 10 cm diameter
- Radiation shield – gold plated
- Sample space 10cm diameter by 10 cm high
- Temperature at Sample mount point will be – 6.5K

Item 3 , Qty 1

Instrumentation for temperature control & monitoring - standard

- Three Silicon Diode Sensors LS-DT-670B installed (one sensor for temperature control and the others for sample monitoring on 4 inch free length)
- 50 ohm / watt rugged cartridge heater specified for in vacuum use. Easily field replaceable.
- Three semi-rigid coax cables installed – heat sunk to both first and second CCR stages
- Three 45 GHz SMA feedthrough CeramTec 23749
- One 19Pin and 3 SMA feedthrough

***Note sensors max is 475K**

Item 4 , Qty 1

Lakeshore Model 335 two channel temperature controller

Includes cable between expander and controller & all sensors curves loaded.

Displex® CH-204 & CH-104
6K, 10K or 25K Closed Cycle Cooler

905 Harrison Street
 Suite 134
 Allentown, PA 18103
 Phone/Fax: 610-628-6363

Model	Type	2nd stage capacity 60Hz	2nd stage capacity 50Hz	1st stage capacity 60Hz	1st stage capacity 50Hz	Highest temp.	Cool down time	Expander Weight	Compressor
Displex CH-204	10K GM	2.0W @ 10K 8.8W @ 20K	1.5W @ 10K 7.0W @ 20K	16W @ 80K	13W @ 80K	350K	30 min. to 20K	7.7 kg (17 Lb)	HC-4E1 (air or water cooled)
	6K GM	3.5W @ 10K 8.8W @ 20K	3.0W @ 10K 7.0W @ 20K						
Displex CH-104	25K GM	na	na	35W @ 77K	30 @ 77K	350K	35 min. to 77K	7.9 kg (17.5 Lb)	HC-4E1

Key Competitive Parameters

CH is new updated design of older DE style

- One piece cylinder assembly with round warm flange
- E-beam welded (less heat = straighter cylinder = longer seal life)
- Fully automated honing - higher quality cylinder finish (longer seal life)
- Adjustable orifice to optimize cooling performance
- Motor is 3 phase or 1 phase (more torque - lasts longer)
- Patented Whisper bumpers (quieter)
- Improved valve motor has less joints resulting in less potential leak paths
- Expander has flanged heat station allowing better thermal contact to item being cooled

Built with ISO 9001 and 6 sigma QA processes

- All expander 100% tested
 - Function & life run
 - Cylinder cold leak checked
 - Min. temperature then heat loads applied
 - Capacity stability measured (automated—not a person checking once in a while)
- Strong quality steps results in very low failure rate - <0.3%
- Warranty - 18 months
- Service interval - 13,000 hours
- In production since 1980's
- Last 10 years 2500 units fielded (DE/CH-204 & 104 combined)
- Field Serviceable by user



UHV CH-204



CH-104

® Displex is a registered trade mark of Sumitomo (SHI) Cryogenics of America, Inc.

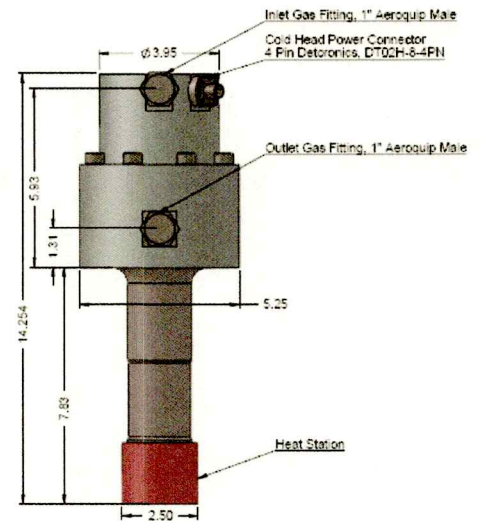
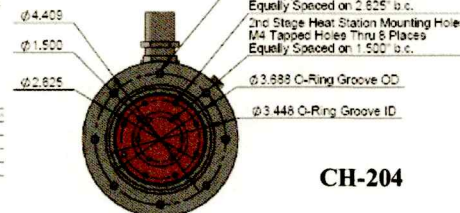
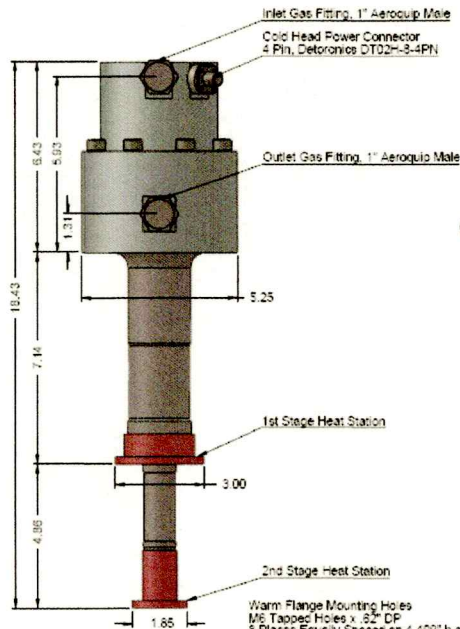
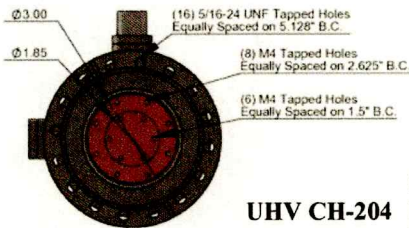
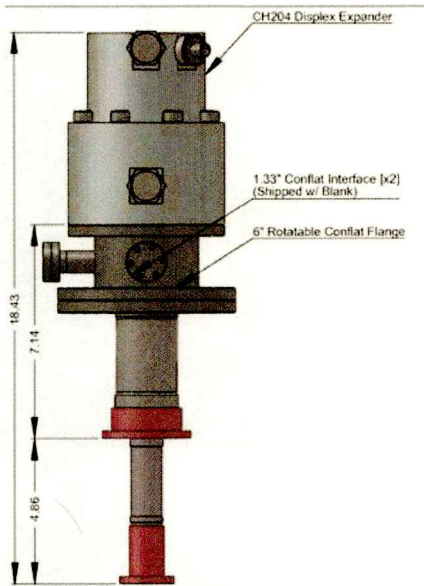
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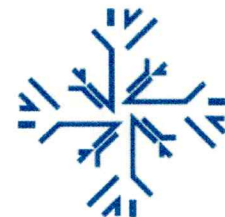
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Displex® CH-204 & CH-104
6K, 10K or 25K Closed Cycle Cooler

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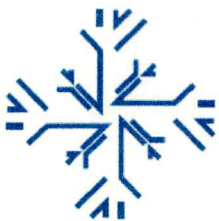
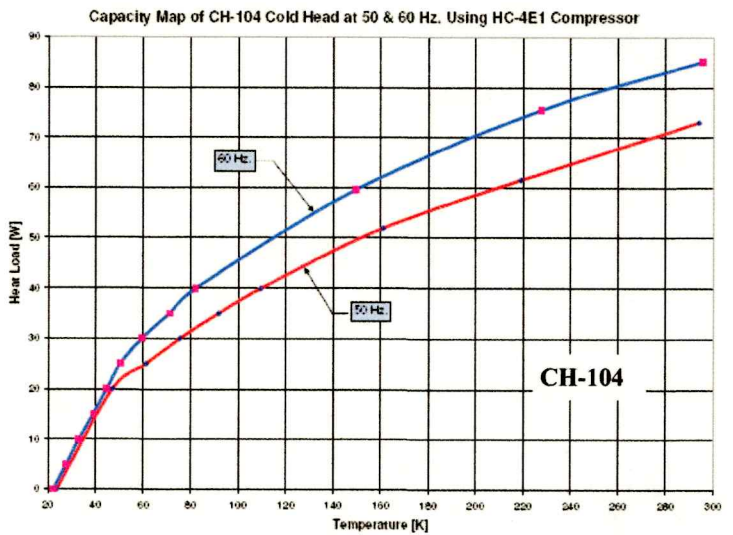
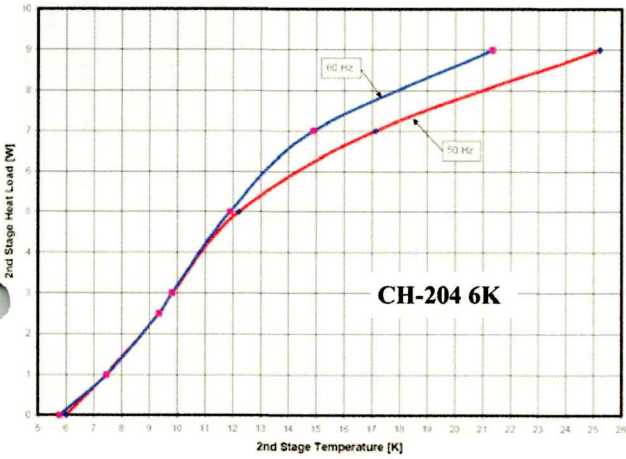
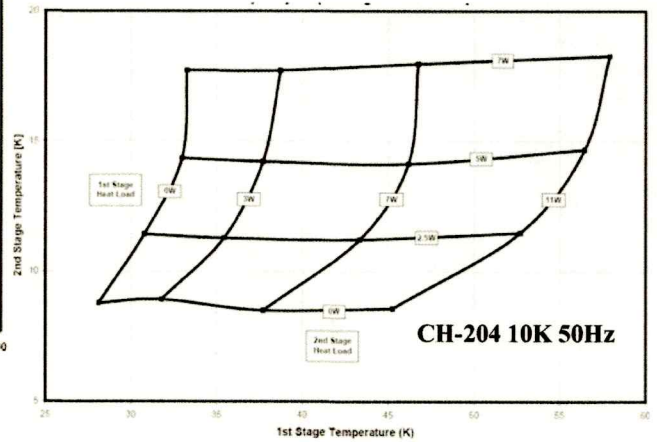
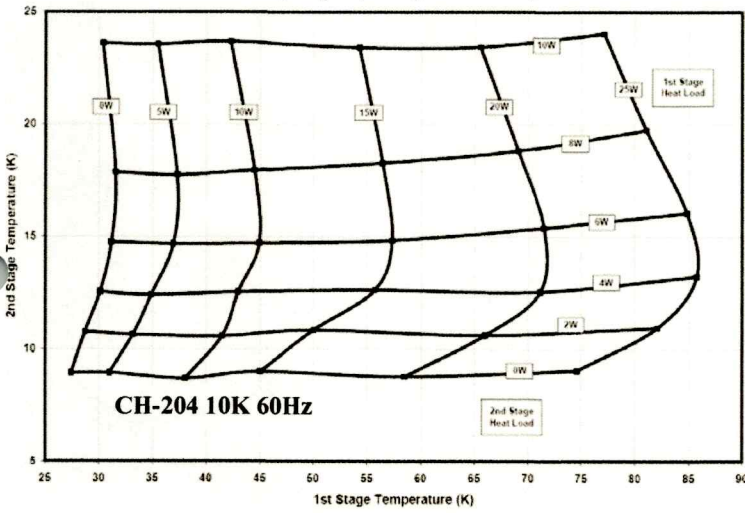


- True UHV with all metal seals
- All weld joints inside the vacuum area to avoid virtual leaks, easy cleaning and no trapping of contaminants (competing systems "welded skirts" are welded from the outside).
- 4.5, 6 and 8 inch conflat flanges available
- Bakeable to 200C with three internal parts removed.
- Great balance of mid range cooling capacity and small size
- Flanged heat stations to for solid thermal connections.
- Operates in any orientation
- Field serviceable
- Small size with high cooling power in the 30K to 150K range
- Fast cooldown



Displex® CH-204 & CH-104
6K,10K and 25K Heat Load Maps

905 Harrison Street
 Suite 134
 Allentown, PA 18103
 Phone/Fax: 610-628-6363



SHI HC-4E1 Helium Compressor

905 Harrison Street
Suite 134
Allentown, PA 18103
Phone/Fax: 610-628-6363

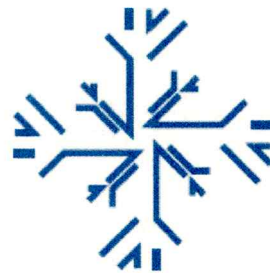
Air or Water Cooled Closed Cycle

Specifications	
Electrical Voltage	208/230V~(+/-5%), 60Hz 200V~(+/-5%), 50Hz 220V~(+/-5%), 50Hz (with transformer) 230/240V~(+/-5%), 50Hz (with transformer)
Power consumption	3.0kW, 15.5 amps full load at 208 V~, 60Hz 2.6kW, 13 amps full load at 200 V~, 50Hz 68 amperes locked rotor current
Ambient Temperature	4C to 40C (40F to 104F)
Cooling Water Inlet Temp.	4C to 27C (40F to 80F)
Cooling Water Flow Rate	2.7 L/min (0.7 gpm) minimum
Dimensions	504 x 439 x 485 mm 19.8 x 16.9 x 19.1 inches
Weight	75 kg (165 lbs.) 82 kg (180 lbs) (with transformer)



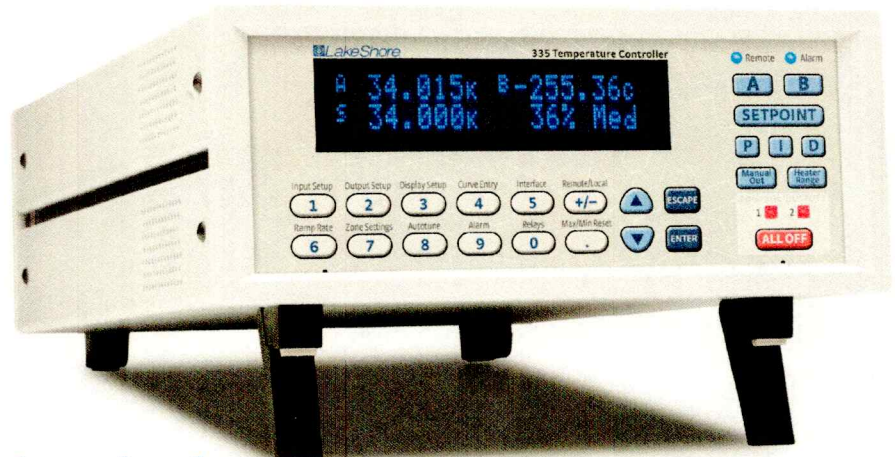
Key Competitive Parameters

- Warranty - 18 months
- Service interval – 30,000 hours (adsorber change)
- Worldwide service network
- Front panel access for all utilities and settings
- Built with ISO 9001 and 6 sigma QA processes
 - All compressors 100% tested
 - Compressor motor purpose built for Helium use
 - Function & life run
 - Measured yields, root cause failure, corrective action, components 100% checked, supplier performance monitored
 - Contamination control process
- Strong quality steps results in very low failure rate of <0.5%
- In production since 1980's
- Last 10 years 2500 units fielded
- Field Serviceable by user



Model 335 Temperature Controller

- Operates down to 300 mK with appropriate NTC RTD sensors
- Two sensor inputs
- Two configurable PID control loops providing 50 W and 25 W or 75 W and 1 W
- Autotuning automatically calculates PID parameters
- Automatically switch sensor inputs using zones to allow continuous measurement and control from 300 mK to 1505 K
- Custom display set-up allows you to label each sensor input
- USB and IEEE-488 interfaces
- Supports diode, RTD, and thermocouple temperature sensors
- Sensor excitation current reversal eliminates thermal EMF errors for resistance sensors
- ± 10 V analog voltage output, alarms, and relays



Introduction

Designed with the user and ease of use in mind, the Model 335 temperature controller offers many user-configurable features and advanced functions that until now have been reserved for more expensive, high-end temperature controllers. The Model 335 is the first two-channel temperature controller available with user-configurable heater outputs delivering a total of 75 W of low noise heater power—50 W and 25 W, or 75 W and 1 W. With that much heater power packed into an affordable half-rack sized instrument, the Model 335 gives you more power and control than ever.

Control outputs are equipped with both hardware and software features allowing you, and not your temperature controller, to easily control your experiments. Output one functions as a current output while output two can be configured in either current or voltage mode. With output two in voltage mode, it functions as a ± 10 V analog output while still providing 1 W of heater power and full closed loop proportional-integral-derivative (PID) control capability. Alarms and relays are included to help automate secondary control functions. The improved autotuning feature of the Model 335 can be used to automatically calculate PID control parameters, so you spend less time tuning your controller and more time conducting experiments.

The Model 335 supports the industry's most advanced line of cryogenic temperature sensors as manufactured by Lake Shore, including diodes, resistance temperature detectors (RTDs), and thermocouples. The controller's zone tuning feature allows you to measure and control temperatures seamlessly

from 300 mK to over 1,500 K. This feature automatically switches temperature sensor inputs when your temperature range goes beyond the useable range of a given sensor. You'll never again have to be concerned with temperature sensor over or under errors and measurement continuity issues.

The intuitive front panel layout and keypad logic, bright vacuum fluorescent display, and LED indicators enhance the user-friendly front panel interface of the Model 335. Four standard display modes are offered to accommodate different instrument configurations and user preferences. Say goodbye to sticky notes and hand written labels, as the ability to custom label sensor inputs eliminates the guesswork in remembering or determining the location to which a sensor input is associated. These features, combined with USB and IEEE-488 interfaces and intuitive menu structure and logic supports efficiency and ease of use.

As a replacement to our popular Model 331 and 332 temperature controllers, the Model 335 offers software emulation modes for literal drop-in compatibility. The commands you are accustomed to sending to the Model 331 and 332 will either be interpreted directly or translated to the most appropriate Model 335 setting. The Model 335 comes standard-equipped with all of the functionality of the controllers it replaces, but offers additional features that save you time and money.

With the Model 335, you get a temperature controller you control from the world leader in cryogenic thermometry.

Sensor Inputs

The Model 335 offers two standard sensor inputs that are compatible with diode and RTD temperature sensors. The field-installable Model 3060 option adds thermocouple functionality to both inputs.

Sensor inputs feature a high-resolution 24-bit analog-to-digital converter and each of the two powered outputs function as separate current sources. Both sensor inputs are optically isolated from other circuits to reduce noise and to deliver repeatable sensor measurements. Current reversal eliminates thermal electromagnetic field (EMF) errors in resistance sensors. Ten excitation currents facilitate temperature measurement and control down to 300 mK using appropriate negative temperature coefficient (NTC) RTDs. Autorange mode automatically scales excitation current in NTC RTDs to reduce self heating at low temperatures as sensor resistance changes by many orders of magnitude. Temperatures down to 1.4 K can be measured and controlled using silicon or GaAlAs diodes. Software selects the appropriate excitation current and signal gain levels when the sensor type is entered via the instrument front panel. To increase your productivity, the unique zone setting feature automatically switches sensor inputs, enabling you to measure temperatures from 300 mK to over 1,500 K without interrupting your experiment.

The Model 335 includes standard temperature sensor response curves for silicon diodes, platinum RTDs, ruthenium oxide RTDs, and thermocouples. Non-volatile memory can also store up to 39 200-point CalCurves for Lake Shore calibrated temperature sensors or user curves. A built-in SoftCal algorithm can be used to generate curves for silicon diodes and platinum RTDs that can be stored as user curves. Temperature sensor calibration data can be easily loaded into the Model 335 temperature controller and manipulated using the Lake Shore curve handler software program.

- 1 Sensor input connectors
- 2 Terminal block (analog outputs/relays)
- 3 USB interface
- 4 IEEE-488 interface
- 5 Line input assembly
- 6 Output 2 heater
- 7 Output 1 heater
- 8 Thermocouple option inputs

Temperature Control

Providing a total of 75 W of heater power, the Model 335 is the most powerful half rack temperature controller available. Designed to deliver very clean heater power, precise temperature control is ensured throughout your full scale temperature range for excellent measurement reliability, efficiency and throughput. Two independent PID control outputs can be configured to supply 50 W and 25 W or 75 W and 1 W of heater power. Precise control output is calculated based on your temperature setpoint and feedback from the control sensor. Wide tuning parameters accommodate most cryogenic cooling systems and many high-temperature ovens commonly used in laboratories. PID values can be manually set for fine control or the improved autotuning feature can automate the tuning process.

The Model 335 autotuning method calculates PID parameters and provides feedback to help build zone tables. The setpoint ramp feature provides smooth, continuous setpoint changes and predictable approaches to setpoint without the worry of overshoot or excessive settling times. The instrument's zone tuning feature automatically switches temperature sensor inputs when your temperature range goes beyond the useable range of a given sensor. This feature combined with the instrument's ability to scale the sensor excitation through ten pre-loaded current settings allows the Model 335 to provide continuous measurement and control from 300 mK to 1505 K.

Both control outputs are variable DC current sources referenced to chassis ground. As a factory default, outputs 1 and 2 provide 50 W and 25 W of continuous power respectively, both to a 50 Ω or 25 Ω load. For increased functionality, output 2 can also be set to voltage mode. When set to voltage mode, it functions as a ± 10 V analog output while still providing 1 W of heater power and full closed loop PID control capability. While in this mode, output 1 can provide up to 75 W of heater power to a 25 Ω load.

Temperature limit settings for inputs are provided as a safeguard against system damage. Each input is assigned a temperature limit, and if any input exceeds that limit, both control channels are automatically disabled.

Interface

The Model 335 is standard equipped with universal serial bus (USB) and parallel (IEEE-488) interfaces. In addition to gathering data, nearly every function of the instrument can be controlled via computer interface. You can download the Lake Shore curve handler software program to your computer to easily enter and manipulate sensor calibration curves for storage in the instrument's non-volatile memory.

The USB interface emulates an RS-232C serial port at a fixed 57,600 baud rate, but with the physical plug-ins of a USB. It also allows you to download firmware upgrades, ensuring the most current firmware version is loaded into your instrument without having to physically change your instrument.

Both sensor inputs are equipped with a high and low alarm which offers latching and non-latching operation. The two relays can be used in conjunction with the alarms to alert you of a fault condition and perform simple on-off control. Relays can be assigned to any alarm or operated manually.

The ± 10 V analog voltage output can be configured to send a voltage proportional to temperature to a strip chart recorder or data acquisition system. You may select the scale and data sent to the output, including temperature or sensor units.

Model 335 Rear Panel Connections

